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**DEL SEMINARIO SULLA VALUTAZIONE DEI
RISULTATI E DELLA METODOLOGIA DEI CENSIMENTI**

PROCEEDINGS

**OF THE SEMINAR ON THE EVALUATION
OF CENSUS RESULTS AND METHODOLOGY**

Organizzato dalla Conferenza
degli Statistici Europei
Organo della Commissione
Economica per l'Europa delle
Nazioni Unite e dall'Istituto
Centrale di Statistica

*Organized by the Conference
of European Statisticians
of the United Nations Economic
Commission for Europe and by
the Italian Central Institute
of Statistics*

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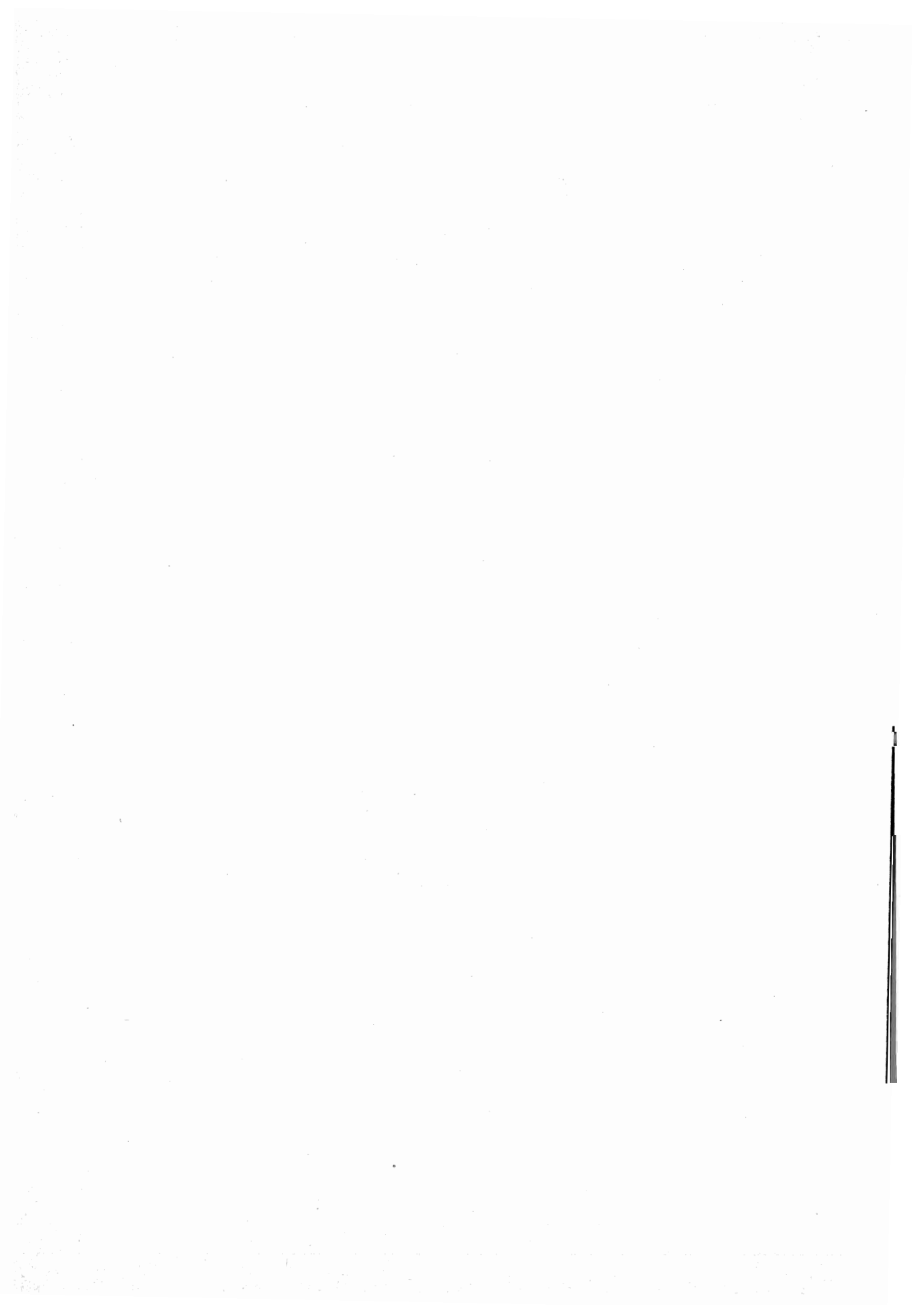
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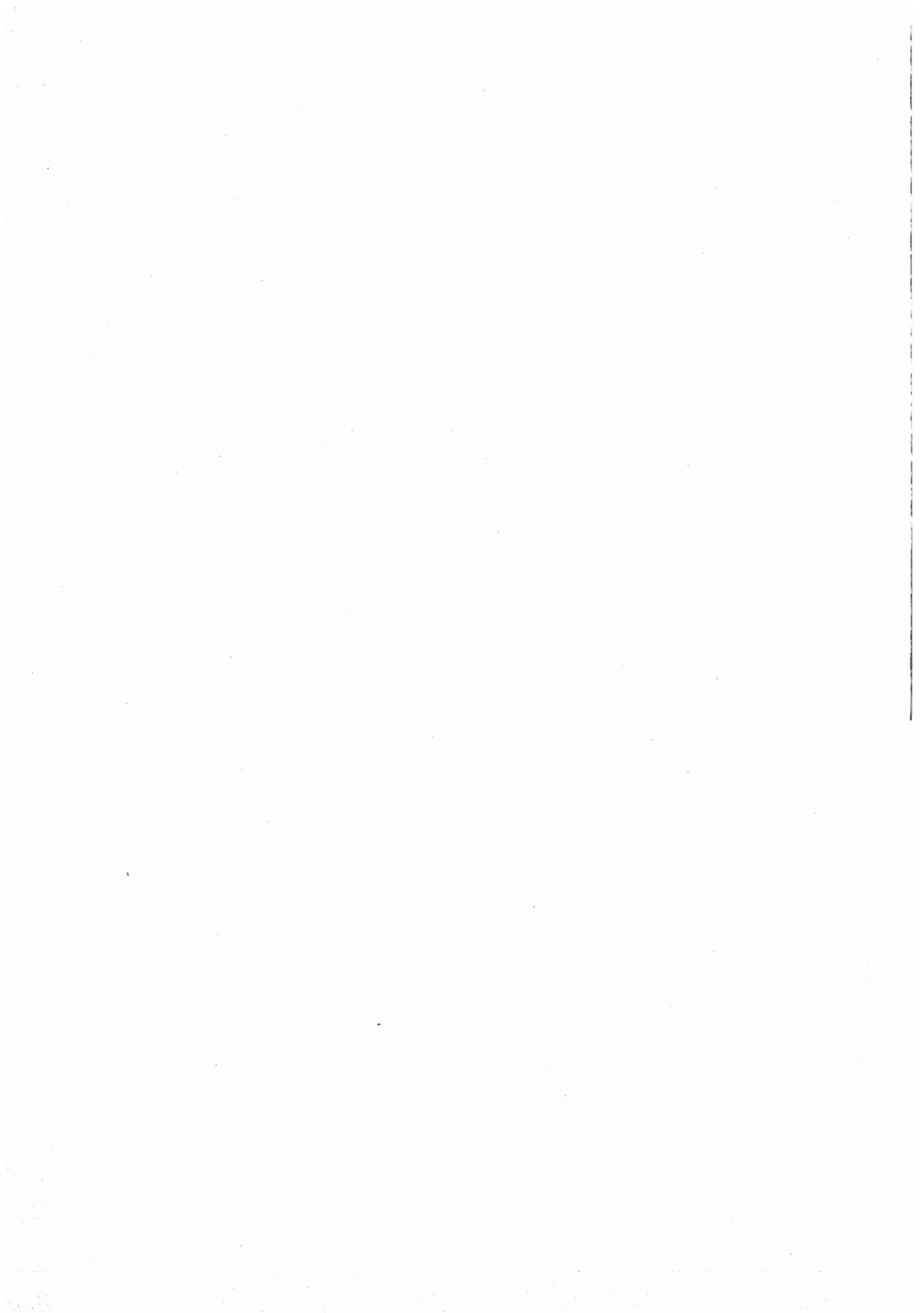
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OPENING SPEECHES

- G. AMATO
- G. REY
- W. HAEDER



I. PURPOSE OF THE SEMINAR

The Seminar was convened under the auspices of the Conference of European Statisticians. Its purpose was to provide a forum for reviewing miscellaneous problems countries in the region encountered in undertaking their most recent censuses of population and housing, for exchanging experiences on the methodologies and procedures used in the censuses, and for evaluating the results obtained from the various census operations. The Seminar was primarily intended for persons concerned with the planning, organization and administration of population and housing censuses and with the evaluation and analysis of the effectiveness of the various census operations and procedures.

II. TIME AND PLACE OF THE SEMINAR

At the invitation of the Government of Italy and in co-operation with the Italian Central Institute of Statistics (ISTAT), the Seminar was held in Rome, from 7th to 11th May 1984.

III. STUDY PROGRAMME

The study programme included the following items:

- (i) problems encountered in the pre-enumeration, enumeration and post-enumeration phases of the census (e.g. cartographic (mapping) work, living quarters and household listing, questionnaire preparation, field procedures, data processing problems, etc.);
- (ii) national experiences in the use of sampling in the different phases of the census (e.g. for pre-census testing, post-enumeration field checks, quality control of data processing, final processing and tabulation, etc.);
- (iii) coverage and content errors: extent of such errors, problems in measuring them and ways of reducing them in future censuses;
- (iv) statistics for small areas;
- (v) plans for future work on the preparation of recommendations for the 1990 round of population and housing censuses.

INDIRIZZO DI SALUTO DELL'ON. PROF. GIULIANO AMATO,
SOTTOSEGRETARIO DI STATO ALLA PRESIDENZA DEL CONSIGLIO DEI
MINISTRI

Signore e Signori,

È con estrema soddisfazione che l'Italia ospita un Seminario di così grande rilievo sia per la vasta partecipazione dei Paesi sia per l'importanza dei temi che verranno trattati. Dallo scambio di esperienze scaturiranno indicazioni utili per il lavoro futuro degli Istituti nazionali di Statistica.

Il censimento rappresenta uno strumento essenziale di conoscenza. Esso fornisce, infatti, la misura delle trasformazioni della società e consente quindi di basare su di essa i programmi di sviluppo e di intervento.

Le informazioni che si possono desumere dai censimenti costituiscono il supporto indispensabile per l'azione del Governo centrale e dei poteri locali in quanto offrono l'opportunità di meglio indirizzarne gli interventi. Tale loro funzione è particolarmente evidente in momenti, quali l'attuale, in cui debbono essere affrontate difficoltà di vario ordine sul piano economico-sociale.

Il vasto patrimonio informativo che viene acquisito nonché la sua massiccia utilizzazione giustificano ampiamente lo sforzo finanziario e organizzativo che l'esecuzione del censimento comporta.

Esso, tra l'altro, costituisce una verifica dell'efficienza dell'apparato amministrativo coinvolto nella complessa rilevazione, fornendo, così, indicazioni utili per interventi volti a migliorare l'organizzazione delle strutture. È il caso dell'Italia che ha da tempo individuato l'esigenza di riordinare su diverse basi il Servizio Statistico Nazionale.

Anche a nome del Governo Italiano, desidero esprimere a tutte le delegazioni i migliori auguri di proficuo lavoro.

OPENING SPEECH BY HON. PROF. GIULIANO AMATO,
UNDER-SECRETARY OF STATE FOR THE CABINET OFFICE

Ladies and Gentlemen

It is with utmost satisfaction that Italy hosts a Seminar of such outstanding importance for the scale of participation by the countries involved and for the importance of the topics with which it is concerned. This exchange of experiences will yield useful pointers for the future work of national Statistics Offices.

The Census is an essential tool for our knowledge and understanding. It provides us with a measure of the changes in society and thus a basis for development and action programmes.

The information it is possible to derive from censuses constitutes an indispensable support for the activities of central and local government in that it provides opportunities for better guidance for intervention. Their role in this sense is particularly apparent at times, like those of today, when various kinds of difficulty have to be dealt with in socio-economic terms.

The vast range of information acquired and its large-scale utilization fully justify the financial cost and the organizational effort involved in carrying out the census.

Among other things it constitutes a means for verifying the efficiency of the administrative machinery involved in the complex operation of enumeration. In this way it provides us with useful pointers to the action to be taken with the aim of improving the organization of administrative structures. This is so in the case of Italy which for some time now has recognized the need to reorganize the bases for the National Statistical Service.

In the name of the Italian Government, I wish to express our very best wishes to all delegates for a fruitful Conference.

**WELCOMING ADDRESS BY PROF. GUIDO REY,
PRESIDENT OF THE CENTRAL INSTITUTE OF STATISTICS, ITALY**

Under-Secretary of State, Mr Haeder, Ladies and Gentlemen,

the Census is an essential instrument for government in every modern country. It produces a wealth of statistical information thanks to which it is possible to carry out detailed analyses of the changes marking the evolution of the community. There can be no doubt therefore as to the importance of the Seminar with its aim to examine in depth the problems arising in each country in the collection, processing and publication of this data.

The Seminar programme is particularly intense. In connection with the difficulties met by certain countries, it is expected that the thoughts surrounding the part concerning the preparation phase will be of extreme interest. Major importance is attached to the session devoted to the use of sampling techniques, and to that devoted to the quality control of census results. I feel it to be particularly worth underlining, bearing in mind the growing interest in studying the problem of the various kinds of error in statistical surveys. Given today's informational needs, the topic concerning the availability of small-area data seems to me to be unquestionably pertinent also.

The presence of a large number of qualified experts from the various countries is the fullest guarantee that an extensive and thorough debate will develop on these topics. This exchange of experiences will make it possible to define better techniques for application in the next round of Censuses.

Convinced as I am of the worth of the results it will be possible to achieve in the next few days, I am very happy to welcome you here today.

**OPENING SPEECH OF MR. W. HAEDER,
DIRECTOR OF THE STATISTICAL DIVISION OF THE ECONOMIC
COMMISSION FOR EUROPE**

Mr. Under-Secretary, Professor Rey, Ladies and Gentlemen,

It is with great pleasure that on behalf of the Executive Secretary of the Economic Commission for Europe, I add my welcome to the participants in this Seminar to that of the previous two speakers.

I should first like to thank you, Mr. Under-Secretary, for being with us today and for doing us the honour of welcoming the participants. We see in your presence an expression of the importance attached to the Seminar by the Italian authorities. Through you, and on behalf of the Executive Secretary of the Economic Commission for Europe, I wish to convey my sincere thanks to the Government of Italy and to the Italian Central Institute of Statistics for hosting this Seminar in Rome and for providing all the ingredients that are needed for a highly successful meeting. It is clear from the beautiful meeting room in which we are now seated, from all the excellent facilities that have been made available for the Seminar and from the extensive social programme that has been planned for the participants by Italian officials, that the Seminar organizers have put a great deal of thought and work into planning and organizing the Seminar and that they have made every possible effort to make the Seminar and our week in Rome a very memorable and enjoyable one for everyone. I am certain, Mr. Under-Secretary, that all the delegates here today have the same sentiment, and therefore I am sure that they join with me in expressing their gratitude to the Government of Italy and to ISTAT for hosting the Seminar and for making the arrangements for us to meet and to do our work. The old well-known saying that «all roads lead to Rome» is perhaps more understandable to the delegates today than it was before they arrived here for the meeting because they have now had an opportunity to see first-hand just how beautiful the city is. If by chance some of the delegates have never before had the occasion to visit Rome, there is no doubt in my mind that their stay here this week will be so pleasant that they will want to visit the city again on other occasions in the future.

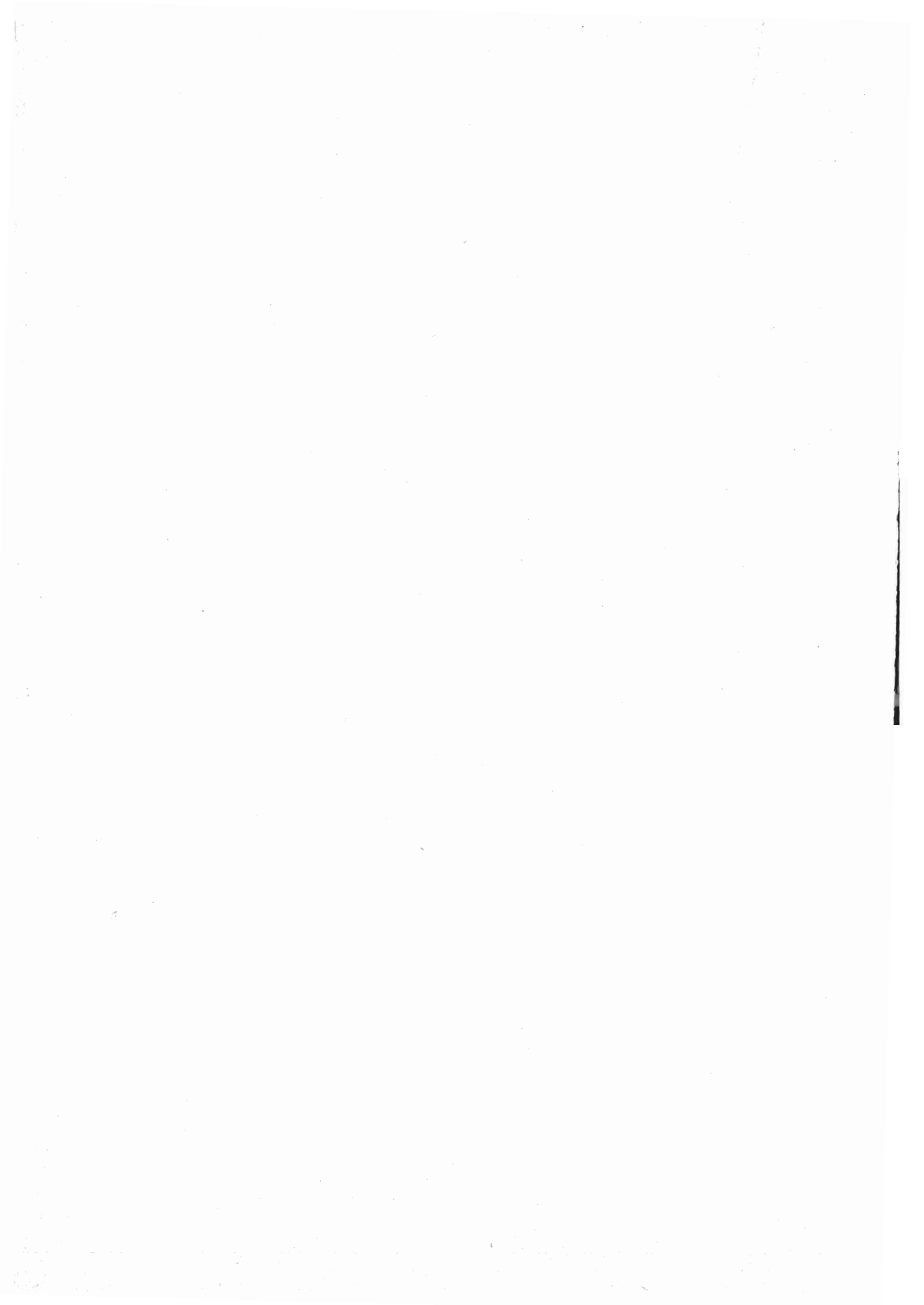
Ladies and Gentlemen, as you all know, a population and housing census is probably the single most extensive, complicated and costly statistical operation that a statistical office undertakes, and therefore it is essential that it be planned carefully in advance and that it be managed carefully from beginning to end. This is necessary in order to ensure that the complex series of interrelated steps in the census operation will occur in their proper sequence and on schedule, and that the census will be an overall success. There are many different types of tasks that are undertaken in any census operation, but two of the most important ones which are of great interest to statisticians and census managers alike are the evaluation of the results obtained and the assessment of the adequacy of the methods used. Of course, it is advisable in all types of statistical inquiries to evaluate the results obtained and the methods used, but it is particularly important to perform these functions in the case of a population and housing census because the census absorbs a comparatively large proportion of the financial, computer, manpower and other types of resources that are available to the statistical office. Despite all the efforts that statistical offices make to minimize the occurrence of problems and to make the census a success, unforeseen and unexpected difficulties of one type or another frequently arise. Consequently, seminars like the present one can be very useful to national officials concerned with the planning, organization and administration of the census or with the evaluation of the census operations and procedures, because they enable them to exchange experiences with one another and to benefit from the successes and failures that have been experienced in different countries in conducting their censuses.

Copies of the Seminar study programme have been made available to all participants and there are two things that should be noted about it. The first is that the Seminar participants are expected to consider a fairly broad range of topics during the course of the week, ranging, for example, from problems encountered in the collection of the census data to matters of concern in the dissemination of statistics for small areas, such as protection of confidentiality and reliability issues. It should not be surprising to see that the Seminar has a broad range of topics to consider, particularly since this is one of the first meetings that the Conference of European Statisticians has convened to deal specifically with census operations, procedures and methodologies. The second point that should be noted about the seminar study programme is that it is intended to be both backward-looking and forward-looking in time. What is meant by this is that for part of the study programme the attention of the participants will be focused on the past, in particular on the different experiences that countries have had in conducting their last census. However, in discussing past problems and experiences with the census, the participants will undoubtedly also be keeping one eye focused on the future, and in particular on the next census that is planned to be taken in their countries. As might be expected, one of the major objectives of the Conference in convening

meetings of this type is to enable countries to benefit from one another's experiences when planning and undertaking new statistical inquiries such as a census. Consequently, the Conference hopes that your discussion this week on the various problems and experiences that countries in the region encountered in taking their last census will be of benefit to the national statistical offices in planning and undertaking their next census.

Finally, there is one other aspect of the future work which I would like to refer to, Ladies and Gentlemen, and it relates to study topic (v), «Plans for Future Work on the Preparation of Recommendations for the 1990 Round of Population and Housing Censuses». During the next two to three years much of the work that the Conference of European Statisticians will undertake in the field of social and demographic statistics will consist of work on the preparation of a new set of recommendations for the 1990 round of population and housing censuses in the ECE region. Work on the new set of recommendations for the 1990 round of censuses will be done jointly by the secretariat and national statisticians, and the Conference would like this joint work to be accomplished as efficiently and effectively as possible. Since this week's Seminar brings together experts in population and housing censuses from most countries in the ECE region, the Seminar provides an excellent opportunity for participants to identify any gaps or weaknesses that they found in the 1980 census recommendations, and for them to suggest to the Conference concrete ways in which an improved set of recommendations for the 1990 round of censuses could be prepared. Therefore, the secretariat hopes to receive comments of this type during discussion under this study topic so that the Seminar will make a positive contribution to this planned future work of the Conference.

The large number of participants who have come to the Seminar and the large number of excellent papers that countries have submitted as contributions to the Seminar are two good measures of the strong interest that national statistical offices have in population and housing censuses. I am certain, therefore, that you are all eager to get down to work and to discuss the various topics that are on the study programme, and I wish you every success in your discussion on these topics this week.

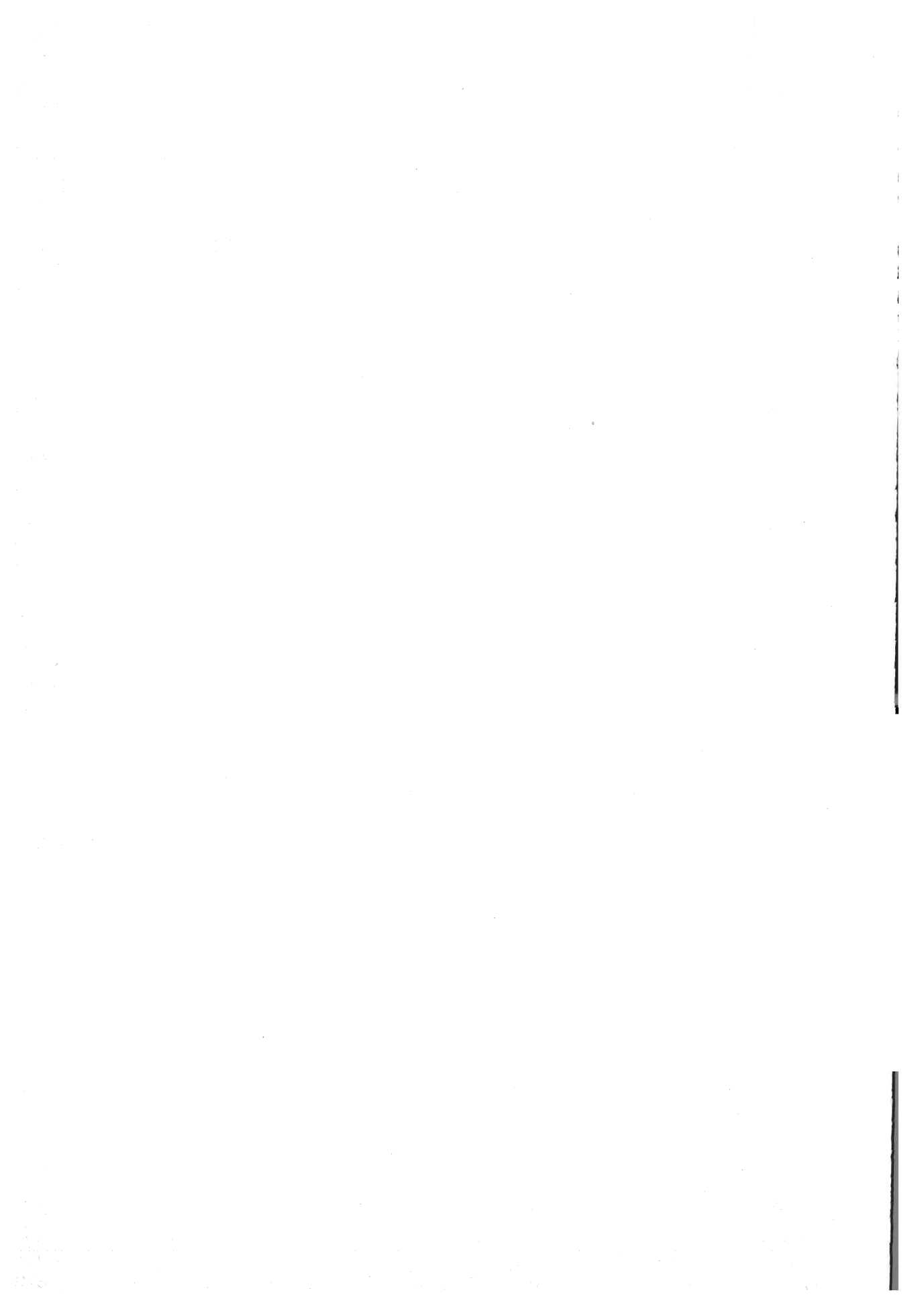


STUDY TOPIC (i)

Problems Encountered in the Pre-enumeration,
Enumeration and Post-Enumeration Phases of the Census.
Discussion leader: Mr R. Barnes (United Kingdom).

Papers prepared by:

- Bulgaria
- Czechoslovakia
- Federal Republic
of Germany
- Hungary
- Italy
- Norway
- Poland
- Sweden
- Romania
- U:SSR
- United Kingdom



TEXT OF OPENING ADDRESS
AND SUMMARY OF DISCUSSION (a)

Mr Chairman, I would like to begin by saying how pleased I am to have the opportunity of opening the discussion on this topic and how valuable I found the papers which have been submitted by the country representatives.

In many ways the subject of this item on the agenda of the Seminar is central to most of our thinking on census issues. The papers and the discussion have been extremely wide ranging and my task in trying to summarize them all is a very difficult one.

It seems that problems occur at two basic levels. On the one hand there are those which are specific, technical and relate on the whole to particular operational aspects of the census. I will say more about those in a moment. But first, and I think more important, are those basic, strategic issues which probably determine not only how successful a census is overall but in fact whether a census is carried out at all.

In reading the accounts of censuses carried out in the 1980 round by member countries of ECE, and in listening to the discussions, I have been struck by the very wide range of experiences which are reported. But no summary of problems in census taking at the present time could fail to give 'pride of place' to the difficulties which have been described by our colleagues in the Federal Republic of Germany and the Netherlands. And in this regard I would like to underline one point that has been made. The census catastrophe which occurred in the Federal Republic of Germany came unexpectedly but when it came there was nothing much which could be done to stop it. What other countries therefore can feel confident that it could not happen to them? Some perhaps, but many more I suspect should take careful note since no amount of enabling legislation and constitutional requirement to take a census may count for very much if the census were to be engulfed in a wave of public hostility. And we should remember that whereas the Federal Republic of Germany and the Netherlands were countries which lost their censuses, other countries also have

(a) Prepared by Mr R. Barnes.

reported grave difficulties with public agitation – e.g. in Belgium and Northern Ireland, and the delegate for Switzerland referred to a “repugnance among the population to answer census questions”. Also, as the representative from the Federal Republic of Germany reminded us, this kind of problem may not stop at censuses: other statistical collections which rely on public response may be affected too – such as the 1984 micro census in the Federal Republic of Germany.

On the assumption that reviewing the past is important not just for historical record purposes but to guide us in the future, an important question in our discussions might be “why has this happened?”. Why should countries such as the Federal Republic of Germany and the Netherlands have found problems which imperilled the whole census operation while other countries seem to face very minor difficulties? Do the former group of countries – that is those that face grave difficulties – have anything to learn from those that didn’t face such severe problems: or, more importantly, do the latter group of countries have anything to learn from what happened in those countries that did face problems?

Of course one possible explanation for the wide range of different experiences could be cultural, political or ideological difference. Scandinavian countries, and some others, for example, report developments in the use of population registers to the point where traditional censuses can be greatly reduced in scale or, as in the case of Denmark, eliminated altogether – and Israel has important links between registers and censuses not only for providing additional data but to help in the enumeration process itself. But we should note here the distinction drawn between, as our colleague from the Netherlands put it, “one way and two way traffic”; among countries that link censuses and population registers, some use the census to update the registers but others do not. Scandinavian countries and Switzerland referred to the fact that censuses can be used *only* for statistical purposes – not for administrative purposes. But other countries *do* use the census for updating the population registers – the Bulgarian presentation said as much and it is interesting that in Italy checks between census records and population records are enforced by law whereas the paper from the Federal Republic of Germany pointed to the fact that the Constitutional Court ruled that the use of census data for administrative purposes, such as checking population registers, was inadmissible. The representative from the Netherlands pointed out that this is now illegal in the Netherlands too.

Another example of differences of public attitude which may be cultural is that in some countries it seems possible to ask many more questions, and on comparatively sensitive topics, while in others the scope of questioning is much more limited. Canada and the United States seem to be examples of the former, while in the UK one reason for the success in carrying out the 1981 Census was the simplicity of the form, and its shortness was hailed as a major virtue; moreover the lack of anything controversial in the 1981 UK Census is

also reckoned to have contributed to its success.

Another possible reason why some countries have more problems than others could simply be *luck* and extraneous events. On the one hand the Federal Republic of Germany might consider that they were *unlucky* in that their census become embroiled in Federal elections and that the census itself became a major target for attack by politicians and aspiring politicians. This may have been difficult to foresee. On the other hand we in the UK considered ourselves very fortunate that public opinion was greatly diverted from the census by the announcement, shortly before Census Day, of the forthcoming marriage of Prince Charles; news of the royal wedding preparations occupied public attention for weeks to come. More tragically, but also lucky for the census, was the news of the shooting of President Regan just six days before the UK Census – again a great distraction of public interest. But in Northern Ireland the census was also caught up in the political situation and, as the UK paper describes, there were public burnings of census forms and physical intimidation of enumerators in some places.

But are there other, more technical, reasons why some countries met with fewer problems than others? Could it be for example that some countries managed to mount particularly effective publicity campaigns and, if so, what did they do? The Hungarian paper, attributes a high degree of public co-operation in the 1980 Census to effective national and local publicity. The paper from USSR also stressed the importance of the publicity effort and refers to more than one million people actively assisting in putting the census message across. In the United States I believe that the success of the census in 1980, especially in counting the minority populations, is thought to be due to sustained and unprecedented publicity efforts. And the Italian and Polish papers referred to the importance of a widespread publicity campaign. On the other hand the paper from Norway emphasised the importance of the *effectiveness* of publicity rather than the size of the publicity budget and in the UK I think we would argue for an effective but possibly low key publicity effort.

But above all I think we should stress the importance of being able to explain to the public, in easy to understand terms, the reasons for the Census and the reasons for each question in it.

Also, among these important general issues, perhaps we should wonder whether some census authorities run into difficulties because they try to do things which they are unable to explain or defend against public criticism. For example, might the 1983 Census in the Federal Republic of Germany have gone ahead if it had not been intended to use census data as a check on local population registers? How perceptive should census authorities be to the public mood with regard to issues of privacy, confidentiality or to public sensitivities to particular subjects? For example, in the UK, pre-tests revealed strong public hostility towards the topic of ethnic background and if such a question had been included in the 1981 Census it is doubtful if the census would have been as

successful as it was. Of course the public reaction to issues of this kind differ between countries, again because of cultural background, but they are too, to some extent, matters which census authorities may be able to do something about and we should try more and more to anticipate problems, and so, if possible, avoid them. The Norwegian paper for example referred to restrictions in the number of questions because of an *awareness* of the response burden.

Before leaving the major fundamental issues, I think we should give some attention to the kind of legal problems facing some countries over the *use* of census results. In the United States for example I believe over fifty law suits have been filed following the 1980 Census because of the under-count issue and the practice of imputation. In 1970 there were only two law suits so the trend may be seen as an alarming one and perhaps we need to consider whether this signifies a greater level of sophistication among users of data which could make for added problems in future with regard to issues such as whether or not to adjust for under-count.

These seem to me to be some of the major issues we should consider in our deliberations on the major strategic problems of census taking. The other kinds of problems to which I referred earlier, and to which I think we should give attention, are those which are more specific and technical. I won't attempt a detailed analysis of other countries, papers but it may be useful as a starting point to list some of the more common problems which seem to be mentioned in the papers.

i. First, there is the question of the basic collection method to be used. Whether this be primarily by mail, enumerator drop off/pick up for self completion or interviewer-type canvass, will depend upon factors such as literacy levels, cost of using enumerators/interviewers, availability of sufficient numbers of persons suitable for enumerating/interviewing, availability of adequate postal address lists and so on. Some countries such as Hungary that employ enumerators/interviewers referred to problems of recruitment. Others, such as North America and Norway use mail back procedures, referred to some of the problems which arise from that, such as double counting of some individuals, delays in receiving forms and the need for follow-up procedures.

ii. Second, inner city coverage. Whichever method is chosen, obtaining complete coverage of inner city areas seems to pose particular problems. It certainly did in the UK, and especially in London, and I think it did too in the larger cities of other countries. It is something to which I believe we should pay particular attention for the next census and explore the possibility of using more intensive methods (e.g. smaller enumerator work loads, more training and supervision, combinations of enumerator and postal lists where possible, follow-up checks of all reported vacant properties or absent households).

iii. Third, perhaps the most common problem of all (referred to by Hungary and Italy, true of the UK and I believe of United States) is that of obtaining adequate, up-to-date, legible and large enough scale maps which are

vital to the allocation of work and to ensure that the population is covered. For the future maps may become more important too for analysis of census data – especially for small areas (and here the paper from Sweden on diagrams and thematic mapping was most valuable).

iv. Fourth, there is the question of what population base to measure in a census. For example, in the UK we have measured the population present (that is the de facto population), the usual resident population calculated from answers given about absentees at the 'home address' and the usual resident population calculated from answers given about absentees at the 'away address'. These all serve separate and valid purposes but together with the preliminary counts, it meant that four different census figures were produced for each area and this led to confusion. Other countries mentioned the problem of defining a usual place of residence: the Hungarian paper for example referred to the problem of how to treat people with two places of residence and the delegate for Austria raised the question of how to define a main residence.

v. Another important problem in the enumeration phase is what to do about addresses reported as vacant properties or as absent households when in fact someone was there at census time. This was one of the main causes for the census under-count in UK (small though this was). The paper from Italy referred to the possibility of providing for some forms to be returned by post in future, especially for persons living alone and often not at home. Such an approach may need to be considered in future in the UK too. Alternatively we may wish to consider the practices adopted in other countries such as North America where imputation techniques are used, not just to supply answers in otherwise completed forms, but also to impute where a household was absent or where it was not certain if an address was vacant or absent.

vi. A problem referred to in the discussion relates to the quality of census responses that are obtained and how certain we can be that the data we collect are what they seem. What are the problems of using one or two simple questions on a census form when the complexities of the concept and definition may demand many more questions to obtain reliable information? Where self completion methods are used, how certain can we be that qualifying notes and instruction printed on the form are read and understood?

vii. A seventh set of problems refers not to the collecting phase but to the post enumeration phase. The Norwegian paper referred to problems of using standard software for tabulating census data and the difficulties of getting adequate computer programmes to produce tables for users and for publication. These are issues which I think we would sympathise with in the UK because although for the 1981 Census we managed to produce all our published census data quicker than ever before in modern times, it is still the case that our last published output was not produced until about three years after Census Day. For the future it should be a major goal of census takers to reduce this period so

that all census output is produced in sufficiently short time for it all to be of maximum value. The Hungarian and Czechoslovakian papers also referred to the need to pay special attention to the utilisation and dissemination of data.

Mr Chairman, I am not sure this Seminar has provided answers to all these problems but I do believe that identifying the problems, and the questions, is an important start in finding solutions and I am sure that the papers and the discussions have provided many important insights which will be valuable in planning and improving the next round of population censuses.

PROBLEMS IN THE INTEGRATION OF THE POPULATION CENSUS AND THE SYSTEM FOR CIVIL REGISTRATION (a)

1. During the population and housing censuses when a considerable amount of information is accumulated, the statistical agencies have to face a number of problems of organizational or programme-methodological character. Since the beginning of the 20th century up to 1975, 13 population and 12 housing censuses have been organized and taken in all. As a result significant information has been gathered with interaction of the population censuses with the registers for civil status.

2. In the past the population censuses in Bulgaria have been used to update the registers for the civil status of the population. This was done because in the periods between the censuses registration errors accumulated: not all the moves within a given settlement were recorded, as well as some births, deaths, marriages or divorces.

3. To eliminate these omissions a principle has been adopted along with the population census to gather also data for verification and more precisely for the renovation of the registers at the municipalities.

4. The registers for the civil status of the population on the other hand have been used when preparing, organizing and conducting the following censuses i.e. in making the lists of the units to be surveyed, in outlining the enumeration areas, etc.

5. In the past the population registers in Bulgaria existed in the form of books. The entries were done manually. Up to 1946 they were updated by the so-called "household list", where all the requisites of the register had been included. After completion of the census these "household lists" were separated from the other census documents thus forming the new population registers.

6. After 1946 this kind of specification was made only during the census of 1965 by a separate document in a short form called "de jure population" for

(a) Report prepared by the Committee for the Integrated Social Information System to the Council of Ministers of the Peoples Republic of Bulgaria.

gathering information on the de jure population according to a limited number of characteristics.

7. The updating of the information on population is a complex process, because the population is an extremely dynamic entity, changing constantly under the influence of different demographic processes.

8. The development and use of computers make it possible to form automated registers for the population. Such a register has been established in our country too known as "Unified System for Civil Registration and Administrative Service of the Population" (ESGRAON), where data processing is done by computers. The registration of the citizens has been carried out again and new registers have been created for the persons in all municipalities.

9. The formation of the ESGRAON system has become a state objective and is a basis for the creation of an Unified Information System of the Population. At the present stage the ESGRAON system is being integrated with the system of current demographic statistics. Its integration with such other systems as the population censuses, the system for labour resources, social insurance, health services, etc. is forthcoming.

10. The problem for the integration of the ESGRAON system with the current demographic statistics has been solved in general terms. Both systems observe the whole population with socio-economic characteristics that change during the course of time. The integration between the two systems expresses itself in the following:

- in the adoption of unified documents for demographic events;
- in the adoption of an unified methodology regarding the surveyed characteristics and for the elaborations made by the two systems;
- in the adoption of unified classifiers and nomenclatures;
- in the unified processing and the unification of the common outputs;
- in the elaboration of the main principles for data base organization and its structure for the needs of the demographic statistics;
- in the elaboration of technology and the relevant software in creating, maintaining and using the data base for the current demographic statistics.

11. For a certain period of time the two systems have functioned in parallel. The aim is to accumulate experience with the new technology when solving the problems of the current demographic statistics.

12. The next step to be undertaken is the integration of the ESGRAON system with the population census. The idea for the practical fulfilment of this integration has undergone a number of modifications, starting from the absolute denial of the possibility for any integration and going to the other extreme – to deny their co-existence.

13. Experience shows that both extremes are unjustified. Even in the most

advanced countries with rich experience in these two directions, the administrative registers co-exist and supplement each other.

14. The ESGRAON system is a newly formed system and there are some problems, for example, to ensure a comprehensive coverage and accuracy of the registration, to finalize some of the classifiers etc.

15. In this connection one of the objectives of the forthcoming population census is to update the information arrays of the ESGRAON system. This operation will be the next step forward toward the integration of the two systems that is going on for several years now. The necessary research activities have been carried out for the elimination of some of the existing discrepancies between the population census and the ESGRAON system. A theoretical model has been built for the links and the interdependence between the two systems. This model was experimented in 1982.

16. The results from the experiment show that certain discrepancies in the methodological basis exist in the information collected by the two systems. For some of the surveyed characteristics, for example sex and age, the approximation is high, but for others, however (marital status, educational level etc.), the deviations are considerable.

17. The main methodological discrepancies are due to the fact the two systems form their information basis on different categories of population. The population census observes two main categories: "constant" and "present" population, formed on the basis of three groups – "constantly present population", "temporarily staying" and "temporarily absent" persons.

18. The information basis of the ESGRAON system is built on the basis of the "de jure population" category. A possibility exists to obtain the constant population, but for this purpose an additional processing is necessary for the data of the ESGRAON arrays.

19. Certain discrepancies also exist in the characteristics marital status, education, speciality, economic activity, occupation and sources of the means of living, social group etc. These discrepancies are being investigated now and new ways are sought for their elimination.

20. Practically the integration between the two systems can be bilateral. In the preparation of the next census the ESGRAON system can supply information to solve some organizational problems of the census (the unified civil number of the persons, population lists etc.). Furthermore, for some of the characteristics included in advance and duly updated, this system can supply definite information that will not be collected during the census.

21. The reverse process lies in the possibility to update the data in the information base of the ESGRAON system by a census. Concerning the gathering of special information which is necessary to solve different problems of economic, educational or other character, this can be achieved only by means of censuses or microcensuses of the population.

22. There is an important issue that has to be solved concerning the type of

the document with which the information of the ESGRAON systems will be updated. This can be achieved by means of an additional questionnaire bound to the main one of the comprehensive survey.

23. Other solutions are also possible. For example, the information for the two systems can be collected by means of an unified document. Another possibility is to use a combined method. The information on the common characteristics can be gathered by means of the main questionnaire of the census, while for the specific needs of the ESGRAON system an updated questionnaire can be used, containing a minimum number of characteristics.

24. A number of problems exist for the adoption of any of the variants, problems on which we are working now. A definite decision will be made after the adoption of the final variant of the population census programme.

25. The rich experience and knowledge acquired during the past eight decades of the 20th century in Bulgaria should be studied carefully and enriched by new ideas. This presupposes that the census programme should also be enriched constantly. With the formation of an automated system for civil registration the need for a personal contact with the separate person still remains, in order to gather additional information that cannot be collected in an automated way. This implies that the most up-to-date methods and technology should be combined with the classical methods, in order to obtain an all-round and more accurate information on the population.

АВТОМАТИЗИРОВАННАЯ ОБРАБОТКА ИТОГОВ ПЕРЕПИСИ НАСЕЛЕНИЯ, ДОМОВ И КВАРТИР 1980 ГОДА В ЧЕХОСЛОВАКИИ (а)

I. Введение

Проведение в нашей стране переписей населения имеет многолетнюю традицию. Установленное уже более чем 100 лет назад определенное содержание и методика переписи используется без существенных изменений до настоящего времени. Увеличение числа наблюдаемых единиц и требования, предъявляемые к расширению числа и глубины наблюдаемых показателей за эти единицы, обусловили необходимость перехода от ручного к механизированному, а позднее и к автоматизированному способу обработки. В Чехословакии первая механизированная обработка данных всеобщей переписи населения была проведена в 1960 году с помощью самых современных в то время перфорационных чехословацких машин АРИТМА. Для нужд обработки данных переписи был создан в то время специальный филиал Предприятия вычислительной техники (ПВТ). В 1970 году перфорирование и контроль были децентрализованы и проводились областными филиалами ПВТ, после чего 90-та колонковые перфокарты (около 23 миллионов штук) передавались в вычислительный центр федерального статистического управления Чехословакии, где на ЭВМ СДС 3300 были проведены контроль, исправление, автокоррекция и обработка всех выходных данных.

В 1980 году для получения массивов входа было начато использование венгерского записывающего устройства «кау-то-тапе» Видеоплекс 2. Подготовка, контроль, исправление и автокоррекция проводились параллельно в 12 областных филиалах ПЕТ вплоть до фазы получения так наз. «очищенных массивов».

Контроль, исправления и автокоррекция проводились на чехословацких ЭВМ ЕС 1021. Кроме параллельности обработки, преимущество заключалось также в «приближении» контроля и исправлений к месту возникновения и сбора данных. Центральная обработка в Федеральном статистическом управлении (ФСУ) была проведена на ЭВМ Сайбер 172.

Одновременно с разделением труда при обработке осуществилось также разделение труда в аналитико-программной подготовке: программы для системы Видеоплекс подготавливали математики-программисты - работники венгерского завода-производителя Видеотон, программы для ЭВМ ЕС 1021 подготовила группа программистов пражского филиала ПВТ, а программы для центральной обработки - работники отдела программирования ФСУ.

Конфигурация используемых устройств:

(а) Доклад представлен Федеральным статистическим управлением Чехословакии

Видеоплеск 2 (завод Видеотон, Венгрия)

основная единица ЕС 1010 с оперативной памятью

64 кВайтов

2 кассетных дисковых запоминающих устройства с емкостью

5 М Байтов

2 магнитоленточных устройства 9-ти дорожковых, плотностью
800 бпи

1 устройство строчной печати со скоростью работы

300-1000 строчек/мин.

1 дисплей оператора

1 матричное печатающее устройство

12 дисплеев с клавиатурой для получения данных

(достигнутая средняя скорость 6-7 тыс. ударов в час, достигнутый максимум
- 12 тысяч ударов в час).

ЕС 1021 - чехословацкая однопрограммная ЭВМ с возможностью параллельной печати с печатных магнитных лент основная единица с оперативным запоминающим устройством 64 КБ со скоростью работы 20-40 тысяч операций в секунду

магнитные диски 7,25 МБайтов

магнитные ленты 9 дорожек

1-2 печатных устройства со скоростью 600 строчек/мин.

консоли оператора

устройство считывания с перфоленты

Сайбер 172 - (фирма СДС - США) (Cyber 172 - firma CDC)

центральный процессор с оперативной памятью

136к 60-битовых слов

скорость работы 10^6 операций в секунду

17 периферийных процессоров, каждый с запоминающим устройством 4к

12-тибитовых слов

8 дисковых сменных запоминающих устройств с емкостью 118 М Байтов

с 6 битами

6 магнитоленточных устройств, 9 дорожек, плотность 800/160 бпи

2 магнитоленточных устройства, 7 дорожек, плотность 800 бпи

3 устройства строчной печати со скоростью работы 1300 строчек/мин.

1 дисплей оператора

26 терминалов

1 устройство считывания с перфоленты со скоростью 1200 перфокарт в минуту
оперативная система НОС

Устройство ЛБР (Laser Beam Recorder) - для записи на микрофильм лазерным
лучом, размеры микрофиша 105 x 147 мм.

Входными документами переписи были: переписный лист (данные о квартире и постоянно проживающих лицах) и домовый лист (данные о доме). В целом обследовались данные приблизительно за 15 миллионов лиц (общий объем 1 миллиард знаков), за 5 миллионов квартир (300 миллионов знаков) и 3 миллиона домов (100 миллионов знаков). На магнитных лентах за отдельные районы были сделаны записи, передаваемые для центральной обработки, сгруппированные в следующем порядке: населенный пункт, часть населенного пункта, переписный участок, дом; далее иерархически: квартира, домохозяйство (ведущее самостоятельное хозяйство), и отдельный житель.

При центральной обработке был повторно проведен формальный и логический контроль и контроль полноты, далее контрольные части автокоррекции. При возникновении ошибок массив возвращался для исправления в соответствующий филиал ПВТ. Записи безошибочных массивов были дополнены выведенными показателями, облегчающими ход расчетов в таблицах, и трансформировались в 7 типов массивов обработки (для создания таблиц за дома, квартиры, ценовые домохозяйства, ведущие самостоятельное хозяйство, за население, женщин и маятниковые поездки к месту работы и в учебные заведения).

В общем было создано около 200 типов таблиц на 5 уровнях (основная единица поселения, населенный пункт, район, область, республика), их суммирование за территориальные участки высшего порядка и таблицы данных о поездках, а также данных о цыганском населении. Общий объем составил около 136 000 печатных страниц. Кроме печати данных по поселениям, которые печатались в предварительно напечатанные формуляры, остальные таблицы печатались на чистой бумаге. Большинство таблиц было расчленено по заголовкам, некоторые таблицы содержали большее количество страниц.

II. Автоматизированная система управления обработки задания

Входные данные задания распределялись по 144 районам. С целью ускорения обработки было необходимо достичь того, чтобы районный массив данных был обработан в среднем в течение суток, что представляло собой проведение около 50 операций (контроль, автокоррекция, расчет выведенных показателей, расчет таблиц за поселения и районы и таблиц за основные населенные пункты, контроль увязки между таблицами, печать таблиц, подготовка массивов для расчета таблиц за области и республики) - см. приложение № 1 - Схема обработки данных.

При классическом способе управления обработки эти задания должен был бы вводить оператор согласно диаграмме хода обработки. С учетом значительной сложности увязок отдельных заданий и вытекающих из этого требований, предъявляемых к синхронизации заданий, управление обработкой обеспечивалось автоматизировано. Тем самым обработка по существу была в большей мере застрахована от ошибок оператора при одновременном оптимальном распределении

нагрузки всей вычислительной системы, так как обработка отдельных заданий, в независимых друг от друга заданиях, проводилась бы параллельно. Одинаково как при обработке каждого задания в области массовой обработки данных, так и при обработке данных переписи населения, предъявлялись более высокие требования к операции входа и выхода. В работе центральной единицы в большинстве случаев приходилось бы ждать окончания операции считывания или записи. У ЭВМ Сайбер, где входные и выходные операции управляются периферийными процессорами, которые таким образом проходят параллельно с расчетами центрального процессора, при параллельном вводе заданий, у которых предъявлялись высокие требования к входным и выходным операциям, наблюдается более значительное улучшение в использовании ЭВМ и сокращение общих затрат времени на обработку задачи.

Вся система управления обработкой и синхронизацией заданий разрабатывались на уровне JCL (Job Control Language), только программа для повторного запуска целого комплекса была записана на программном языке Кобол. При подразделении отдельных программ на задания и при записи команд оперативной системы, соблюдались следующие принципы:

1. Продолжительность обработки одного задания не превышала 1000 секунд времени работы центрального процессора. Тем самым возможно было сравнительно несложно обеспечить повторность задания в случае аварии ЭВМ, при этом отпала необходимость в обеспечении повторного запуска в рамках (внутри) отдельных заданий. В случае аварии повторялись только задания, которых непосредственно касалась эта авария, нормально законченные же задания не повторяются.

2. В каждом задании взаимно увязаны также входные и выходные массивы данных, ни один массив не подключался одновременно для входа и выхода. Входные массивы каждого задания снимались заданием непосредственно следующим за ним, так что повторная обработка не могла исказить данных массивов.

3. Все массивы, связанные в настоящее время с обрабатываемым районом, должны в своем названии содержать номер этого района, на основе чего можно было провести параллельную обработку данных района.

4. Каждое задание запускало бы следующее за ним задание. Последующие задания сами проводили контроль того, закончены ли все задания, которые для них подготавливали входные массивы.

5. При обработке данных за каждый район был создан самостоятельный информационный массив, в котором каждое задание записывало время начала и окончания своей обработки. В случае появления ошибки в информационном массиве было записано ошибочное окончание и установлен признак появления ошибки в обработке данных района.

6. При запуске задания был проведен контроль того, не был ли установлен признак появления ошибки. Если же он был установлен, то запуск не был проведен, а в информационном массиве было отмечено, что задание должно быть запущено. После устранения ошибки была запущена повторная программа, считывающая информационный массив и запускающая все задания, которые были начаты, но не были нормально закончены, или их запуск не был проведен в результате установления признака появления ошибки.

7. После окончания каждое задание приписывает в хранящийся массив комплектные информации о ходе обработки (dayfile).

8. Процедура управления каждого задания была разделена до трех частей:

- а) контроль условий запуска задания и запись информации о начале задания,
- б) собственно действующая часть задания,
- в) запуск последующих заданий и запись информации об окончании обработки задания.

Эта процедура управления была записана так, что в случае, если бы имел место выход ЭВМ из строя во время, когда действующая часть задания уже была закончена (б), то эту часть обходят и повторяют только запуск последующих заданий (в).

Все рабочие массивы были записаны на диски, так что манипуляция оператора ограничивалась только запуском в обработку данных района, вкладыванием входной магнитной ленты с данными за район (поступившими из децентрализованной обработки), закладыванием магнитной ленты для хранения выходных массивов и изъятием выходных машинограмм из печатающего устройства ЭВМ. По терминалу можно было получить информацию о состоянии разработки данных за район, или даже обработку данных за район остановить. В случае выхода из строя ЭВМ оператор включает восстанавливающую программу.

III. Перечень территориальных единиц и единиц поселений

Для обеспечения обработки итогов переписи населения в соответствии с действующим административно-территориальным делением ЧССР, использовался Перечень территориальных единиц и единиц поселений. Эта совокупность служила основой также при контроле полноты передаваемых данных, для проведения пересчета выборочных данных из переписи населения 1970 г. на территориальную структуру, действующую в 1980 году. Кроме того, она служила основой для составления Статистического лексикона (списка) населенных пунктов за 1982 год.

Основная структура административно-территориального деления государства, а следовательно, и Перечня территориальных единиц и единиц поселений, строилась иерархически: республика - область - район - населенный пункт, часть населенного пункта (можно ее выпустить) - основная единица поселений - часть основной еди-

ницы поселения. К записи за основную единицу поселений прилагается список переписных участков, входящих в ее состав. Исходной совокупностью для создания Перечня территориальных единиц и единиц поселений ПН-80 (Перепись населения 1980 г.) служил Список населенных пунктов ПН-70 (Переписи населения 1970 г.), содержащий данные 1970 года. Следовательно, в подготовительной фазе необходимо было провести актуализацию по состоянию, на дату проведения переписи и приложить список переписных участков. Полный и действующий перечень территориальных единиц и единиц поселений стал основной исходной информацией для создания идентификаций всего переписного инструментария.

Программное решение подготовки Перечня территориальных единиц и единиц поселений было направлено на минимизацию необходимой ручной работы. Необходимо было обеспечить следующие основные функции.

1. Перевод отдельных территориальных единиц со всеми им подчиненными единицами на другие единицы, или аннулирование территориальных единиц за счет слияния с другими единицами на всех уровнях иерархии.

2. При переводе всех подчиненных единиц в высшие территориальные единицы эту единицу аннулируют

3. Сохранение всей исторической последовательности в процессе актуализации означает:

а) дать возможность определения состояния Перечня территориальных единиц и единиц поселений, действующего на любую дату между ПН-70 и ПН-80;

б) у каждой недействительной единицы найти ее действующий эквивалент или территориальную единицу, которой эта единица была «поглощена».

4. Подход к отдельным территориальным единицам по их организационным идентификациям и по наименованиям (названиям).

5. Распечатка состояния Перечня территориальных единиц и единиц поселений согласно какой-либо из приведенных идентификаций, включая распечатку в очередности по названиям с диакритическими знаками чешского и словацкого алфавита.

Перечень территориальных единиц и единиц поселений закладывается как индекс-последовательный массив с альтернативными ключами. Основной ключ отражает принадлежность территориальных единиц к их выстоящим единицам. Каждая запись за территориальную единицу содержит дату возникновения, у недействительных единиц и дату аннулирования, указание (отметку) на территориальную единицу, в которой данная единица возникла и способ ее аннулирования. Указанная отметка одновременно служит и альтернативным ключом. Остальные альтернативные ключи позволяют осуществить непосредственный подход к отдельным территориальным единицам по другим идентификациям и названиям. Историю

аннулированной («исчезнувшей») единицы можно наблюдать с помощью отметки. Во временном разрезе на определенную дату регистрируются все территориальные единицы с указанием на время возникновения до этой критической даты или указанием на момент аннулирования после этой даты. К определениям всех единиц, которые перешли в данные единицы, ведет рекурсивный алгоритм для прослеживания древовидной схемы, которая была реализована моделированием рекурсии в Коболе.

Актуализация массива проводилась с терминала. Исходным материалом для проведения актуализаций были выводы из ЭВМ, на которых простым способом были обозначены требуемые переводы территориальных единиц. Работник, проводящий актуализацию данных, полученных с терминала, имел в своем распоряжении по существу 2 команды: «найди территориальную единицу» и «перемести территориальную единицу в другую единицу». Основные идентификации территориальных единиц, определяющие включение их в общую структуру, не поддавались непосредственной модификации.

После окончания актуализации Перечня территориальных единиц и единиц поселений в записи по основным единицам поселений были дополнены номера переписных участков. Дополнение было проведено с помощью записывающих устройств key-to-tape типа «ДЕ523-Оливетти». Действующие номера переписных участков дополнялись в предварительно составленных записях. По сравнению с обычным ходом работ: перфокарта-первоисточник, машинограмма ошибок, запись исправления ошибок, перфокарта-первоисточник и т.д., наличие сбоев вручную перфорированных входов снизилось до 1/4, так что отпала необходимость в проведении комплектации и контроля полноты считываемых данных, полностью исчезло наличие сбоев в идентификационных номерах записей.

Однако выбранный ход решения значительно усложнил эксплуатационный режим. Массив данных должен был быть тщательно застрахован против выхода ЭВМ из строя. Поэтому Перечень территориальных единиц и единиц поселений регулярно копировался на магнитную ленту, все вмешательства по актуализации от момента создания последней копии хранились в архиве, причем в случае необходимости можно было обрабатывать их в разбивке на группы.

Актуализированная программа позволяла в случае необходимости заменять какое-угодно число из массива независимо от контрольных взаимосвязей.

После проведения переписи была сделана копия Перечня территориальных единиц и единиц поселений, которая актуализировалась по состоянию на 1.1.1982 г. и использовалась для составления Статистического лексикона населенных пунктов. Первоначальный массив был повторно структурно подразделен и каждая запись по основной единице поселений была дополнена 15 данными из переписи населения, почтовым индексом, данными о размерах площади, идентификационным номером основной территориальной единицы, данными о национальном комитете (включая вид и ступень) и данными о метрическом участке. Важным моментом было дополнение точных названий территориальных комплексов в полном соответствии с

чешской и словацкой орфографией. Для облегчения и ускорения коррекций названий и остальных данных подготавливались программы для печати различных выборочных массивов специального целевого назначения (включая выражение диакритических знаков графически подобными знаками печатающего устройства и больших букв подчеркиванием), выборочные суммарные данные и программы для контроля логических связей между данными. С помощью программных средств были также обеспечены суммирование данных в направлении укрупнения территориальных комплексов и упорядочение названий по алфавиту. Для обработки окончательной формы отдельных глав подготавливались программы для создания печатных страниц. Программы были написаны на специальном языке, созданном в Федеральном статистическом управлении и дающем возможность описания графического оформления печатной страницы. Результатом деятельности транслирующей программы этого языка была магнитная лента управления, которую можно было обработать с помощью фотонаборного устройства ДИСИГЕТ. Пленки, созданные этим устройством, передавались непосредственно в типографию.

Составной частью разработки Лексикона населенных пунктов было также полностью автоматизированное составление реестра.

Большое значение этого хода работ при подготовке Лексикона населенных пунктов заключалось в замене обычной трудоемкой работы человека работой ЭВМ. Кроме того, несомненным положительным моментом было и избежание ошибок, возникающих при списывании при ручном наборе.

IV. Генераторы программ

Для того, чтобы справиться со все увеличивающимся числом задач при сокращении численности программистов, в Федеральном статистическом управлении за последние 3-4 года осуществился переход к созданию генераторов программ (для составления статистических таблиц, для печати таблиц и для составления и печати статистических машинограмм). Требуемое количество таблиц собственно невозможно подготовить при помощи классического способа, например, программированием на языке Кобол, а в стандартном программном обеспечении ЭВМ Сайбер аналогичных продуктов не имеется. По сравнению с продуктами интерпретационного типа (напр., по сравнению с генератором таблиц, используемом при обработке ПН-70 (перепись населения 1970 года) на ЭВМ СДС 3300, генераторы программ имеют то преимущество, что с их помощью сгенерированные программы являются более эффективными и предъявляют менее сложные требования к емкости внутренней памяти. Так как из генератора программ выходят программы на Коболе, то в случае необходимости можно в сгенерированные программы дополнить и такие функции, включение которых в генератор обычно не было бы эффективным. У генератора программ можно также проводить отладку лучше, чем у сложной разветвленной интерпретационной программы и можно лучше модулировать его. Язык

задания был сформулирован так, чтобы как можно более приблизить его к способу передачи задания, обычному при подготовке проектов в Федеральном статистическом управлении. Сочетание генератора программ с текстовой программой редактирования, которая имеется в обеспечении ЭВМ Сайбер, позволяет легко подготовить уже сгенерированные программы и для такого применения, которое первоначально при создании генератора вообще не предполагалось. Язык задания можно прокладывать командами, записанными на языке Кобол и таким способом структурировать и дополнять целевую программу.

Для проведения контроля и автокоррекции, а также для составления таблиц, был использован генератор, генерирующий программу, которая позволяет работать с одним входным последовательным массивом и с одним или более выходными массивами. Сгенерированная программа сама считывает входной массив, а программист на языке задания определяет операции на одной записи. Выходные и входные массивы могут иметь вид элементарных данных или матриц определенного стандартного формата. Генератор содержит, например, команды по описанию массивов, перекодированию и перемещению данных, установке данных, контролю значений данных, автокоррекции данных, переходу (обращению) на подпрограммы пользователей, составлению, досчету и суммированию таблиц.

Для центральной обработки были с помощью генератора программ программированы все виды контроля и контрольной части автокоррекции, за исключением контроля полноты Перечня территориальных единиц и единиц поселений. Генератор был использован также и для составления большинства таблиц, за исключением таблиц с заранее неизвестным количеством строчек.

Для составления печатных программ был использован второй из генераторов программ, созданных в ФСУ. Этот генератор составляет таблицы на основе макета и их печатные определения - простую и эффективную подпрограмму Кобола для печатания этой таблицы. Макет для каждой страницы содержит таблицы размещения всех текстов (надписей, заголовков, сказуемых, подлежащих, примечаний), размещение и формат печатных чисел и выделяет области с соответствующим (переменным) текстом, зависящем от данных. Макет, пробитый на перфокартах, является основным входом для генератора. В печатном определении программист регулирует только корреспонденцию (связь) между отдельными элементами входной, матрицы данных и печатной страницей и определяет декодирование значений получаемых из входных данных переменных частей текста.

Команды генератора позволяют и осуществлять печать одной матрицы данных переменных частей текста на большем числе страниц, печать нескольких матриц на одной странице и т.п. Декодирование можно проводить при помощи перечисления или у более сложных и более обширных текстов вызовом программ пользователей. Для отладки и составления макетов и печатных определений генератор предоставляет обширные возможности. Пользователь может исправлять макеты и печатные определения на основе сведений, полученных с терминала, составлять отдельные части макетов в новые таблицы, пробно печатать заполненную печатную

страницу и т.д. При обработке ПН-80 печатные подпрограммы были вмонтированы в систему overlay переписываемой части программы в памяти. Для печатания одной таблицы далее нужно было провести только две операции входа: считывание (чтение) матрицы данных и считывание (чтение) соответствующей переписываемой части программы в памяти (соответствующего overlaya).

При обработке ПН-80 генератор печатных программ использовался для подготовки печати всех таблиц, за исключением таблиц за населенные пункты (села), которые были уже напечатаны на формулярах (2 страницы).

Все напечатанные таблицы были переведены на микрофиши.

V. Контроль, исправление и автокоррекция входных данных

На основе установленного разделения труда между децентрализованно и централизованно обрабатываемыми составными частями задания были контроль, исправление и автокоррекция, которые проводились децентрализованно, и в центральную же обработку передавались полностью очищенные массивы. Однако это не исключало повторения контроля при центральной обработке, когда при обнаружении ошибок магнитоленточные массивы возвращались для исправления.

Основными контрольными операциями было 77 проверок наличия недопустимых знаков, появляющихся при записи с помощью установки (оборудования) Видеплекс. Что касается ошибки оператора, то оператор ее сразу же исправил, так как это делается при проведении 24 логических контрольных операций на одной записи. Далее проводился контроль по 19 операциям логической увязки записей, проверка правильности контрольного знака территориальной идентификации (созданного методом МОДУЛО 11), контроль последовательности записей внутри переписного участка, дома и квартиры и контроль полноты контрольных итогов (число домов за переписной участок, число квартир в доме, численность жителей в квартире или в учреждениях гостиничного типа). При обнаружении ошибки было необходимо сделать выписку требуемого количества записей (например, при ошибке в увязке «дом-квартира» записи за дом и за все квартиры в доме). Исправления переписывались на листы исправлений и переносились на магнитную ленту с помощью устройства Видеоплекс; после каждого исправленного хода (прогона) следовала снова операция контроля.

Для контроля увязок, в случае которых можно было заранее предписать способ исправления, здесь использовалась автокоррекция. В общем для контроля в записях и между записями было предписано проведение 78 автокоррекций на входных массивах и 26 автокоррекций в обрабатываемых массивах (т.е. после дополнения входных данных выделенными показателями и после перекодирования данных). Большинство проведенных автокоррекций были более сложного типа, т.е. при обнаружении несоответствия в контрольной части просматривалось еще несколько данных, далее в зависимости от их величин была исправлена и величина

этого одного или более данных. Таким образом число комбинаций значений входных данных, у которых были проведены операции автокоррекции, достигало несколько тысяч. Несмотря на наличие твердо установленной очередности автокоррекции, может иметь место возникновение «цепи» или цикличность. В целях устранения этих явлений наиболее выгодным представляется проведение повторной автокоррекции. Если же ни при одной автокоррекции не возникает «цепи» или замкнутой цикличности, то в этом прогоне не проводится никакой автокоррекции. При централизованной обработке проводились повторные автокоррекции; в случае обнаружения ошибок массивы возвращались.

Большинство автокоррекций проводилось на основе теста в контрольной части с помощью твердо установленного значения и только в весьма ограниченном числе случаев использовался метод «hot deck» или подставлялось одно из многих значений в определенном соотношении (с помощью генератора случайных чисел).

Несмотря на тщательную подготовку задания по контролю и автокоррекции в ходе обработки возникает в незначительной мере и комбинации данных, которые вообще не предполагались в задании, или которые возникли из-за неправильной трактовки предписаний по кодированию.

Ввиду того, что в то время обрабатывались данные нескольких районов (причем эти недостатки здесь не имели места), а также ввиду того, что было бы необходимо во всех вычислительных центрах приостановить работу, было принято решение о разработке дополнительных автокоррекций, проводимых в центре и устраняющих эти недостатки. В ходе обработки данных за другие районы число этих автокоррекций увеличилось с первоначальных 6 до 15.

VI. Контроль взаимосвязи между таблицами

Одним из требований, предъявляемых к выходным таблицам, является обеспечение взаимной непротиворечивости содержащихся в них данных. Сопоставимые числа, хотя и представляют собой в выходных таблицах определенную избыточность выходных информации, однако они являются средством для проверки правильности и взаимоувязанности выходных таблиц. Ввиду большого объема и многочисленности таблиц число сопоставимых элементов было также сравнительно большим, также их вручную проводимая проверка была бы слишком трудоемкой и длительной. Из-за многообразия входных данных нельзя считать программы совершенно отлаженными даже после окончания обработки итогов переписей населения. Поэтому в обработку данных за каждый район был включен прогон, который служил для контроля правильности взаимосвязей между таблицами.

Контролировавшиеся связи были в принципе разделены на три типа: элемент одной таблицы равняется элементу другой таблицы; элемент одной таблицы равняется сумме элементов другой таблицы или других таблиц; сумма элементов одной таблицы равняется сумме элементов другой таблицы или других таблиц.

Контрольные связи были предписаны для групп таблиц одинакового территориального участка (город, район, область и т.д.). В целом было определено 3900 контрольных связей.

Связи были пробиты на перфокартах и после переноса, проведения оптического и формального контроля, а также после проведения исправлений, им была придана специальная форма, контроль может использоваться в программе собственно контроля связей между таблицами.

Ошибки в связях между таблицами встречались очень редко и были обусловлены с одной стороны, неточностью определения связей, с другой - различиями в интерпретации заданий и разных программ и разных программистов, причем прежде всего это имело место при суммировании крайних значений кодов (напр., « не установлено ») в таблицы.

VII. Использование массивов данных переписи населения 1980 г., нестатистическими органами

Кроме центральной обработки итогов, проводимой на основе технического проекта ПН-80, для потребностей некоторых внешних пользователей была проведена дополнительная обработка или же им передавались выборочные массивы, записанные на магнитных лентах.

Одним из таких экстерных пользователей данными ПН-30 был Географический институт Чехословацкой Академии Наук в Брно, в котором данные ПН-80 дополнялись данными ПН-70 и с помощью собственной ЭВМ рассчитывались характеристики определенных явлений, а на основе заранее подготовленных преобразованных систем координат границ территорий и центров населенных пунктов вычерчивались на чертежной установке ДИГИГРАФ матрицы для цветной печати географических карт. В первой фазе было создано 30 карт в масштабе 1 : 5000000 с изображением различных явлений на уровне населенных пунктов. Этот комплект был дополнен картами в масштабе 1 : 3000000 с изображением тех же явлений на уровне района.

Следующим пользователем был Институт территориального планирования, который получал таблицы с данными за поселение. После увязки данных ПН-60 с данными ПН-70, эти комплекты использовались для разработки прогнозов и моделирования в области территориального планирования, для создания таблиц, содержащих данные по жилому фонду (дома, квартиры) и населению, населенным пунктам, к которым тяготеют более мелкие поселения, по объектам, являющимся местами работы для населения прилежащих населенных пунктов, по общему жилищному строительству и строительству семейных домиков. Кроме таблиц, были составлены графики возрастной структуры населения, зон отдыха и проживания, а также схема возрастной пирамиды.

В числе пользователей необходимо назвать Институт информации системы

здравоохранения (выборка работников здравоохранения по возрасту и образованию), Словацкая плановая комиссия (таблицы с данными за поселение, с данными о маятниковой миграции, с дополнительными данными по населенным пунктам), Бюро главного архитектора Праги (таблицы с данными, пересчитанными на новое территориальное подразделение), Чешское статистическое управление и Словацкое статистическое управление (таблицы с данными по городским районам 17 городов), Научно-исследовательский институт областей и городов, Институт философии и социологии Чехословацкой АН, Государственный институт урбанизации и территориального планирования (маятниковая миграция), Чешское статистическое управление (выборочные данные для составления регистров квартир в Праге, Пльзене и Усти-на-Лабе), Городское статистическое управление в Пльзене (пересчет данных за 2 городских района).

VIII. Заключение

Обеспечению успешного хода обработки, сокращению сроков и достижению высокого качества результатов в значительной мере способствовала децентрализованная обработка на стадии получения первичных данных, контроля исправлений и автокоррекции. Минимализации расхода машинного времени в центральной обработке удалось достичь тем, что почти все данные, необходимые для составления выходных таблиц, получались из входных массивов, явившихся результатом одного прогона массива данных через ЭВМ. Безопасность и высокое качество учета процесса центральной обработки обеспечивались программой управления. Генераторы программ вместе с высокой степенью формализации задания упрощали и повышали качество подготовки программного обеспечения для создания и печати таблиц, контроля и автокоррекции.

По сравнению с обработкой итогов ПН-70 на ЭВМ СДС 3300 использование ЭВМ Сайбер давало более широкие возможности (более высокая скорость, диски повышенной емкости, Job Control Language). В виду того, что по сравнению с ПН-70 над обработкой ПН-80 трудился более опытный коллектив, были использованы все возможности, предоставляемые вычислительной машиной Сайбер. В области стандартного программного обеспечения при обработке итогов ПН-80 в нашем распоряжении имелись также уже более эффективные инструменты по сравнению с генератором таблиц и программой печати, использовавшиеся при обработке данных ПН-70, имелись генераторы программ, а по сравнению с обработкой, проводимой в форме постепенного пуска отдельных программ, имелась программа управления с автоматизированным учетом.

Следующим фактором, оказавшим благоприятное влияние на качество и продолжительность обработки, явилось параллельное составление таблиц с областными и разпубликанскими данными и их контроль на уровне района. Тем самым были устранены проблемы, которые при обработке данных ПН-70 заключались в двой-

ном, значительно подвинутом по времени, различном формировании выведенных показателей и вытекающих из этого различий между районными и республиканскими таблицами.

Вышеприведенные факты обусловили то, что по сравнению с обработкой итогов ПН-70 сократилась продолжительность аналитической программной обработки (вместо 3,5 лет на 2,5 года), продолжительность обработки с 2,75 года до 1,5 года, а аналитическо-программный потенциал уменьшился с приблизительно 50 человеко-лет на 15 человеко-лет. Общая численность работников, участвовавших в обработке (не все в течение этого периода) снизилась с 32 человек до 10 человек.

При обработке итогов ПН-70 коллектив работников подразделился на рабочие группы. В ходе обработки итогов ПН-80 коллектив в большинстве случаев (за малым исключением) на рабочие группы не подразделялся. Оправдало себя и тесное сотрудничество руководителя коллектива со специалистом, ответственным за содержание обработки и специалистом, ответственным за программирование.

В ходе обработки итогов ПН-80 неблагоприятно отразился тот факт, что экспериментальная перепись не проводилась. Даже самым лучшим образом подготовленный массив по своему объему и «пестроте» ошибок не может заменить массивы, получаемые в результате проведения реального обследования населения. Поэтому при обработке итогов ПН-80 эта работа на основе данных за три района была своего рода экспериментальной обработкой, в результате которой, однако, возник сдвиг в завершение обработки данных за отдельные районы. Это было в дальнейшем устранено и в конце концов окончательные сроки отдельных этапов разработки удалось значительно сократить.

Пояснения к приложению (схема обработки)

- A) Перепись населения, домов и квартир 1980 г.
- B) Ход обработки массива данных за район
- C) Ход обработки массива данных за область
- D) Ход обработки массива данных за республику
- E) *Расшировка сокращений:*

- CD - цензовые домохозяйства
- DOJIZD - рабочий массив данных о маятниковых поездках
- HD - домохозяйство, ведущее самостоятельное хозяйство
- K - конец обработки, проведенной при помощи соответствующей группы программ или номер (код) области
- KO - номер (код) района
- KSKO - основной массив данных за район KO
- O - порядковый номер (код) района в области
- PVTKO - массив данных, получаемых от Предприятия вычислительной техники (ПВТ) за район KO
- R - номер (код) республики
- SUSJ - перечень территориальных единиц и единиц поселений
- TxyKO - массив таблиц « x » за группу таблиц « y » за район KO
 - x = A - для домов
 - B - для квартир
 - C - для цензовых домохозяйств
 - D - для домохозяйств, ведущих самостоятельное хозяйство
 - E - для населения
 - F - для маятниковых поездок
 - G - для женщин
- Y - O - для таблиц за районы
- R - для таблиц за республики
- не приведено для увязки таблиц за районы и республику
- TABz - массив таблиц за территорию « z »
 - z = KO - для район KO
 - K - для области K
 - R - для республики R
 - CEL - для всей Чехословакии

- VDOJIZD - выходные таблицы за маятниковые поездки
 VOVKO - выходные таблицы общие за район КО
 VTABz - выходные таблиц за территорию z (z см. выше TABz)
 VTKO - выходные таблицы за район КО
 z - начало проведения обработки на основе соответствующей группы программ
 ZSxKO - обрабатываемый массив x за район КО (x см. выше TxyKO)
 ZSJz - таблицы за основные единицы поселений за территорию z (z см. выше TAB z)

- a) общие таблицы за села OB1 и OB2
 b) таблицы по домам
 c) городские и районные таблицы по квартирам
 d) республиканские таблицы по квартирам
 e) городские и районные таблицы по домохозяйствам, ведущим самостоятельное хозяйство
 f) городские и районные таблицы и цензовые (переписные) домохозяйства
 g) республиканские таблицы по цензовым домохозяйствам
 h) городские и районные таблицы по населению
 i) республиканские таблицы по населению
 j) городские и районные таблицы по категории женщин
 k) республиканские таблицы по категориям женщин
 l) маятниковая миграция
 m) областные таблицы K1-K11
 n) печать суммарных данных по областям (суммарные данные за районы и нас. пункт)
 o) ЧСР (Чешская СР) и ССР (Словацкая СР)
 p) ЧССР (Чехословацкая Социалистическая Республика)

- 001 - Подготовительные работы, создание KSJKO
 003 - Контроль, автокоррекция, создание KSKO
 005 - Создание обрабатываемых массивов, расчет таблиц за нас. пункту OB1, OB2 и таблиц за ZSJ (основные единицы поселений)
 010 - Хранение основного массива
 020 - Расчет таблиц по населенным пунктам OB1, OB2 за высшие территориальные единицы по характеристикам нас. пунктов
 022 - Выборка таблиц по населенным пунктам для контроля взаимосвяз
 030 - Группировка обрабатываемого массива данных за дома для городских и районных таблиц

- 032 - Генерирование городских и районных таблиц по домам
- 034 - Расчет и оформление городских и районных таблиц по домам
- 036 - Контроль взаимосвязи между таблицами данных по домам
- 040 - Группировка обрабатываемого массива данных о квартирах для городских и районных таблиц
- 042 - Генерирование городских и районных таблиц данных о квартирах
- 044 - Расчет и оформление городских и районных таблиц о квартирах
- 050 - Группировка обрабатываемого массива данных о квартирах для составления республиканских таблиц
- 052 - Генерирование республиканских таблиц данных о квартирах
- 054 - Расчет и оформление республиканских таблиц данных о евартирах
- 056 - Контроль взаимосвязи между таблицами данных о квартирах
- 060 - Группировка обрабатываемого массива данных о домохозяйствах, ведущих самостоятельное хозяйство, для составления городских и районных таблиц
- 062 - Генерирование городских и районных таблиц данных о домохозяйствах, ведущих самостоятельное хозяйство
- 064 - Расчет и оформление городских и районных таблиц с данными о домохозяйствах, ведущих самостоятельное хозяйство
- 066 - Контроль взаимосвязи между таблицами, содержащими данные о домохозяйствах, ведущих самостоятельное хозяйство
- 070 - Группировка обрабатываемого массива за цензрвые домохозяйства для городских и районных таблиц
- 072 - Генерирование городских и районных таблиц с данными о цензовых домохозяйствах
- 074 - Группировка обрабатываемого массива данных по цензовым домохозяйствам для составления республиканских таблиц
- 082 - Генерирование республиканских таблиц с данными по цензовым домохозяйствам
- 084 - Расчет и оформление республиканских таблиц с данными по цензовым домохозяйствам
- 086 - Контроль взаимосвязи между таблицами, содержащими данные по цензовым домохозяйствам
- 100 - Группировка обрабатываемого массива данных о населении для составления городских и районных таблиц
- 102 - Генерирование городских и районных таблиц, содержащих данные о населении
- 104 - Расчет и оформление городских и районных таблиц, содержащих данные о населении
- 110 - Группировка обрабатываемого массива данных по населению для составления республиканских данных
- 112 - Генерирование республиканских таблиц с данными по населению
- 114 - Расчет и оформление республиканских таблиц, содержащих данные по населению

- 116 - Контроль взаимосвязи между таблицами, содержащими данные о населении
- 120 - Создание обрабатываемых массивов данных по категории женщин и данных о маятниковой миграции
- 122 - Группировка обрабатываемых массивов данных по категории женщин для составления городских и районных таблиц
- 124 - Генерирование городских и районных таблиц с данными по категории женщин
- 126 - Расчет и оформление городских и районных таблиц с данными по категории женщин
- 130 - Группировка обрабатываемого массива данных по категории женщин для составления республиканских таблиц
- 132 - Генерирование республиканских таблиц с данными по категории женщин
- 134 - Расчет и оформление республиканских таблиц с данными по категории женщин
- 136 - Контроль взаимосвязи между таблицами, содержащими данные по категории женщин
- 140 - Группировка обрабатываемого массива данных маятниковой миграции
- 142 - Включение данных о районных поездках в республиканские таблицы маятниковой миграции
- 150 - Печать таблиц ОВ1, ОВ2 с данными по населенным пунктам в печатные формуляры
- 152 - Печать таблиц ZSJ1-ZSJ5
- 154 - Хранение массивов ZSJKO
- 160 - Объединение городских, районных и республиканских таблиц в районном разрезе
- 162 - Печать таблиц с районными данными
- 164 - Выборка данных для таблиц, составляемых по областям
- 166 - Хранение таблиц за район
- 170 - Печать протокола об обработке данных за район
- 200 - Печать таблиц K1-K11
- 210 - Включение областных таблиц в республиканские таблицы
- 212 - Расчет и оформление областных таблиц
- 214 - Печать таблиц за область
- 216 - Хранение таблиц за область
- 300 - Дополнительный расчет таблиц за ЧСР, ССР и ЧССР
- 302 - Расчет и оформление таблиц за ЧСР и ССР
- 304 - Печать таблиц за ЧСР и ССР
- 306 - Расчет и оформление таблиц за ЧССР
- 402 - Печать таблиц за ЧССР
- 404 - Хранение таблиц за ЧССР
- 410 - Печать таблиц с данными о маятниковой миграции
- 412 - Хранение массива данных о маятниковой миграции

AUTOMATIC PROCESSING OF THE RESULTS OF THE 1980 POPULATION AND HOUSEHOLD CENSUS IN CZECHOSLOVAKIA (a)

Summary

The report is devoted to key areas of programme-analytical preparation problems and methods of solving them in connection with the automatic processing of data of the 1980 population census. The report is in eight parts.

The first part contains, in addition to a reference to earlier population censuses, a brief description of the procedure (division of labour) adopted in processing the results of the 1980 census. Attention is also given to input and output data and to questions of the arrangement of computers used in decentralized and centralized processing.

The second part sets out the reasons for establishing an automatic control and processing system and describes the system's main principles and characteristics.

The third part is devoted to the structure, method of use and procedure adopted in compiling the list of geographical units and settlement units, which was used in allocating numbers to census districts and, in the interest of checking the completeness of coverage, also contains the names of inhabited localities (settlements), parts of inhabited localities and basic settlement units used in printing the tables. This part also contains a brief note on the statistical lexicon of inhabited localities, the compilation of which was based on the list of geographical units and settlement units.

The fourth part discusses the reasons for establishing programme generators and using them for the monitoring and automatic correction of input data and for the compilation, aggregation and printing of output tables. This part also mentions the transfer of the output table data to microcards.

The fifth part discusses in greater detail the problems arising in connection with monitoring and automatic correction operations, including the rather definitive automatic correction that takes place during centralized processing.

(a) Report prepared by the Czechoslovak Federal Statistical Agency.

The sixth part states the reasons why operations for monitoring the interrelationship of the tables are included in the processing method and describes various types of such interrelationships.

The seventh part contains brief information on the utilization of the population census data by external clients (the Geographical Institute of the Czechoslovak Academy of Sciences, the Geographical Planning Institute and others).

The last part contains an evaluation of the processing of the 1980 population census data and compares it with the processing of the data of the 1970 census.

PROBLEMS EXPERIENCED DURING THE PRELIMINARY,
MAIN AND FOLLOW-UP SURVEYS
PROBLEMS OF THE 1983 POPULATION CENSUS
IN THE FEDERAL REPUBLIC OF GERMANY (a)

I. PRELIMINARY REMARKS

1. The preparations for the population census – which according to the recommendation of the UN (1) was to be taken around 1980 – started in 1975 by defining the basic outlines of its content and a cost limit of originally about 290 mn DM (2) by the German Federal Government. At that time, not only a population and occupation census, but also the recording of statistical data on buildings and dwellings as well as a census of non-agricultural local units had been envisaged. The legal foundation required for this large-scale census, later referred to as "Census Law", failed however to get through the Bundestag in Autumn 1978 due to the fact that the Laender demanded a contribution from the Federal Government towards the expenses of the census operation. In the course of subsequent parliamentary debates, the cost limit for the census was reduced to 371 mn DM with a reduction in the scope of the survey. The amended draft of the 1983 Population Census Law was finally passed unanimously by the two bodies after protracted mediation efforts between the Bundestag and the Bundesrat, and promulgated on 25 March 1982.

2. In the following period, the statistical offices of the Federation and the Laender prepared the methodological, organizational and technical details of the Census. In this connection several tests of the questionnaires were made and early in 1982 a pilot survey was conducted covering 25,000 households in which both the catalogue of questions and the entire census organization were tested, including the technical possibilities for having the results processed by computers. For about 3 mn proprietors of houses, who did not live in their houses themselves, a survey of buildings ("pilot survey of buildings") was made at the

(a) Report prepared by the Federal Statistical Office of the Federal Republic of Germany.

end of 1982/beginning of 1983 in which, according to the communities who were responsible for the execution of this survey, the return was all but complete. In the light of the good results of the test and pilot surveys and the pilot survey of buildings, it was expected that the 1983 Population Census would operate without any particular difficulties and that the citizens would understand and support it.

II. THE 1983 POPULATION CENSUS IN PUBLIC CONTROVERSY

3. In the middle of the preparatory work for the population census, however, early in the autumn of 1982, opposition against the Census commenced. It was first observed in the university cities, and supported by the Greens-Alternatives and other groupings, and by early 1983 the media had increasingly joined in the opposition to the population census.

4. The stepped-up information work as from February 1983, as well as the extensive confidence-creating measures of the government agencies in charge of the population census, coincided with the final phase of the election campaign for the 10th German Bundestag. Partly contradictory public statements made by politicians of all parties on the subject of the population census while campaigning for the elections further increased the unrest among the population. With the support of party of the "Greens", newly elected into the German Bundestag, politicians from other parties of the Bundestag publicly considered postponing the *population census with a view to having a revision made.*

a) *Opposition to the population census*

5. The first activities directed against the 1983 Census were undertaken in Berlin, where members of the "Population Census Boycott Initiative" proclaimed that they were not prepared to answer the census questions. In a leaflet distributed in great numbers, various possibilities of civil disobedience were suggested, such as non-acceptance, abusive employment and incomplete filling in of the questionnaires, the lodging of objections and actions to avoid providing information, refusal to accept the function of an enumerator and the like. Similar initiatives with comparable leaflets were also launched in Hamburg, Frankfurt and other university cities.

6. In the course of time, other groups – supported primarily by Greens-Alternatives and Liberal quarters – joined the movement against the population census. Thus the Bundesverband Bürgerinitiativen Umweltschutz (Federal Association of Citizens' Initiative Groups for Environmental Protection) in Bonn supported the boycotting actions. In an open letter the Humanistische Union

e.V. (Humanistic Union) in Munich declared that the proposed questionnaires should be destroyed because the information on the person and for statistics were inadmissibly linked with each other. They further claimed that the federal legislator had no competence to demand data on the population, obtained by way of statistics, for comparison with the registers of inhabitants kept by the communities (3).

7. The groupings of the Greens used the Census as a means for attacks against the Government, asserting that census data would be used to identify foreigners staying illegally in the Federal Republic, conscientious objectors, tax evaders, illegal recipients of social benefits and other groups of persons.

8. Because of these activities, in the last quarter preceding census day growing uncertainty developed among the population with regard to the population census. From February 1983 on, a wider segment of the public questioned whether a complete statistical stock-taking of the population was necessary to the extent envisaged. There were above all fears that the protection of the personal data to be recorded could not be safeguarded against abuse, given today's technical possibilities of automatic data processing.

9. The uncertainties created among the population with regard to the population census were evidenced by various queries addressed by citizens to the competent authorities, above all to the Federal Minister of the Interior and the Federal Statistical Office. The queries of the population related first of all to doubts concerning the legal foundation and the reasons behind the population census, doubts with regard to the use and the objectives of evaluation of the survey and to concerns about the protection of personal data as far their transmission and utilization (data protection) was concerned.

b) 1983 Population Census in the news media

10. The activities directed against the population census were echoed early in 1983 by a broadly-designed press campaign of steadily increasing severity. Also supraregional newspapers and magazines of wide circulation, such as "Die Zeit", "Der Spiegel", "Der Stern" and others took an active part in this campaign. In some articles, the use of a complete statistical stock-taking in general was questioned. A number of press reports created the impression that the population census was designed to prepare a register of persons for the entire Federal Republic and the information provided by the citizens would be released to all kinds of public authorities and private organizations, which in the last resort would amount to creating the "transparent man". With purposive slogans, such as "complete subjection to government planning and legal incapacitation of the citizens" (4) part of the press fomented suspicion of technical progress and other fears in the population, thus further heating up emotions against the population census.

11. Many reports and interviews on television and radio also tended to be directed against the 1983 Census.

12. Biassed presentations containing wrong allegations, such as "introduction of a personal identification number via the number of the questionnaire", use of a pencil for the position-mark technique in order to enable manipulations to be made later, earmarking of questionnaires completed by gypsies, were quite common occurrences.

13. Given this atmosphere of opposition to the population census in general, it is not surprising that the advocates of the population census were not given much opportunity to present their case in the mass media. Thus the representatives of the Federal Government and of official statistics were hardly given the opportunity to present the Census appropriately or to refute the wrong or misleading assertions made. Of the high circulation newspapers, only the *Frankfurter Allgemeine Zeitung* and the widely-read *Bild-Zeitung* supported the census.

14. An advertising campaign conducted on a short-term basis by the Federal Government and featuring in a large number of daily newspapers of the Federal Republic detailed and objective large-size advertisements informing about, and at the same time giving further publicity to, the population census could hardly any longer influence public opinion in a positive way.

c) Population census in the Bundestag 1983 election campaign

15. From February 1983 on, the intensified publicity activities of the government agencies entrusted with the census operation coincided with the final phase of the election campaign for the 10th German Bundestag. Some members of the Bundestag announced that they would not answer all of the questions in the census. So it was inevitable that the discussions concerning the 1983 Population Census were also used as a subject in the election campaign.

16. Public opinion, which had been increasingly opposed to a census being taken on 27 April 1983, did not change after the Bundestag elections on 6 March 1983. Moreover, the existing uncertainties among the population could not be removed in the short term.

17. The opponents of the Census then received active support from the parliamentary group of the Greens, which had been newly elected to the Bundestag. Politicians of other parties represented in the Bundestag were publicity contemplating the possibility of postponing the population census with a view to revising the Census Law. The Social Democratic candidate for the post of Federal Chancellor, who as Federal Minister of Justice had also been responsible for the Population Census Law 1983, now demanded its revision for reasons of data protection (5). Under the pressure brought to bear on them by the activities against the population census, the data protection commissioners

of the Federation and several Laender also voiced their concern over the population census (6).

d) *Intensified information of the public: Public relations work of the Federal Government*

18. The Federal Government and the public agencies involved with the population census – in particular the Laender governments and the statistical offices of the Federation and the Laender as well as the data protection commissioners – reacted to the resistance against the Census with a number of public confidence-building measures. The Federal Statistical Office endeavoured to explain to the members of the press the legal foundations, contents and procedures of the population census and at the same to disprove wrong or misleading arguments in the mass media (see paras. 13-14). The statistical offices of the Federation and the Laender engaged in purposeful public relations work. Numerous advertisements in daily newspapers, television spots and the like informed the population of such things as the meaning of the Census, the question programme, the purposes for which the data to be recorded would be used and the planned evaluation of the results. This information campaign showed in particular that the information provided in the population census is used only for statistical and planning purposes and that the use for any administrative decisions involving individual persons is excluded. In some places enlarged copies of the dwelling and household questionnaires were on public display. The information campaign was intended to reach its peak in the last few weeks before census day in the form of advertisements, leaflets, posters, interviews and radio and television spots. The Federal Chancellor himself was to address the public on the subject of the population census on 21 April 1984, i.e. a few days before census day.

19. Despite the various endeavours of the statistical offices of the Federation and the Laender, the public relations activities did not have the hoped-for overall success. The reservations and uncertainties existing in the population about the 1983 Census could not for the most part be removed. The less than efficient public relations work was partly due to the fact that the representatives of official statistics did not get sufficient opportunity to present their case clearly and convincingly in the media which took a critical to negative attitude towards the population census, and that their statements were frequently counteracted by biased arguments of the election campaign (see paras. 15-17).

20. The discussion of confidence-building measures in the sphere of data protection led to the agreement of 24 March 1983 between the Federation and the Laender and also accounted for the demands made by the Conference of Data Protection Commissioners. This agreement clarified, among others, the following aspects to be considered for the census:

- Enumerators must not be employed in the immediate neighbourhood of their residential area;
- Respondents may send the completed questionnaire direct to the census office – possibly in a closed envelope;
- Respondents may fill in a questionnaire of their own in order to avoid other people in the same household becoming informed of the data provided;
- Questions to be answered on a voluntary basis (e.g. telephone number) must be indicated as such.

21. The enumerators were also to carry with them a leaflet containing information on the population census and references to the above possibilities for the respondents, and to data which was to be provided voluntarily. These measures were designed to win the confidence of the citizens in an efficient protection of their data against any third parties including the enumerator and other persons living in the household.

e) *Results of public opinion polls*

22. The reservations and uncertainties of the population were reflected in the results of opinion polls on "Public Opinion Before the 1983 Population Census". Symptomatic of the situation is the survey held by Institut für Demoskopie in Allensbach during the week from 26 to 29 March 1983. An analysis of the results on the attitude of the questioned citizens towards the taking of the 1983 census showed that both the opponents and advocates of the population census had considerable doubts about:

- the safeguarding of the confidentiality of the data by the (perhaps personally known) enumerators or members of the statistical offices living in the same location and
- the usefulness of the census results because of missing or wrong data provided by persons boycotting the census and thus of the high financial expenditure.

23. The opinion poll showed that the opposition to the population census extended to various segments of the population. Only 41% of the persons questioned considered the planned population census to be necessary. Especially among young people and persons with secondary education there were above-average numbers of opponents to the Census. Questioning in the form of the population census by an unknown person would have mattered only for just over a quarter of the persons (26%), questioning by a person known by the respondent, e.g. from the neighbourhood, however for almost half (47%) of all the persons included in the poll (7).

24. The main results of the investigation of the Institut für Demoskopie in Allensbach have been confirmed by a representative opinion poll taken by the EMNID Institute, also in late March 1983. According to this poll, only about half (49%) of the persons questioned were generally prepared to provide all the desired information for the population census. The preparedness to provide information decreased with the age of the persons questioned and with growing level of education. Only 34% of the persons interviewed under 30 years of age and of those with a final high school examination / university education were prepared to provide information. In a further EMNID survey conducted from 20 to 29 April 1983 – i.e. after the suspension of the population census by the Federal Constitutional Court – 57% of the persons interviewed were of the opinion that in certain cases the citizen was entitled not to participate in government activities, such as the population census – even if he acted contrary to one or several laws. For persons interviewed aged 14 to 29, as well as for those with a final high school examination/university education, the relevant percentage was 67% in both cases.

25. A third opinion poll was conducted in March 1983 by the Research Group Elections on behalf of Zweites Deutsches Fernsehen (Second Television Chain) covering a representative cross-section of the population entitled to vote. This investigation also yielded results comparable with the two surveys mentioned above. According to the investigations of the Research Group elections, just over half of the persons questioned in March (54%) agreed to the planned population census. In the age group of those under 25 years, the percentage of persons approving was only 39%, and for the 25 to 29 year-olds just under 42%. Only in the age groups of 30 years and over did approval of the population census predominate, the proportion of persons advocating the census increasing with growing age. One fourth of the persons questioned declared that they did not intend to participate in the Census. In conformity with the results of the other enquiries, the readiness to participate in the Census is lowest in the age groups under 30 years. More than half of all persons interviewed (52%) feared that their data for the population census would be misused. Of the persons who did not intend to participate in the Census, 90% thought that, despite the assurances of the authorities to the contrary, there would be misuse of their data. Even among those who were prepared to participate, 37% still feared a misuse of the data (8).

26. Summing up, it can be said that according to all the opinion polls held, the population census encountered a wave of resistance against the State which claimed that rights guaranteed by the Constitution were being violated (9). This growing movement is affecting more and more spheres of public life and as a whole represents what could be described as growing "displeasure with the State". The population census further offered a welcome opportunity for venting a widely-felt distrust of the possibilities of modern computer technology.

III. THE 1983 POPULATION CENSUS SUBJECT TO LEGAL PROCEEDINGS

27. The opposition to the population census finally climaxed in a great number of complaints lodged to void the 1983 Population Census Law as unconstitutional. On 13 April 1983, the Federal Constitutional Court granted a preliminary injunction suspending the operation of the census, pending judgment on the main issue. The public controversy over the population census that was originally scheduled to be taken on 27 April 1983 (key day) thus came to a provisional conclusion.

a) *Complaints lodged to void the 1983 Population Census Law as unconstitutional*

28. In this general climate of a mainly negative attitude, still a few weeks before the scheduled census day of 27 April 1983, two Hamburg lawyers and several computer science professors, among others, lodged complaints with the Federal Constitutional Court to void the 1983 Population Census Law as unconstitutional. These main complainants who in detailed written statements opposed the population census, and whose reasons were essentially adopted by the various other complainants, mainly argued that the Census Law violated the Basic Law (Constitution) in that the planned complete enumeration infringed upon the personal sphere of the individual citizen, that due to the possibilities of transmission of census data provided for by the Law there was not sufficient protection against misuse of the data and that in particular the use of data from the population census for purposes other than statistical purposes was not excluded.

b) *Suspension of the execution of the Census*

29. Following the complaints lodged, the Federal Constitutional Court granted on 13 April 1983 a preliminary injunction suspending the operation of the population census scheduled to be held on 27 April 1983 pursuant to the 1983 Population Census Law, pending judgment on the main issue. This decision for the suspension was not unanimous, however, but based on a 5 to 3 vote.

30. In the reasons for the above decision, the Court pointed out that the implementation of the Census Law would violate all citizens under obligation to provide information in their basic rights, if the preliminary injunction would not be granted and the complaints should later prove to be justified. These violations of basic rights would be gravest where data derived from the population census would have been compared with the registers of inhabitants or passed on by the statistical offices of the Federation or the Laender and thus irrevocably been utilized. Accordingly, the judges of the Federal Constitutional

Court unanimously held that the comparisons with the registers of inhabitants as well as the provisions concerning the transmission of the data pursuant to Art. 9 of the 1983 Population Census Law had in any case to be suspended for the time being (10).

31. The Court stated that "in the proceedings on the main issue,... fundamental questions of the protection of basic rights of the individual as a personality integrated in and related to the society will be raised under the special conditions of the further developed possibilities of statistics and automatic data processing, following the microcensus decision of 1969 (BVerfGE 27, 1), which call for close consideration".

32. The Court emphasized with regard to its consideration of the case in particular the question of a possible violation of the "general personality right", as derived from Art. 2, Par. 1 of the "Basic Law" in connection with Art. 1, Par. 1 of the "Basic Law", by the statistical collection and utilization of personal data. The above microcensus decision recognizes absolute limits for infringements of the personality right of the individual where there is, due to the data collection and utilization, an interference with the inviolable sphere of intimate human life or where the human being would, under compulsion, be registered with his/her entire personality. "Where... the statistical survey only touches upon the behaviour of the human being in the outside world, the human personality as a general rule is not yet covered in its inviolable sphere of private shaping of life... at any rate where these data lose their personality relationship by the anonymity of their evaluation" (11).

c) *Hearing on the main issue at the Federal Constitutional Court*

33. Prior to the oral hearing on the main issue, which the Federal Constitutional Court had fixed to take place on 18/19 October 1983, the parties involved in the process explained their legal viewpoints. The oral hearing was attended by the complainants, the Federal Government, most of the Laender governments as well as the Federal Data Protection Commissioner and most of the data protection commissioners of the Laender. As the general climate of the hearing became more detached and the arguments of the Federal Government and the Laender were given consideration, the necessity of having a census was finally no longer challenged.

34. After having granted the preliminary injunction suspending the population census, the Federal Constitutional Court provided the opportunity for the contending parties (Federal Government, Laender Governments, data protection commissioners of the Federation and the Laender) to submit written statements prior to the hearing on the main issue. In preparation for the oral hearing, the judges submitted to the contending parties 14 questions relating to essential points of procedure concerning, among others, the purposes of data

collection and processing, the possibilities of replacing complete enumerations or using less stringent means of execution, and the utilization of census data for practical purposes of administration.

35. For the oral hearing the First Senate of the Federal Constitutional Court further attached special importance to statements concerning the following three sets of subjects:

- Constitutional measure of examination, i.e. protection of basic rights in the case of infringements by data collection and processing,
- Problems involved in the provisions for the transmission of data in the 1983 Population Census Law,
- Need to regulate the organization and the conduct of a census by law/ordinance.

36. The main arguments advanced by the complainants against the survey prescribed by the 1983 Population Census Law were: the volume of the catalogue of questions would permit the inadmissible preparation of a personality profile, thus giving the administration an unjustified informational lead; the questionnaire contained data not covered by the law; the identification of individual respondents remained possible even after the removal of the name (deanonymization); the separation of the statistical recording of data and the use for practical measures of administration was not guaranteed; the recipients of the data and the purposes of data processing were not clearly defined; and due to these and other reasons the proposed execution of the Census Law is illegal. For the reasons stated, the complainants moved that the 1983 Population Census Law be voided as unconstitutional.

37. The Federal Data Protection Commissioner and a number of data protection commissioners of the Laender raised different constitutional objections against the 1983 Population Census Law. There was no agreement as to whether these objections could be removed by an interpretation in conformity with the Constitution and a restrictive implementation of the Law in conformity with the Constitution, or whether they would entail the unconstitutionality of the impeached Law.

38. The Federal Government and most of the Laender governments considered the 1983 Population Census Law to be compatible with the Basic Law (Constitution) and the complaints to be unfounded. The respondents under the 1983 Population Census Law, the execution of the Census and the processing and utilization of the data collected were held to be determined by the statistical purpose of the Law. The results of the statistics as one of the most versatile sources of information was considered to be essential for the observation of the social and economic situation and its development as well as for the preparation and supervision of decisions, measures and planning projects. It was stated that in the case of laws for statistical purposes with complex terms of reference it was impossible to describe all survey purposes in the law. The catalogue of

questions for the 1983 Population Census Law was less extensive than that of 1970 and did not contain any questions relating to the inviolable sphere of private life.

39. The transmission of data from the population census was admissible only for statistical and planning purposes, the use for practical application by the administration being however explicitly prohibited. The risk of personality profiles being established did not exist because the evaluation programmes provided for excluded such a possibility and because there did not exist a data pool with agencies outside the statistical offices.

IV. DECISION OF THE FEDERAL CONSTITUTIONAL COURT ON THE POPULATION CENSUS LAW, 1983, OF 15 DECEMBER 1983

40. The Federal Constitutional Court pronounced its decision on the complaints against the 1983 Population Census Law in the light of the oral hearing of 18/19 October 1983, on 15 December 1983 (12). The material core of the decision confirms the methods of official statistics:

- Statistics are of essential importance for a modern industrialized country
- the collection of statistical data is legitimate, and
- the obligation of the citizens to answer questions for statistical purposes is in conformity with the Basic Law (Constitution).

41. Given the progress of the possibilities of statistics and automatic data processing, the Court has further developed the basic rights and decreed a right of "informational self-determination" which, in the interest of the State community (and thus of all fellow citizens), is however subject to limitations to be defined exactly. These require a constitutional legal foundation which has to conform to the rule-of-law precept of the clearness of norms and has to consider the principle of proportionality.

42. For the population census, the Court has confirmed the admissibility of collecting and storing personal data. The decision makes it clear that there is at the present time no suitable alternative which also be acceptable under aspects of data protection.

43. The survey programme, as prescribed by Art. 2 No. 1-7, Arts. 3 and 4 Population Census Law, 1983, is compatible with the Basic Law (Constitution). According to the decision, it is however inadmissible to use for other purposes the personal data originally collected for statistics. The citizen shall rest assured that his data will not be used for other purposes and especially not to his disadvantage.

44. In its decision, the Court has with great earnest balanced the benefits of automatic data processing against the risks involved. It permits the use for

statistics the opportunities offered by automatic data processing, but on the other hand demands additional legal provisions for the execution and organization of the population census, in order to secure the right of informational self-determination.

45. The decision of the Federal Constitutional Court has cleared the way for a population census based on clear legal regulations. The Federal Government has already announced that it will without delay take the legislative initiative for the enactment of a new Census Law. In this respect the court decision does not represent a last point, but rather the beginning of intensive preparations for the new Census. For organizational reasons, it will however not be possible to take the Census before 1985.

(1) See Resolution No. 1947 of 5 May 1975.

(2) In the draft of the population census law, the overall costs of the census were estimated to be 428 mn DM (Federation 31 mn DM, Laender 223 mn DM, communities 174 mn DM) (cost level of 1 February 1977). See Bundestagsdrucksache (Parliamentary Paper) 8/2516 of 26 January 1979.

(3) Prof. Dr. U. Klug, Chairman of the Humanistische Union e.V.: Open letter addressed to Senator Fröhlich in Bremen, Munich, 21 Feb. 1983.

(4) K. Pokatzky, E. Brunner, M. Schwelien: Erfasst, registriert, entmündigt in: Die Zeit, No. 12 of 18 March 1983, Dossier, p. 11.

(5) Frankfurter Rundschau of 30 March 1983.

(6) Frankfurter Rundschau of 23 March 1983.

(7) Noelle-Neumann, E. and Piel, E. (Publ.): Allensbacher Jahrbuch der Demoskopie 1978-1983, Vol. VIII, Munich-New York-London-Paris, 1983, p. 303.

(8) See Institut für praxisorientierte Sozialforschung (IPOS) (Publ.): Volkszählung 1983, Eine Analyse ablehnender Einstellungen, Bericht, Mannheim, Sept. 1983, p. 12-20.

(9) See among others Isensee, J.: "Widerstand gegen den technischen Fortschritt" in: Die öffentliche Verwaltung, 36th Year, No. 14, July 1983, p. 565 ff.

(10) Decision of the Federal Constitutional Court of 13 April 1983, in: Bundesanzeiger, Year 35, No. 78a of 26 April 1983, p. 4.

(11) BVerfGE 27/1, 7.

(12) Decision of the Federal Constitutional Court of 15 Dec. 1983 concerning the Population Census Law, 1983, in Bundesanzeiger, Year 35, No. 214a of 24 Dec. 1983.

THE 1980 POPULATION AND HOUSING CENSUS OF HUNGARY EVALUATION OF THE CENSUS RESULTS AND METHODS (a)

1. In the practice of Hungarian population censuses during the past 110 years efforts were made in each case to summarize the experiences and information in connection with the census methods by reviewing the different phases of the preparatory work and programme development, the performing of the census, and all processing operations up to the dissemination of data.

2. Separate and detailed reports were given on the two censuses preceding that of 1980. In 1970 we published a detailed publication entitled "Summarizing report on data collection and data processing", the abbreviated version of which was also published in English and in Russian. The volume was forwarded to the United Nations for dissemination and further use. The methodological material of the 1980 census was summarized in a similar way. The Hungarian version will be published in the first half of 1984 and an abbreviated form in English and Russian is also planned to be published in 1984.

3. We think that without a methodological summarization the compiling of a modern census programme at an adequate level cannot be imagined; this summarization makes use of past experiences, considers the Hungarian traditions and peculiarities and, at the same time, provides also for the satisfaction of actual data demands.

4. The present paper prepared for item (i) – problems encountered in the pre-enumeration, enumeration and post-enumeration phases (e.g. cartographic, mapping work, living quarters and household listing, questionnaire preparation, field procedures, data processing problems etc.) – of the Seminar on the Evaluation of Census Results and Methodology included in the Programme of Work for 1983/84 of the Conference of European Statisticians relies essentially on the material described in the above mentioned methodological publications. In preparing this paper we made efforts to summarize the experience in a way that the instructions, concepts and possibilities relating to future censuses have also been taken into account.

(a) Report prepared by the Hungarian Central Statistical Office.

PREPARATORY WORK ON THE LEGAL LINE

5. The activities of official statistics and the rights and obligations of the citizens in this connection were regulated by the Act on Statistics No. 1973/V. in Hungary. The order of execution joining the former was issued by the Cabinet Council under No. 27/1973/X.12. and the regulation No. 1/1974/VIII.10., issued by the Central Statistical Office. Item 2 of § 18 of the above said law deals with population censuses.

6. The interviewing of individuals, families does not belong to the scope of voluntary data supply. This data supply – i.e. on the occasion of population census – is obligatory, therefore legal rules regulate the performance of the population census on each occasion.

7. Law-decree No. 1977/29 of the Presidential Council of the Hungarian Peoples's Republic on the 1980 population and housing census states:

1. § (1) In the territory of Hungary general population census must be carried out on basis of the status valid at midnight between 31 December 1979 and 1 January 1980.

(2) Simultaneously with the population census the census of housing and institutional households (hospitals, workers' hostels, students' home) have to be carried out, as well.

2. § (1) On the execution of population census and the censuses connected therewith (1. § 2) as well as of the data collection in this respect are provided for by the president of the council of the capital and of the countries, respectively.

(2) The professional direction of the data collection within the scope of population census and other related censuses, as well as the data processing and dissemination is carried out by the Central Statistical Office.

3. § The persons carrying out the census have to be considered as official entities in the course of making this job.

4. § (1) The data belonging to the scope of population and related censuses must be supplied obligatorily by everybody corresponding to reality and within the given deadline.

(2) The data and the relevant questionnaires form official secret; they may be used exclusively by the Central Statistical Office for statistical and for population register purposes, respectively.

5. § This Law-decree enters into force on the day of its enactment; the president of the Central Statistical Office provides for the execution.

8. The method of execution was regulated by a *Resolution of the Cabinet Council* which laid the charge on the presidents of the county councils and of the capital (of the districts) within the administrative apparatus to designate the

persons responsible for the census, who cared for designating local census officials at the level of towns, districts and settlements, respectively. Further on, this resolution arranged for putting in order the street names and street numbers as well as for executing the local annexations and the changes in the legal status by the end of 1978.

9. All the above was completed by the order No. 9/1978 launched by the president of the Central Statistical Office which uniformly summarized – for the first time in the Hungarian census practice – all the organizational co-ordinating and professional tasks beginning with the preparatory work and finishing with the completion of the survey. In this way it was possible to provide the local administrative units, prior to the preparatory work, with the apparatus they required for the execution of their tasks, to provide the statistical organs performing the professional supervising tasks with a complex overview of their responsibilities and to obtain a harmonized organization of the activities with due consideration to the centrally determined deadlines.

ELABORATION OF THE CENSUS PROGRAMME

10. The prevailing task of population censuses is to gauge the socio-economic changes, to demonstrate the development of cultural and educational level and to supply basic data for the medium- and high-level economic planning. Taking into account all the above, the corresponding determination and elaboration of the programme is of primary importance. Nowadays the data demand, the financial resources required and the demand for rapid data dissemination are such requirements that all three of them must be given careful consideration.

11. In elaborating the *programme* of the 1980 population census we had to take into account the economic conditions of the country, the limited financial possibilities and the circumstance that free labour force within the national economy was available only within very narrow limits. Therefore, with respect to the organizational structure and programme of the census we elaborated a plan taking into due consideration all the above.

12. In developing the final elaboration of the programme the following main guidelines were taken into account:

- the questionnaires comprised only those questions which were inevitably demanded by the organs using the data;
- the possibility for continued data supply, traditional in the Hungarian population censuses that provide a time-series for more than a hundred years, had to be provided for;
- performance of international data supply obligations on the basis of CMEA and United Nations recommendations;

- by further developing the computerized programme system established in 1970 for processing household-family and building-construction data, respectively by the means of computer;
- for the sake of easing the census work, we had to omit from the draft programme those questions which can be provided for in the course of small sample surveys within the frame of Uniform Population Survey System.

13. In elaborating the thematics of the 1980 census we took into account the experience of Hungarian censuses, the international recommendations of the CMEA and of the United Nations as well as the demands of high- and medium-level data users. Similar to the practice followed in 1970 the preparatory work was begun much earlier in order to finish it much earlier, and as a result the publications should be issued in a significantly shorter period of time.

14. In the development of the thematics, according to the Hungarian practice, assigned representatives of the most interested relevant organs participated – representatives of the State Planning Bureau, the Ministry of Finance, the Ministry of Labour as well as the Ministry for Building Construction and Urban Development (on basis of the thematics of the housing statistical survey).

15. Significant activities were carried out by the subject-matter departments of the CSO. Their participation until the termination of the programme was provided for.

Beyond and over the above – similiary corresponding to the former practice – separate consultations were held with the statistical divisions of the universities and with the institutions of the Hungarian Academy of Sciences concerned with this issue in order that the dissemination plan of the census should possibly satisfy the most important data demands.

16. In 1970, besides the basic programme, a very detailed representative survey was also carried out which covered data primarily in the field of occupation, commuting and productivity. In the course of elaborating the programme for 1980 the possibility arose that instead of the planned 25 per cent sample a 10 per cent sample survey should be carried out. The budgetary limits did not facilitate this smaller survey either. Thus, in the final elaboration of thematics all the interested ministries and the above enumerated organs had to be informed about the fact that the economic conditions of the country do not allow a too detailed programme, and that there is no possibility either to carry out a sample survey beyond the basic questionnaires.

17. In the course of negotiations suggestions more than the average had to be rejected because of the above said facts. Despite this circumstance, the basic programme offered possibilities for a rather wide-scope data collection and publication. In rejecting the data demands the interested ministries were informed about the fact that a part of the topics omitted from the census

thematics will be included within the programme of the Uniform Population Survey System in the year preceding and in the years following the census. From among these topics the most important ones are the following:

- change of occupation, congruence examination, professional mobility;
- secondary job, secondary employment, employing of pensioners;
- worktime, commuting, conditions of going to work;
- intellectual qualifications, second diploma;
- commuting of students;
- detailed fertility – and housing – demographic data.

18. Hungarian censuses carry out the population and housing census simultaneously. Information relating to the household and family – by making use of certain supplementary criteria – are derived from the personal data, and that on buildings from the data of housing census. The present practice demands to an ever increasing extent the complex use of information, that is to say the more detailed disclosure of the interrelations of data relating to households, families and housing, which is facilitated only by a simultaneous survey.

PREPARATORY WORK OF THE CENSUS

19. The preparatory field work of the 1980 population census was begun in 1977 by preparing and organizing the pilot census scheduled for 1 January 1978. The final programme was elaborated on the basis of the experiences obtained in the *pilot census*, which determined also the tasks of preparatory work to be done in the field.

The purpose of the trial census is to control whether the organizational guidelines are suitable in practice; its major tasks, however, are the control of the programme and thematics of the census. We intended to examine within this frame the preparing of street name and street number lists, the developing of census districts, the recruiting and assignment possibilities of interviewers and census supervisors, the training experience and the readiness for co-operation between local administrative organs and the county directorates of the CSO. Beyond the above, we tested the questionnaires and observed whether they were in harmony with the census instructions and whether they satisfy the requirement system of the 1980 census.

20. In the course of the 10 years that passed since the last population census in 1970 significant changes took place in the administrative structure (the dissolution of county districts, the development of surroundings of towns, the construction or the connecting of communities to towns, the establishment of new towns). Similarly, considerable changes were experienced in the number of inhabited areas on the peripheries and also in the modification of

borderlines of peripheries and of downtowns. All the above justified that the preparatory work should be begun with a "State Administration Data Collection" surveying the data of settlements.

21. Such a complex survey of this nature was carried out for the first time in the history of censuses, namely when the census provided the data of settlements in a breakdown of part-settlements – primarily with respect to peripheries – as well (area population, official denomination, transport, etc.). In towns and in selected settlements there was also a supplementary data collection carried out in a breakdown by urban development aspects on the degree of supply with services (communal services, transport, social services, institutional conditions). The survey was completed by preparing draft maps on inhabited areas of the peripheries. The data were collected according to a breakdown elaborated in common with the Ministry of Building and Construction and Urban Development; central, other downtown, periphery. Within this breakdown the data were given also in hectares; the survey comprised the preliminary number of residential buildings and of the population, the enumeration of changes in local areas, and the denomination of liquidated and newly inhabited areas both in the downtown and periphery areas.

22. This information was of basic significance partly in the further working stages of the census (establishing of census districts, determination of the needed financial and personal conditions etc.) and partly they provided basic data for the gazette to be published later.

23. In order to provide for the comprehensiveness of the population census and to avoid double recordings, a fundamental demand is that suitable *maps* should be available for establishing the census districts. In Hungary the National Land and Cartographic Institute is the central organ which possesses full-scope cartographic material at the level of settlements. On the basis of the information received, there were three sources from which the local administrative organs could purchase maps suitable for census purposes (1:4,000 - 1:5,000 scale for downtown and 1:10,000 - 1:25,000 for peripheries):

- Land Survey Office and the local organs of the National Land and Cartographical Office (the county land-offices)
- different planning and designing institutions
- own maps of local administrative organs.

24. The regional units of the Central Statistical Office carried out a comprehensive survey on the supply of maps for settlements in 1978 and stated that since 1970 the situation has changed favourably; thus no further purchases or central measures were needed in this respect.

25. The Ministry of Food and Agriculture ordered in a circular the Land Survey Office and its regional organs, as well as the county land-offices under its supervision, the maps needed for the census work; thus these organs were well ready for the orders placed by the local administrative organs. On basis of the

above the purchasing of the needed maps did not cause troubles in general; the local administrative apparatus was burdened only with the task of supplementing the maps and rendering them timely. If required, the Population Census Section of the CSO also made available the maps of the 1970 census.

26. The lists of *street names and street numbers* have been compiled since the 1960 population census. The purpose of these lists was to determine the preliminary number of dwellings and of the population needed for establishing the census districts and to avoid double counts and omissions, respectively.

27. Prior to preparing the above lists the local administrative organs arranged the street names and street numbers and completed the missing street number tables on the basis of the presidential order No. 1/1976, of the Office of Cabinet Council.

The lists were compiled by dwellings in the towns and communities indicated by the Ministry for Building and Construction and Urban Development, and by residential buildings in all other settlements. The lists comprised the residential buildings in increasing order of sequence of street numbers by streets, and within this the dwellings by stocks and by door number, as well as the number of persons living in the dwellings.

28. On the basis of the street name and street number lists the census districts were established. In the case of towns and large communities the borders of administrative districts and sub-districts were taken into account. The size of each census district was determined by the consideration that the interviewer should be able to carry out his work without any trouble within the given period of time. By taking into account the time-factor, there were about 300 persons in each census district in downtown areas and about 100-150 in scattered peripheries.

29. From the census districts established in this way a "Preliminary summarizing list of towns and communities" was prepared, which comprised the expected number of housings and persons to be recorded in the increasing order of sequence of the census districts. On the basis of these data the necessary number of interviewers, supervisors and reserve-interviewers as well as the compilation of the census forms (compiling of type-packages, the labelling of folders) could be determined beforehand.

THE CENSUS METHOD

30. The 1980 population and housing census was carried out by the traditional method by interviewers walking from house to house, from dwelling to dwelling within the given census district established on basis of the street name and street number lists, in the form of *interviews*. This survey technique was used already in 1970, and in the course of preparatory discussions the question arose as to whether it would not be expedient to choose a different

method. With a view to the fact that the educational and cultural level of the population underwent an extraordinarily significant change in the past 30 years, one might assume that not only in the towns but also in the communities the inhabitants were able to fill-in a census questionnaire of moderate programme by themselves. The changing of census method would be justified also by the fact that already the experiences obtained in connection with the 1970 census have shown how difficult a task it is to recruit interviewers and supervisors for interviewing purposes in the adequate number.

31. According to the former Hungarian practice, the organizers relied primarily on the pedagogues when establishing the interviewer network. Recently – along with a relatively moderate fee – the pedagogues were even less willing to undertake such a work, especially in the period of the winter holidays of schools. (The majority of pedagogues are women and mothers and wish to spend the holidays with their family).

32. By weighing all the above, and taking into consideration that in the processing it was for the first time that we applied the decentralized system, that the pilot censuses were oriented to a survey of this type and that the possibility for correction did not seem to be provided in the case of those citizens who filled in the questionnaires by themselves, we – after all – decided to apply the traditional survey system. But we had to count on the fact that in Hungary it will be probably the last census (the 1980 one) which would be performed by the traditional methods.

33. As a technical question of the census method, the participation of the already functioning State Population Register in the census arose in the course of developing the draft programme. In this connection we had to examine on the one hand the possibility of whether, by the operating of the system of the State Population Register, the census could be eased to a certain extent, and on the other hand whether the programme had to be widened because of the fact that all the 1980 census data would be utilized to revise the data base system. Moreover, it also arose that the population register data may potentially be extended.

34. The operational system of the State Population Register was not adequately prepared to fulfil this task in 1980, and thus it could not be expected that it should suitably co-operate and supply data, that is to say that it should use the census data for controlling its data base. The participation of that office on the occasion of the forthcoming census is already provided; its data base system is well developed and can be used also for census purposes.

ORGANIZATION OF THE CENSUS

35. The organizing and management of census takers and supervisors was performed by the local organs of the Council Bureau of the Cabinet. The

development of the Hungarian administrative network or system made it possible in the course of the preparatory work for us to rely to a far greater extent on the local administrative apparatus than in the case of earlier censuses. This possibility is expected to be even more favourable for the forthcoming census, with special regard to the modernization planned in the field of administration.

36. *Professional management* and supervision was provided for by the Central Statistical Office. The two central organs co-ordinated the census work in close co-operation in the course of the entire survey. This practice – having proved to be excellent – can be well applied also in the future.

EXECUTION OF THE CENSUS

37. The census taking and supervising works of the 1980 population and housing census had been carried out, according to the pre-set schedule, between 2 and 15 January. In correspondance with tradition the census moment was 1 January, which corresponds also to recommendations of the Statistical Commissions of both the United Nations and the CMEA. In the 48,000 census districts of the country 44,000 census takers (in the case of small census districts, peripheries etc., one census taker surveyed more than one district) and 11,000 supervisors carried out the work.

38. The population group causing the greatest problems within the Hungarian census is the scope of those persons who *have two places of residence*. (According to the Hungarian legal practice each person may have a permanent and a temporary dwelling.) In the case of such persons the situation occurs that at the time of the census they are staying in one of their places of residence – or, in exceptional cases, in neither of them. In general, these persons are frequently left out of the census. It can be provided only by their recording in both of their dwellings that they are not left out from the census, and at the same time they can be separated also from the accumulation. On the basis of suitably elaborated survey principles they are enumerated at the stage of processing only in one of their places of residence. If the census is of only one-direction and the persons of double residence would not be recorded in both of their dwellings, a lack of several hundred thousand persons could be experienced in the population number. This double enumeration and the collation of data sheets of persons of double place of residence causes serious difficulties. At the early stage of processing it results in voluminous extra work which ought to be avoided or at least diminished in the future. This demands, however, the modernization of not only the statistical survey but also of that of notification of change of address, the preparatory works of which are already in progress in the state administration. This work will be facilitated partly by the re-organization of the State Population Register and partly by other administrative measures.

39. In reporting on the 1980 census we can state that the co-operation of the population was extraordinarily positive, which fact was highly promoted by suitable information, by the consolidated social and political atmosphere and by the central and local propaganda activity, as well.

The above cannot be unambiguously stated on the survey apparatus as their work was carried out partly skimpily and partly in a not orderly way, but only to an insignificant rate.

PROCESSING

40. For the sake of rapid processing of the results, the finalization of the processing programme and of the processing plans, the development of coding system, the final solving of instructions and of technical issues was completed simultaneously with the census programme.

41. The organization of decentralized processing was elaborated by making use of the experience of the former, central processing practice. *Local offices* were organized by counties, and their tasks were laid down in written form by the stages of work. This provided for the processing to be carried out according to uniform principles. The series of instructions entitled "Tasks of census offices after the survey" regulated the following phases of work:

- reception of questionnaires and supplementary recordings, preliminary summarization of population and housing data
- selection and copying of the elements of the 2 per cent sample
- collation of Revision-cards of persons of double place of residence and completion of missing data
- coding, revision of coding by the means of manual processing – by external co-workers – forwarding of the coded material for computerized data recording.

42. Unlike the former censuses a decision – involving also certain risk – was made that, similar to the coding work, the working phases of revision of comprehensiveness and of data entry should also be carried out in a decentralized way. The automatic data editing and the preparing of dissemination tables were made centrally, in accordance with the traditions.

43. *The first stage of electronic data processing* (data entry, data editing) was carried out in 14 country-computer centres of the Central Statistical Office and of the National Enterprise for Computer Techniques. The computer centre of counties carried out this work besides their permanent work, and to the debit of their free capacities.

44. When summarizing the *most important experience of the preparatory work (survey and data processing)*, the following have to be taken into considera-

tion in developing the 1980 census programme:

- the preparatory work has to be begun possibly three years prior to the census. It is similarly expedient to finish the programme prior to the beginning of the census in order that the electronic data processing, data recording, data editing and the entire processing and dissemination work can be prepared in time;
- the law decree should be issued two years before the census, to facilitate the preparatory work;
- the administrative apparatus should be involved more extensively in the works connected with the census; the major part of the local preparatory work and census taking should essentially be entrusted to the local administrative organs;
- the Central Statistical Office should care only for the professional direction;
- the potential modification of the census moment should be considered;
- the housing census should be carried out simultaneously with the population census also in the future;
- the census programme has to be determined in such a way to take into account the data base of the State Population Register, and the survey programme should be diminished therewith. The utilization of labour registers for population census purposes should also be considered. The utilization of the representative survey process can be neglected by no means (it is one of the most up-to-date data survey systems of the statistical methods);
- a survey method which can be applied most efficiently in the Hungarian practice should be developed; this would not only mean the introduction of up-to-date practice, but would facilitate the decrease in the number of the interviewers' apparatus which is inevitably needed for the future. The establishing and organizing of a suitable network of interviewers was a task which seemed to be insoluble already in 1980;
- the system of registration of dwellings and of the personal registers should be modernized so that the collation of Control-cards of persons of double place of residence would be negligible;
- in the field of housing census the local recording of holiday homes should possibly be neglected;
- all the new methods to be introduced should be tested previously within the frame of pilot surveys and only on the basis of the experience obtained should decisions be made as to which of them is suitable for modernizing the traditional Hungarian practice, without

- exerting a negative influence on the evaluation level of data;
- decentralized processing can be applied also in the future. It is already a tested method which has proved to be applicable. The direction of this work should be entrusted temporarily to experts familiar with the census works and having experience in doing it, from among the associates of the regional units of the CSO;
 - the textbooks of processing should be prepared prior to the census, and the managers of processing should be trained adequately;
 - data dissemination should possibly be rendered more rapid, and the processing period should be decreased. The precondition for this is that the survey, data processing and recording, electronic data processing and the dissemination works connected thereto should be finished in a maximally harmonized way and harmonized also with all data users.

PLANS AND CONCEPTS IN CONNECTION WITH THE MODERNIZATION OF THE 1990 POPULATION AND HOUSING CENSUS

45. The revision of the traditional *date* of Hungarian *population censuses* – the years ending with zero – is necessitated by the aspect of utilizing the results. The census results cannot be used in due time for the medium-term economic planning as the five-year plan period begins one year after the survey and the majority of full-scope data cannot be published yet. On this basis the execution of the census one year earlier is to be considered; this would offer possibilities to disseminate the needed information in due time.

46. Changing the *census moment* – 1st January – would be justified by the practical consideration that the recording of persons who are away from their place of residence – that is to say, providing for the comprehensiveness of the survey in practice – is the census task which causes the most problems since the population's most intense moving is the period of feasts. This difficulty could be surmounted – similar to the practice followed by other countries – by having the census carried out either in mid-December or in the second half of January.

47. By evaluating the experience obtained from the 1980 population census the opinion was developed that conditions became ripe for *modernization* and simplification. Following the practice of developed countries, it would be expedient to change over to the method of filling in the questionnaires by the citizens themselves, eventually combined with other methods (mailing, utilizing the data of the State Population Register), which – when adjusted to the national circumstances – would provide maximally for the conditions needed for performing the population census.

48. The replacement of population censuses by making use of administrative registers demands the execution of a series of measures. As part of this preparatory work we will carry out a pilot survey within the frame of the micro-census planned for 1984, the primary objective of which is to obtain methodological experience on the utilization of the data base system of the State Population Register for population census purposes, as well as on the technical possibilities in this respect.

49. An indispensable pre-condition of the introduction of the new method is that the thematics, structure and style of questionnaires and instructions should be adjusted to the fact that the census would not be taken by a professionally skilled apparatus and the questionnaires would be filled-in by the citizens on the basis of brief guidelines.

50. The *State Population Register* would participate in the above described works as an active partner with the housing and personal data registered in its data base, the utilization of which would offer the possibility for decreasing the time demand of preparatory works and the population census programme. It should also be noted that the State Population Register similarly intends to utilize the population census results partly for checking the street and personal cadastre data compiled by this office, and partly to extend and widen its data base with demographic and occupational data.

**PREPARATORY WORK,
DATA COLLECTION AND OTHER OPERATIONS
IN THE 1981 POPULATION CENSUS OF ITALY (a)**

I. INTRODUCTION

1. First and foremost, it is worth providing some information on the aspects of the census organization.

2. The population census carried out with reference to the 25 October 1981 is the twelfth in a series which started in 1861 at the time of the unification of the nation.

3. From 1961, three distinct decennial censuses have been taken:

- a) the population census, which was coupled with that of housing;
- b) the census of industry, commerce, welfare services and handicrafts;
- c) the census of agriculture.

4. It is important to stress that the first two censuses take place jointly and therefore benefit from the same organization. This must be taken into account in considering the following explanations.

5. The task of census taking is entrusted by law to the Istituto Centrale di Statistica (ISTAT). At a peripheral level the material collection of data is entrusted to the Communes (more than 8,000) which co-operate with ISTAT by providing the enumerators (in 1981 there were about 95,000).

6. The task of co-ordinating the census operations within each of the 95 provinces into which the national territory is divided, is carried out by the Provincial Offices of Statistics which operate through the Chambers of Commerce. These offices enrol the services of the provincial Inspectors who are assisted in the task by ISTAT officials.

7. Those responsible for the regular proceedings of the census operations are the Mayor within the sphere of the Commune, and the Prefect in that of the Province.

(a) Report prepared by Mr A. Cortese, Central Institute of Statistics.

II. PREPARATORY WORK

8. The plan for census-taking was devised along the lines of the proposals which were formulated by a proper Study Commission set up by ISTAT and includes University lecturers, representatives of Public Administrations as well as of various Bodies interested in the use of such census returns.

9. At the time when the questionnaire's content was being determined (and which, as shall be described later on, was tested by means of an experimental survey carried out in November 1980) and the plan for tabulation and editing was being prepared, the preparatory operations were launched.

10. Three aspects should be mentioned at this point:

a) *Formation of a topographical plan*

11. Evidently, the carrying out of a population and housing census calls for the pre-determination of the territorial bases which, in our country, is achieved by means of preparing the so-called "topographical plan". It is none other than the graphic illustration, to the scale 1:25,000, of the Commune's territory and its subdivision into areas of smaller size (enumeration areas) to render the census data collection more practical. Since such small geographical areas have, in time, assumed great importance as territorial spheres whose census returns are useful for reference, especially in relation to the requirements for town planning, it is worth noting that the task of the Commune in this field is at times rendered difficult because of the lack of suitable maps. Obviously, it is not a matter of the absolute lack of maps but of the availability of up-to-date maps so that they are not of much help in pursuing, for instance, the development of housing in urban areas.

b) *Enumerators*

12. In order to single out the units for census-taking (households and houses), Communes are not asked to provide lists that would help the enumerators in their task. However, it must be said that this would be possible only with reference to the first of the two above-mentioned spheres for which information could be obtained from the registers of the resident population. In practice, census-taking in Italy has really always been oriented towards entrusting the enumerators with the task of singling out the households and to making use of Communal registers only for further controls to be carried out by the Commune. Each enumerator is asked in detail:

- to cover rationally, by making the best use of available time, the territory assigned to him (one or more enumeration areas): for such a

purpose, he uses an "enumeration area itinerary" and, very frequently, a topographical map supplied by the Commune;

- to hand over, initially, facsimiles of the household questionnaires and to give the families clear explanations on how to fill in the questionnaire correctly;
- to collect the completed questionnaires, to check the information supplied in order to ascertain its reliability, and to complete and correct the questionnaires on the spot when necessary;
- to complete certain "auxiliary" forms to be handed to the Commune at the end of the data collection activities, which shall keep him engaged for about a month.

13. Obviously, these are delicate tasks which call for adequate training. The experience of 1981 has shown in this regard that the organization of training courses lasting generally three days should be revised. In fact, it would be preferable to have courses lasting longer and to have a "group leader" so that — especially in large cities — there would be more scope for following the performance of each enumerator. One should no longer shun the idea, in the future, of resorting to the use of visual-aid systems for better training. This might also guarantee a more uniform interpretation of the instructions imparted by ISTAT. The illustration of the instructions that govern the operation of census-taking takes place by stages: the ISTAT personnel train the provincial Inspectors; the latter train the Commune officials, and they in turn instruct the enumerators. The ones to gain most are the Communes whose staff is not always adequate enough to tackle the problems involved in census-taking. Also, as for the enumerators, it is to be noted that in certain areas some enumerators protested, but these protests were limited. It was a question of pressure aimed at the local administration in claiming a regular job. Even in the preceding censuses, the assigning of enumeration tasks to external staff with short-term contracts led to expectations of guaranteed long-term work. Since the law prescribed recruitment largely from persons in the public service, this has, in any case, served as a restraint of an action which, if generalized, would have led to problems which would have affected the smooth running of the census.

c) *Promotion Campaign*

14. Considering the past, it was thought best to promote a widespread campaign by involving the leading mass media, and above all to remove from public opinion all shadow of doubt about the rules concerning the pledge of official secrecy on information gathered in the census. The money spent on this campaign was not negligible, but it was worthwhile. There was also a considerable involvement of the population which often proved its diligence by

notifying the Commune, for instance, that the household questionnaire had never reached its destination. In this regard it should be noted that, especially in large towns, some problems arose as a result of the difficulty encountered by the enumerator in contacting households (as in the case of persons living alone and who are often not at home and away at work). This experience suggests that, in the future, the possibility of returning the questionnaire by mail should be studied.

III. CHECKING OF QUESTIONNAIRES AND DATA RECORDING

15. After collecting the questionnaires, the Communes undertook a thorough and careful quantitative and qualitative evaluation. The former was aimed at making certain that no unit was omitted from the census or counted twice. The qualitative scrutiny consisted in carrying out a critical examination of the information collected with a view to verify whether it had been indicated in conformity with the instructions and reflected the real situation of Census units in regard to the features considered.

16. For the quantitative check, the Communes rely essentially on the outcome of the comparison between the household questionnaires and the information obtained from the population registers. Such a comparison, enforced by the law and therefore binding on the Communes, certainly favours the updating of the Commune's files. This is also useful to the census since it can lead to identifying demographic units that escaped the enumeration. Such an operation can be effectively fulfilled if the comparison is carried out within a short time; the usefulness of the comparison to the census strongly depends on the extent to which the registers are up to date.

17. To shed light on such aspects ISTAT carried out, very near the time the census was taken, a control survey involving the larger Communes. This has shown that the updating of the files is generally not carried out often enough, and that administrations usually are not aware of its importance and therefore do not provide sufficient amounts of human and material resources for the work. Furthermore, it is evident that changes of residence are often registered after a considerable delay. Such a situation highlights the need to involve other channels in order to guarantee a satisfactory degree of coverage in the census. Some experience in this regard has already been gained during the operations for the 1981 census: a sample survey has provided some indicators.

18. Evaluation was also carried out on the quality of the data gathered. Immediately after collecting the census questionnaires, another survey was conducted using a sample of households and certain questions contained in the household questionnaire were asked again: this evidently was devised to compare the answers given autonomously by the persons included in the census

at the time the census was being taken, with those gathered by the post-census interviewer.

19. While the control survey was under way, it coincided with the registration of the data gathered by means of the questionnaires which the Commune had meanwhile checked. Such an operation was only partly taken care of by ISTAT, since the law which called for the general census of 1981-82 gave those Communes that were well equipped for data processing the faculty of bearing the costs themselves. The decentralization of this phase in the operation had a positive effect on the time required to prepare the input to be used in later processing. The activity of the registration centres that worked on behalf of ISTAT has been closely followed. It is opportune to mention, besides, that systematic checking of the registered material was carried out on a sample basis.

IV. DATA PROCESSING AND DISSEMINATION OF RESULTS

20. Immediately after starting the registration operations, a first data processing, of a provisional nature, followed. This involved a limited amount of information transmitted by the Commune by means of a form in which some summarized data, drawn from a table that was featured on the front page of the census questionnaire, were indicated. This processing, considering the limited volume of the input, was easy to complete within a short space of time. The results have been disclosed in aggregate form in an "ISTAT News-sheet", and in detailed form in a volume which has given users some early information at Commune level only five months after the census date.

21. The final processing is obviously a much more complicated operation. It was carried out over a period of two and a half years, divided into various phases. The first phase consisted of preparing the registered material from a quantitative point of view, and this made it possible to obtain data concerning the population having residence in each Commune (the so-called "legal" population) which, according to the practice, was published in the Official Gazette.

22. The procedure studied for the qualitative control initially called for the checking of the order of sequence of the reference data (code number of Province, Commune, Census Section, serial number of questionnaire). Here, likely irregular situations have been identified with specific reference to the completeness of the answers given to the single questions. This analysis has underlined, in certain cases, the need to return systematically to single questionnaires for further scrutiny, coding and new registration of the same.

23. The registered records (five types) were then submitted to the screening of a complex control programme which provided for the automatic imposition, under pre-determined conditions, of codes found lacking or not valid and the

adjustment of the registered codes in case of proved error. Such a control, extended to the conditions provided for in the publication plan, was first carried out on the single type record and later extended to all the type records.

24. If the complete registration of the collected data (in 1971 for a part thereof, a 20 per cent sample was registered), on the one hand, outweighed the preparation phase of the input and naturally rendered the checking more burdensome, on the other hand it has also allowed a more ample tabulation plan and therefore has enabled the most diverse user's needs to be met.

25. As far as the publishing of the census results in printed form is concerned, the most important publication is represented by the traditional provincial reports (*Fascicoli provinciali*). These are volumes showing, in particular, the data relating to the single Communes in each Province. The practice of publishing the data separately for the territorial districts was adopted in 1931 to avoid delaying the publication of the results till the completion of the material for the entire nation. The possibility of disseminating census data just as soon as they become available is, in fact, an evident advantage. The experience of 1981 has marked, in this respect, an important improvement. In order to cut down on the waiting time for the users who find themselves in need of some information on the major structural characteristic of the spheres considered in the census (households, persons, occupied housing), as soon as the first provincial reports were issued, a 2 per cent sample was selected from the registered material and processed so as to make its results available, at a regional level, in a volume published in June 1983.

26. This having been stated, it is to be observed, however, — with regard to the dissemination of the census results — that the available information can be found only partly in the publications: a large number of tables, the contents of which obviously has been made known, is also supplied to users on tape. A further contribution shall come with the setting up of a territorial data-base to which all efforts are being expended. One cannot omit stressing the fact that ISTAT processing shall be integrated with those that can be carried out autonomously by the local authorities (Regions, Provinces, Communes), which are authorized by the law governing the general census of 1981-82 to have access to data, rendered anonymous, on the single enumeration units.

V. EXPERIENCE IN THE FIELD OF ELECTRONIC DATA PROCESSING

27. In order to guarantee the optimum conditions for census operations, a well - equipped electronic centre was set up for the purpose.

28. The population census, in particular, was the project that engaged the centre constantly and in a big way, for it absorbed the bulk of available resources for all of 1982 and the greater part of 1983.

29. Such a project has numerous phases, each of which should be consi-

dered as a separate procedure. The important ones, as partly described before, were the following:

1. Preparation of the initial activities (registration schemes, contacts with external bodies and processings to determine the compensation for the data recording activity);
2. Quantitative preparation of the material;
3. Qualitative preparation of the material (in batch mode): inconsistencies and automatic corrections, by single records and by housing and households;
4. Qualitative preparation of material (in interactive mode): interactive corrections, by single records and by housing and households;
5. Control tables: comparisons 1971/81, comparisons with the labour force statistics, tables of internal control;
6. Tables of Commune and Province data per publication;
7. Tables of regional data per publication;
8. Tables of State-level data per publication;
9. Tables for internal intermediate use;
10. Tables to meet special requests.

30. The activity of programming has brought about the development of more than 220,000 programming lines written in COBOL. This excludes the qualitative preparation of the material obtained in interactive mode, for which natural language was used.

31. The programming of the phases of the qualitative and quantitative preparation was particularly time - consuming, not only because of the intricacy of the controls and of the need to provide external users with files that are as clean as possible, but also because the condition of the material obtained was in such a state that many of the controls provided had to be revised (and made more complex) several times, according to the various situations.

32. For the sole aim of providing an average indication of the complexity of such an application, let it be said that the programme, divided into several forms, which provides controls per single records, required the drawing up of about 30,000 COBOL statements.

33. Compared to past censuses, the experience of interactive data correction has been a complete novelty.

34. For the first time, in fact, the officials of the Census Office were placed in a position to handle the data files directly. Such action, which is performed before or after the "batch" preparation phase of the material as the case may be, was substantially carried out through the use of simple screening, appropriately set beforehand.

35. From a strictly technical point of view, it is worth pointing out that

such an application has warranted the aid of data base structures (ISTAT has recently acquired the ADABAS DBMS) and has provided the development of programmes and maps for more than 20,000 natural language statements.

36. It could be estimated, however, that the number of corrections actually achieved in an interactive mode affected not less than 130,000 records; if one were to consider that the total number of initial records concerning the population census was about 80 million (20 for housing and 60 for population), technical problems would obviously have to be solved especially in so far as the loading and unloading of data and the "inquiry" activities are concerned.

37. In conclusion, information on the resources of the centre and their distribution among the offices interested in the population census is provided below:

Central Unit: 2 AMDAHL 470 V7
of 4 Mb main memory each

Mass Storage: magnetic disk drives
IBM 3350 and NAS 7350-7360

Census Service

- 24 video terminals
- 5 small printers

Information Service for Censuses

<i>Operative Sector</i>	<i>Programming Sector</i>	<i>Data Base Sector</i>
9 terminals	21 terminals	5 terminals
10 tape units	2 tape units	1 small printer
3 printers	1 printer	
	2 small printers	

**PROBLEMS ENCOUNTERED IN THE PRE-ENUMERATION,
ENUMERATION AND POST-ENUMERATION PHASES
OF THE NORWEGIAN POPULATION AND HOUSING CENSUS 1980 (a)**

I. THE DUTY TO ANSWER

1. The Norwegian Population and Housing Census was taken on 1 November 1980. The coverage of the census is all persons registered by the Central Population Register as resident in Norway on that day. Norwegians living abroad for more than 6 months were omitted, except for students abroad and persons at the Norwegian embassies. On the other hand, persons from abroad who intended to stay in Norway less than 6 months and persons at embassies from other countries, are not registered as resident in Norway.

2. From our Central Population Register we got sufficient information about persons below 16 years of age, so we did not need to distribute questionnaires to these persons. The duty to answer the questionnaires was therefore limited to persons 16 years of age or older resident in Norway on 1 November 1980. This duty is based on the Statistical Act of 1907 and a decision in the Parliament (Stortinget) in 1978.

3. Some people were penalized by the police because they refused to fill out the questionnaires. Some of these cases were brought to court, and one complained to the Supreme Court. In all cases the penalty was confirmed. We have incomplete information on the total number of penalties issued by the police, but the number would hardly exceed one thousand.

II. THE USE OF INFORMATION FROM REGISTERS

4. During the planning period, we appraised registers on EDB-medium with information on individuals and with our personal number as identifica-

(a) Report prepared by the Central Bureau of Statistics of Norway.

tion, and tried to find out if information from these registers could replace information collected by questionnaires. We found that all demographic information needed for the census could be taken from the Central Population Register or from historical files from that register. Information on education completed could be taken from the 1970-census and from the data system of started and concluded education established for the educational statistics of the Central Bureau of Statistics. We only had to ask education completed from persons coming to Norway after 1970, because they often obtained their education in other countries. The data system also gave us information on persons who were students or pupils on 1 November 1980.

5. From administrative files we also got information on conscripts or persons doing compulsory civilian service. On the questionnaires was could therefore concentrate the questions on the ordinary job a person would have in the year before census day, or on that day.

6. Income data were obtained from the data system of municipal and central governments, tax assessment, the system of grants and educational loans, the national insurance payment system and the system for rent subsidies.

7. We were asked to use registers on employment and housing which were established a few years before the census, or were planned to be established before it, but we refused to use them. Registers need time to reach a sufficient quality, and we feared that they would not reach that quality before census day. Our experiences with registers has shown us that this was a correct decision. The claims of the statisticians are not strong enough to influence the routines of the administrative register and the allocation of resources to them.

8. The census was not used to correct the information of these registers, and we do not know very well how good their quality was. Different information obtained during the collection and control process suggests that in the Central Population Register about 2-3 per cent are registered at a wrong address in comparison to the rules of the registration routine.

III. THE QUESTIONNAIRES

9. The information we wanted from all persons 16 years of age or older which could not be obtained from registers was obtained through questionnaires (a personal form and a housing form).

10. The number of questions had to be restricted because the resources to handle them were restricted, because of the burden for the public and because of technical restrictions connected with the optical reading of the questionnaires. The content of the questionnaires was discussed with the users of the statistics, and the way of asking the questions was tested with some sample surveys. (These surveys are described in paper CES/SEM. 17/17 "Norwegian experiences in the use of sampling in different phases of the census"). An information booklet

explaining the questionnaires was also produced.

11. We did not have any problems with the questionnaires, and the reactions from the public were positive. Due to the wrong addresses registered in the Central Population Register, we had some wrong answers on questions about travelling from home to work. The geographical specification of the place of work may also have been misunderstood because the public often gave us the address of the enterprise instead of the establishment of work. To find the correct information, we had to collect additional information by an additional questionnaire which we had to send out to around 35,000 persons in the autumn of 1981.

IV. THE "MAIL-OUT, MAIL-BACK" PROCESS

12. Every person 16 years of age or older was to receive a personal form. This was sent to him/her by post. The Central Population Register constitutes as families: married couple with or without unmarried children, mother/father with unmarried children, and single persons. The oldest person in each family received a housing form and a reply envelope. This person had to gather his/her own completed form with those of the rest of the household and return them in the same reply envelope. For about 90 per cent of the households in Norway one and only one family constitutes a household. But we have no register which tells us what families are living together in one dwelling and therefore constitute a household. These 10 per cent of the households would therefore receive two or more housing forms. On the questionnaire, we told them to use only one housing form and one envelope for the whole household, even if they got two or more. If they did not follow our instructions, but mailed back the questionnaires in different envelopes, we would register them as two households and two different dwellings. We had some methods to control and correct such wrong information, but they were not quite satisfactory.

13. We were very anxious about this problem with the "mail-out, mail-back" process before the census. No systematic test of how well our instructions functioned have been made, but as far as we can see it worked better than we had anticipated.

14. To envelope the questionnaires we hired a private firm. The job had to be done as near to the census day as possible because we wanted to use the most up-to-date register. (It started on 1 July and was finished by 1 October.) On the other hand this set the machinery under high pressure, with greater possibility for breakdown. When different firms are responsible for printing the questionnaires, for the "mail-out" envelope, for the "mail-back" envelope, for the enveloping process and for the optical reading, it is easy for them to accuse the others when something goes wrong. We noticed some tendencies of doing so in the tests just before the process started. The administrative practice in Norway

prevented us from using one or two firms for the whole process. Perhaps that solution might have saved us from such administrative problems. But we must add that when the process started, all went well.

15. In the discussions with other experts with experience in data collection, some of them questioned whether people would "mail-back" the questionnaires by themselves. Our original plan was to have 90 per cent of the questionnaires returned to us before any call from us, but this was said to be too optimistic. (Our plan was based on experiences from the Swedish Census from 1975 which had a 95 per cent return rate.) The method proved to be a success in Norway too, and we reached 95 per cent before the call.

V. THE INFORMATION CAMPAIGN

16. Especially because of the "mail-back" process, but also to motivate the public to fill out the questionnaire, we had to use more resources on information and public relations than in previous censuses. In brief, the information activities were:

- advertisements in newspapers and magazines;
- filmstills in cinemas;
- local information services by the local population register offices;
- special information to employees in social institutions and in social services;
- special information booklets in different languages;
- delivery of questionnaires to persons who for different reasons were not receiving them from post offices and population register offices;
- press conferences for local and central newspapers;
- programmes on radio and television.

17. Comments on some of the above activities are provided below:

a) *Local information services.* The local population register offices were not as engaged as we thought they would be. Maybe the recruitment for such services was less than expected. We also feel that the population register offices are not known enough to the public, and that people with problems and questions therefore used other institutions and persons. The Population Census Division in the Central Bureau of Statistics had a lot of telephone calls when we mailed out the questionnaires.

b) *Special information, social institutions.* We made a special booklet for employees in social services and institutions, and distributed it through the local social administration. We feel that this worked well. Institutional house-

holds are problems in the information campaign as they are in the census as a whole. We also had special programmes for the blind.

c) *Special information booklet in different languages.* An information booklet in Norwegian followed the questionnaires in the "mail-out". On the back of this booklet, we announced in 10 different languages that separate booklets were also available in Urdu, Hindi, Serbo-Croat, Turkish, Chinese, Finnish, English, Arabic and Vietnamese. The fact that we had this special activity gave us a very good image in press reports. But the small demand for the booklets indicated that the need for them was not so great, or that it was too difficult to obtain them.

d) *Programmes on radio and television.* We contacted State Broadcasting to get information and programmes on the census on both radio and television. This was more difficult than the work with the newspapers. We realize that television paid less attention to the census than radio and newspapers, but we do not know why.

18. As a conclusion we have to say that we put less resources in the information campaign than we thought had to. This was done on the basis of advice from outside specialists in that field who were on our information board. It seems to us that the information budget is not the restriction in obtaining success with the "mail-out, mail-back" process. Rather, it depends more on how the money and time reserved for this purpose is used.

VI. RECEIVING QUESTIONNAIRES

19. The post offices distributed the questionnaires to the public in the days between 22 and 31 October. The questionnaire stated that it was to be returned as soon as possible, and not later than 7 November. The municipalities were pooled into groups, and each group had its own address printed on the reply envelope from all households living in the municipalities included in that group. Regardless of where a person mailed his/her envelope, it would come to the address printed on the envelope. From this address, which in practice was an "artificial" address in a post office, we got all envelopes from that group in separate postal sacks. In that way the reply envelopes were sorted into 31 groups by the post offices when they reached the Bureau. This arrangement with the post offices saved us from sorting the questionnaires.

20. We had planned some crude methods to estimate the number of envelopes we received each day. The method was to count the postal sacks and multiply that number by an average of the number of envelopes in each sack. The contents of the postal sacks varied considerably, so the method could not be used any longer. In addition it seemed to indicate too few mail-back envelopes.

We began to fear that we would not reach more than 80-85 per cent. We had another indicator, the sample survey for the evaluation study. In the beginning we did not trust this method, but it was more stable and trustworthy than the other. In December 1980 this method indicated that we had reached about 90 per cent. When we place the attention of the reader on this point, it is because the mass media were interested in how many questionnaires were mailed back, especially because this was the first time we tried the method in Norway. We were not fully aware of this when we planned the reception procedure, but soon realized the negative public relations effect that would result if the indicators were to show that we would not reach our goals (people could say to themselves, "Why should I fill in the questionnaire when so many others don't?").

21. We received confirmation of the 95 per cent return rate at the end of January 1981, when all the questionnaires were registered. This was done by taking the upper part of the personal form and putting it into an optical reader which registered the identification number preprinted on it. The questionnaires had to be cut by hand, and we underestimated the time for this job and therefore had to organize two shifts in December and January to keep to the time-table.

VII. CALL FOR QUESTIONNAIRES BY POST AND BY ENUMERATORS

22. The 5 per cent that had not returned their questionnaires until the end of January got a new envelope with new questionnaires and were told to fill it out and return it quickly. After this call by post we reached a per cent of about 97.5. The remaining 2.5 per cent had to be visited by enumerators. This job was organized by the local Population Register Offices and was carried out in May-June 1981. They got lists with the name and address of the persons who had to be visited in each enumerator district, and they had to hire staff to do the job. The enumerator was to only visit the person once, and if he/she was not at home, the enumerator was then to deliver the envelope with questionnaires and a warning, in the mail box. Then the person could fill out and send the questionnaire back. In March 1982 we mailed a letter to about 30,000 people whom we had not heard anything from, and gave them the last warning. In May 1982 we reported 4,500 persons to the police. These persons have of course no influence on the statistics. Our aim was to prevent us from having greater problems in our next census. We now regret that the reports were delivered as long as 1½ year after the census day, for this motivated neither the police nor the public for the job. The high priority we gave to the editing and publication process are the main reasons why we waited so long.

VIII. THE EDITING PROCESS

23. The optical reader read the identification numbers pre-printed on the

form marked "H" and all information marked by crosses in the boxes on the forms. All other information had to be transformed into digital codes by the Division's staff.

24. The following information had to be coded:

- Education abroad
- Industry (enterprise)
- Occupation
- Working place (municipality).

25. Education abroad was classified after a standard classification adjusted to the Norwegian classification of education. This work needed qualified staff, and only two persons took care of this relatively small problem. We encountered some problems in the transformation of the reported education due to lack of information and knowledge of the educational systems of some countries.

26. Enterprise/industry were classified by using administrative and statistical data registers. The main source was the Bureau's Register of Enterprises. The name of the enterprise a person was employed at was written on question 6 on the personal form. By registering this name or a part of it on the data terminal, all enterprises with that name or a similar name were listed on the screen. When the correct enterprise was identified, and its number was registered in the terminal, information on industry, municipality and ownership was automatically transferred to the record from the Register of Enterprises.

27. If we were not able to find the enterprise in the register, we had to classify the type and place of activity by the Norwegian version of ISIC, and a list of the Norwegian municipalities.

28. In addition to this process, we developed a sort of "half-automatic" editing system. We used the information in the registers of employers and employees, a register on persons paying sales taxes, and the register on personal tax payers. These registers gave us the name and address of one of the enterprises where the person had been working during the reference period. In addition they had classified a lot of other information on the enterprise. The information in the registers was organized by person number. When the coder called for the person on the terminal, the name and address of an enterprise came up on the screen. This enterprise was selected from the information in the different registers mentioned. The coder had to compare this information with the information on the personal form, question No. 6. If the information from the two was confirmed as being in harmony, the editing was made automatically on the basis of the registers. If they did not harmonize, the coder had to use the search procedure mentioned earlier. This "half-automatic" process took about 42-45 per cent of the editing of enterprise/industry, and was more successful than we had thought it would be.

29. Occupation was edited in the traditional way by using an updated version of the Nordic Standard Classification of Occupation in ISCO 1958. The standard was available on the terminal. The coder had to punch some letters from the name of the occupation written on the questionnaire. Then occupations with similar names were listed on the screen, the coder selected the correct occupation, and by punching the number of the actual line on the screen, the code would automatically be edited.

30. In connection with the editing some controls were made:

- a) Occupation against education
- b) Occupation against region (some occupation are infrequent in some regions)
- c) Occupation against industry.

31. If the occupation code was not accepted, the coder got a signal on the screen, and had to go through the process again. If he was sure that this code was correct, we accepted it.

32. The question on place of work (Q. 12) had to be edited if during the last week of October 1980 the respondent worked in a municipality other than the one he worked in during the November 1979 to October 1980 (Q. 6). In this case, we had to transform the name written on the line to a code of the municipality.

33. The editing process was the part of the census that consumed the largest amount of money and working hours out of the budget. It seems to have worked out well, but we noticed some problems that occurred that could have caused problems for us.

34. The coders have to process a great mass of questionnaires as fast as possible. Therefore, we had to choose between two possibilities. One was to buy or rent a large computer and data screens for the editing process, appoint a lot of people and organize and train them for a job which would last a short time (depending on how large the staff would be). This involves great costs in training and organizing the staff, maybe also for the machinery, but we would receive better timeliness in the statistics, and we would not need to squeeze the staff for a long time.

35. The other possibility was to have less machinery and less people involved. This would give us much more out of each hour invested in training and organization because we could use the investment much longer. It might also provide us with an economic usage of the machinery. But on the other hand one would have to force the staff for a longer time. The productivity curve would raise very much in the beginning of the project, but after a while the raise would slow down. At a certain moment it might even reach a turning point and go down because the staff may begin to tire of the job. "It is the same job every day, and it is not so much to learn of it any longer". At the end of the process, the curve would go up again, "the finish effect". We chose this second alternative. With about 60 persons working on 2 million questionnaires, we observed the top

of the productivity curve about 12-13 months after we started the editing process. Luckily this was only 2-3 months before "the finish effect" started, and we followed the time-table nearly to the day.

36. In choosing between the two possibilities when there are restrictions on the budget, we think the second alternative is the better one, but one has to pay attention to the estimated form of the productivity curve.

IX. CONTROL ROUTINES AND CORRECTIONS

37. In this section we will make some comments on controls and corrections for the variables taken from the questionnaires.

38. The control routines consisted of single controls and combination controls. Single controls were taken on variables which had no connection with others, and were mainly a control of the type "many crosses when it should be only one". An example of a variable which is subject to single control is the question on religion on the personal form. Only one cross should be possible here. If more than one cross occurred, we had to make rules for deciding how to choose one of them. In the case of this question only the information from that question was taken into account.

39. Through the combination control we tried to observe "unacceptable" combinations of two or more variables. An example of combination control is when more than one cross had been placed on the question on total area of the dwelling in the housing form. This question should have only one response. To choose among the crosses, we made a comparison with the response to the question on number of rooms. The correlation between the total area and the number of rooms was estimated. The data for this estimation was taken from the results registered for these two questions in the housing forms in each group. We assumed that this correction may differ from one group to another because the dwellings may differ from one type of municipality to another (most of the municipalities in each group belong to the same type).

40. We were especially interested in the problem "economically active or non-active", and almost all combination controls were concentrated on this. The programme is, however, too complicated to be presented here.

41. The controls were made by the computer immediately after the variables had entered the record. The corrections were made by the computer immediately after the control.

42. Controls were also carried out in the editing process. For each control, a specified set of correlations corresponded to the "unacceptable" answers/combinations. The coder made corrections immediately after he completed the editing, before he went on to the next form.

43. The use of automatic corrections has never before been used on huge data masses in the Bureau. On the basis of our quality control survey, we can say

that it seems to have worked as expected. Only a few "unacceptable" combinations were observed in the tables, and these were combinations which had been specified in the controls.

44. We found that the correction program was used only a few times. This tells us that there were few "unacceptable" responses on the questionnaires, and that we saved a lot of resources using automatic controls instead of manual ones to find the few cases that required correcting. One might ask it would be more effective to correct these few cases by using manual methods instead of using manual software (and other experts) to construct a correction program. We feel this use of resources is rational. One cannot take such risks using new collection methods, and a moderate amount of resources was used on the correction program.

X. PUBLICATIONS AND DATA DISSEMINATION

45. We planned to publish statistics for each municipality and county in Norway in a single publication for each unit. For the whole country we planned publications on:

1. Families and households statistics
2. Employment/economic activity
3. Comparing tables from the censuses in 1960, 1970 and 1980
4. Statistics on living conditions
5. Thematic maps and graphs
6. Housing statistics.

46. In addition, separate publications were to be published on:

- documentation of the census (principles, definitions, dissemination);
- evaluation survey;
- analyses of special subjects (e.g., on economic activity in different families and households, and commuting/travel to work).

47. A very important part of our dissemination programme was to make the data available for users who need more statistics than we were able to give them in the publications. Unpublished tables will be at their disposal. In addition our technical equipment should make it possible for the Division of Population Census to produce user-specified tables very quickly.

48. The publications for each municipality were published as planned, from May 1981 to August 1982. When each group of municipalities was edited and controlled, we produced publications for the municipalities in the group. In addition to the publications for the 454 municipalities, we produced a similar publication for each county and for the whole country.

49. At the end of 1983, only two of the publications for the whole country were finished, one on employment statistics and one on housing statistics. Four others are under preparation. This is behind the time-table.

50. Some of the problems in the enumeration phase, and some turn-over in the staff, took resources from the planning of publications. But the main reason why we did not follow our time-table is a more positive one. When we started to publish statistics for the municipalities, some of them began to order additional information from the census. That was expected, but the rise in this demand was much stronger than we had anticipated. Our capacity in 1982/83 was not so high that we could meet both this demand and the production of publications. We had to make priorities, and we chose to give highest priority to the demand for additional tables from our users. We felt that we could cover more specific purposes through these special tables than we would be able to through the publications. Also, many of the projects had a time limit and a political weight attached to them, and these were factors which were very difficult not to take into account.

51. The publications will henceforth be much more of an asset in the marketing of the census and a document containing some main figures for historical reference, than a handbook for users of the census statistics. Some of our users may dislike the priority and the new profile of our publications, but we think that most of them will support it.

52. In comparison to the planning, enumeration and editing phases, we encountered greater difficulties in getting the service we need to make special computer programs to produce tables both for the users and for publications. The standard programs handled by the Population Census Division have limited application.

THE INFLUENCE OF PREPARATORY WORKS ON THE COMPLETENESS OF CENSUS (a)

1. General censuses are the biggest statistical surveys providing complex and detailed data on the population and housing conditions in all territorial units of the country. Since the survey is so extensive, the conducting of it is connected with many complicated organizational and methodological problems. Foreseeing and solving those problems require each time a careful study of the up-to-date census practices, both domestic and international and their critical evaluation and adaptation to present conditions. This is one of the basic conclusions resulting from our census experiences.

2. The extent of activities connected with the preparation and conducting of a census and processing of the results makes it necessary to start the preparatory work quite early. The adequate directing and performing of those activities has a great influence on the results of the census. That is why we pay particular attention to them.

3. Since the preparatory activities for the next census are now at the initial stage we would like to present the scope and significance of the preparatory work on the basis of the last census conducted in December 1978.

4. It should be mentioned at the very beginning that in our country activities connected with the preparation and conducting of the census are carried out by local organs of State administration under the supervision of the Central Statistical Office and its territorial organs as far as the organization and methodology are concerned. We consider such an organization justifiable. Our experience during the 1978 census proved that the practices that have been applied for many years are good. They allow us to ensure adequate conditions for the correct and efficient conducting of the census.

5. The first law which started the official preparations for the 1978 census was the law of the Council of Ministers issued in 1976, i.e. two and a half years before the census. It determined the year in which the census was to be

(a) Report prepared by Halina Zaremba, the Census Bureau, CSO, Poland.

conducted, the subject-matter scope limiting enumeration to the data on the population and housing conditions, and it also established the basic principles of census management.

6. The management of the over-all census activities was entrusted to the CSO President who acted as the General Head of the Census. The Head appointed one of the CSO vice-presidents and the director of the Census Bureau as his assistants.

7. The organization of the census field work was closely connected with the two-stage administrative system existing in our country. On the voivodship level (major administrative units) the function of census supervisors (co-ordinating census activities in particular voivodships) was fulfilled by presidents or vice-presidents of voivodships, and on the level of basic units (i.e. in town and gminas-rural administrative units), presidents of towns and heads of gminas. In order to tighten the links between the census activities and the professional assistance provided by the State statistics organs, the directors of regional statistical offices were appointed as vice-heads of the census. The employees of town and gmina administrative offices acted as vice-heads of the census at the level of towns and gminas in the territories where there were no permanent organs of the State statistics.

8. The executive organs of census heads were census bureaux of the voivodship and of basic (town and gmina) levels brought into existence for a determined time. Besides, in towns of a population size of over 20 thousand district census bureaux were created. The aim of such a division was to create smaller and more efficient census units in which it was easier to organize the work.

9. On the central level there is the CSO Census Bureau as a departmental unit specializing in the organization and conducting the various mass surveys. The following people were members of the regional census bureaux:

- in voivodships – the employees of regional State statistics organs, voivodship offices and other units of the socialized economy;
- in basic units (in towns and gminas) – the employees of regional organs of State administration and other units of the socialized economy.

10. Regional census bureaux were established in May 1978 and functioned until the end of February 1979, i.e. 10 months, while census bureaux at the basic level were established in August 1978 and ended their activities in January 1979. The staff composition of census bureaux was determined by regulations and the number of members increased with the increase in census activities. In the culminating period the number of employees in voivodship census bureaux was, depending on the size of the voivodship, from 40 to 90 persons. The number of staff of census bureaux at the basic level depended on the number of census enumeration areas. It was assumed that each member of the staff should be

allocated from five to seven census areas.

11. The duties of census bureaux concentrated, in general, on two basic census tasks:

- ensuring the completeness and good quality of the collected census materials, and
- the efficient conducting of the census.

12. The most important duties connected with the first task were the following:

- checking the names of streets and the numbers of building;
- updating the division of the country into statistical regions and census areas and the records and cartographic documents pertaining to this division;
- preparation of documents for census enumerators (lists of dwellings for a particular census area);
- recruitment of census enumerators;
- training of the staff;
- supervising the activities of census enumerators during the pre-enumeration round and during enumeration, and taking the census material from enumerators and transferring them to higher census organs;
- advertisement of census activities.

13. The main activities connected with setting in order the names of streets and numbers of buildings were performed in 1977 by the regional organs of State administration and regional organs of statistics. The task of census bureaux was to keep all the documents up-to-date until the census. Youth associations, especially scouts, were a great help in this respect. They prepared reports on the gaps in the numbers of buildings and the names of streets, and submitted them to regional organs of administration.

14. When all the gaps were bridged, lists of buildings in particular streets (in towns) and in villages were prepared and utilized in the next stage of preparatory activities, i.e. during the updating of the territorial division of the country into statistical regions and census areas. Statistical regions constitute multiples of census areas and are treated as basic of records and statistical documentation. Census areas are treated as technical units for conducting censuses and other mass surveys, and are important not only for the organization of the census but also for the preparation of the results. It should be emphasized that the double network of permanent and uniform territorial units was established before the 1970 census. The reform of administrative divisions conducted in 1975 which introduced the two-stage division of State administration (an intermediate level – poviats – was liquidated), and the development of

housing construction in some areas, especially in municipal areas, caused the existing division to become outdated. That is why there was a need for the detailed review of the existing units and for adjusting their boundaries with the boundaries of administrative town planning and geodetic units. The boundaries of regions and census areas are closely connected with the boundaries of particular rural areas. There is a principle that a census area comprises the whole locality or part of a big locality but on no account can a census area or a region comprise parts of different localities. The assumptions, which were adopted during the creation and updating of the network of permanent statistical units helped to obtain and retrieve data from mass surveys in cross-sections of various organizational units and to convert them into a variety of optional files.

15. The changes in the network of statistical units were followed by the verification of records and cartographic documentation which consist of:

- lists of statistical regions and census areas, containing numbers and addresses of those units and basic information on their sizes (the number of residential buildings, dwellings, the population). Statistical regions are given serial numbers within the whole country. The applied decimal system makes it possible to divide an old region into new regions without violating the system for the whole country (census areas are numbered within a region);
- maps for particular towns and gminas with the marked boundaries of statistical regions and census areas against the background of the boundaries of units of other divisions adopted as a basis for creation of a statistical network. Also the numbers of those units occurring in the above-mentioned list were placed on the maps;
- location plans for particular regions and census areas showing in detail the position of each building within those units.

16. In principle a census region consists of five census areas and an average census area comprises about 230 persons, but in towns the average size of a census area is a little bigger than in rural areas. From our point of view the creation of small census areas is necessary for avoiding long census procedures. The period should be as short as possible, taking into account the high mobility of the population and the need to obtain good census results as far as completeness is concerned.

17. At the next stage of the preparatory work census bureaux of basic level, on the basis of lists of buildings, documents of statistical network and current records of the population, prepared lists of dwellings for each census area. All dwellings (occupied and unoccupied) situated in the census area were listed here and for each of them a detailed address, number of inhabitants and the status of family members (whether one of them a user of private agricultural holding, and if so the area of the holding) were enumerated. This document

together with the location plan of the census area was essential for ensuring the completeness of the census. It was a landmark for a census enumerator during his activities. It constituted a basis for selecting dwellings for the sample survey which accompanied the census.

18. Legal regulations determined the principles of recruitment of census enumerators. They were mainly young people and employees of the socialized economy. The number of census enumerators was proportional to the number of census areas. We assumed that reserves should amount to 20 per cent. Young people from secondary schools and universities constituted 50 per cent of the enumerators and other enumerators were recruited from the units of the socialized economy and other circles. Census enumerators were employed for 16 working days of which 4 were devoted to training, 1-3 days for the pre-enumeration round, 7 days for enumeration and 1-2 days for the preparation of collective reports (preliminary results).

19. In the training programme for enumerators special attention was paid to practical activities – conducting tests and providing illustrations of how to fill in the census questionnaires. At the end of each training session, after discussion on particular topics and explanation of all doubts, there was a test of the acquired knowledge which consisted in giving answers to a set of test questions. The final test consisted in filling in census questionnaires on the basis of illustrative data. The examples were prepared in a few variants taking into account *inter alia* specific characteristics of municipal and rural areas. The lecturer was supposed to choose examples which referred to the future work area of the enumerator. Generally speaking, we pay special attention to the training of enumerators because the value of the conducted census depends on the quality of their work. The significance of the work of census staff is connected on the one hand with the increasing scope and detailed nature of the collected data and on the other with the need to obtain fully correct information which makes possible much more detailed elaboration of the results (mainly in reference to the lower level of regional divisions).

20. The pre-enumeration round conducted by the enumerators three or four days before the census was a very important preparatory activity. The employees of census bureaux of basic levels who performed the function of so-called “guardians” of groups of enumerators directly supervised the pre-enumeration round and census activities. Each guardian supervised the work of five to seven enumerators and each enumerator was supposed to enumerate one census area. Such a solution resulted from the fact that young people constituted a large part of the census staff.

21. Before the pre-enumeration round an enumerator was given a list of dwellings and a location plan of the census area. He visited all buildings and dwellings situated in them according to those documents. In this way full control of completeness of records on the above-mentioned lists was done and actual division into occupied and unoccupied dwellings was checked. It should

be added that those lists were prepared a month before the census so not all information in them could be fully up to date. The enumerator reported all discrepancies between the received documents and the actual state of affairs discovered during the pre-enumeration round to his guardian, and they together made a decision about further procedures.

22. The enumerator was given the following additional tasks during the pre-enumeration round:

- he was supposed to fix with his respondents the day and approximate hour of his arrival for conducting the census;
- he had to distribute a proclamation informing respondents about the aims and purposes of the census and an auxiliary questionnaire on which the respondents were supposed to prepare data on the floor space of the dwelling and the place of employment of the members of a household.

23. During the census the enumerator was obliged to be in touch with his guardian every day at a certain hour in order to discuss current doubts and to obtain any required explanations. On this occasion the guardian checked the quality of the census material collected during that day and corrected errors made by the enumerator.

24. When the census ended the enumerator transferred the materials to the guardian who in the presence of the enumerator checked them thoroughly.

25. The checking comprised the following aspects:

- completeness of material – if the census was conducted in all dwellings written down on the updated lists;
- completeness and correctness of records on each questionnaire – if all questions were answered, if the answers were complete and consistent with the census instructions;
- logical relations between particular records within a questionnaire;
- correctness of the preparation of collective reports for the census area comprising preliminary results.

26. When the census enumerator found an error he was obliged to revisit the persons to whom the data pertained and collect information once again. Errors of a formal and routine nature were corrected on the spot.

27. The above described organization of the preparatory activities and the census itself was checked in the pilot census conducted a year before the general census.

28. For the correct and efficient conducting of the census it was indispensable to advertise the census throughout the whole society. Mass media are the most common and effective form of dissemination of information. Thanks to them the whole advertising programme may be conducted properly and may

produce desirable results, making it possible to collect complete census data of high quality.

29. Among the various forms of census advertising used by us the most effective were the following:

- daily newspapers and magazines which publish information on the census in the form of notes, announcements, interviews with the organizers of the census, articles explaining the significance of the census and the aims for which the data on particular topics are collected;
- radio and tv broadcasts in which an appeal is made to the society for the kind and active participation in the census activities, and in which the scope of data collected during the census and the way of conducting the census are presented;
- short films on the census shown in cinemas;
- proclamations to the population, handed out to all respondents during the pre-enumeration round conducted by enumerators three or four days before the census;
- special posters, folders and announcements concerning the census exhibited in public places.

30. Since a lot of young people participated in the census, special materials on the census were prepared for schools which helped teachers to deliver lessons on that topic.

31. Widespread advertising of the census created the proper atmosphere for conducting the census activities. People were well-disposed to the census, welcomed enumerators and were eager to give answers to the questions. Many persons who had left their place of usual residence for the period when the census was conducted came to census bureaux in order to provide the required information.

32. Despite the fact that usually all possible measures are taken in each statistical survey, for various reasons there are omissions of some units. The probability of omissions is larger in the case of bigger groups of the surveyed population. In a general census which is a statistical survey of the greatest scope the probability of omission is considerable.

33. In order to evaluate the level of completeness of the 1978 census test a post-enumeration survey was conducted in the whole country in 160 census areas selected at random which constituted 0.001 of all census areas. By comparing the data collected during the post-enumeration survey with the corresponding data from the complete census and with records of the population, it turned out that in the complete census 0.3 per cent of the inhabitants in the checked census areas were omitted. Two-thirds of the gaps occurred in Warsaw and in some other big cities. The gap concerned mainly sub-tenants

who did not possess their own dwellings. It should be mentioned that in our censuses we determine the number of permanent inhabitants by *de facto* place of usual residence.

34. The fact that the largest number of omissions occurred in big cities – despite the fact that people were aware of the obligation to be enumerated in their place of usual residence even when their stay was not legally regulated – forces the enumerators to consider this problem once again. In reference to the above-mentioned group of people it will be necessary to apply additional measures in order to eliminate the omissions.

35. For other towns and rural areas the census completeness was in our opinion very good and there were very few omissions. In the checked rural areas only 0.05 per cent of the population was not enumerated. We can state then that our system of preparatory activities produced good results. Detailed census documentation, especially up-dated lists of dwellings, were of the greatest importance during the pre-enumeration round. This part of the preparatory activities proved to be a good solution, worth applying in future.

36. It should be mentioned that during the conducting of the last general census we collected several comments which will help us to improve the organizational scheme and the programme of the future general census planned for 1988. For this purpose we prepared a questionnaire containing a broad set of questions concerning the evaluation of particular stages of work connected with the preparation and conducting of the 1978 census. Regional census authorities, on the basis of the above-mentioned questionnaire, made comments on which of the adopted assumptions proved to be useful in practice and should be continued in future censuses and on which ones require modifications. At present the comments are carefully being analysed in order to make use of the suggestions in the future census.

AUTOMATED CODING OF OCCUPATION AND SOCIO-ECONOMIC CLASSIFICATION IN THE 1980 CENSUS OF POPULATION (a)

I. INTRODUCTION

1. In the 1980 Census of Population the coding of occupation and socio-economic classification (SEI) is automated. In short, this automated coding means that personal identifications and the occupation descriptions are punched and matched against a computer-stored dictionary. The dictionary contains a number of occupation descriptions with associated occupation and SEI code numbers.

2. The occupation code used in the census is built upon the "Standard Classification of Occupations" (NYK) which in turn is built upon the "International Standard Classification of Occupations" (ISCO). The code is hierarchically built with three different levels (three-digit code numbers) and contains roughly 280 different three-digit categories. The code for SEI is a two-digit code with 14 different categories.

3. The coding system is "tailor-made" for the census but of course we have used the experiences gained at Statistics Sweden during the last decade.

4. In this paper we shall concentrate mainly upon the coding of occupation, since the system was originally constructed for this coding. The coding of SEI was added later on and the system is not "perfect" for coding that variable.

II. THE CODING SYSTEM - AN OVERVIEW

5. First, the occupation descriptions and the personal identifications on the census questionnaires are keypunched. The punched information from a questionnaire is called a questionnaire record. A questionnaire record may contain one or two individual records. After the keypunching the questionnaire records

(a) Report prepared by Mr Curt Nilsson - Statistics Sweden.

are split into individual records and at the same time punched occupation descriptions are edited.

6. In the editing process special signs (points, lines, etc.) and prefixes (1st, vice, etc.) are removed and the remaining parts of the occupation description are brought into one sequence.

7. The punched file is matched against a file containing the economically active population in the census. In this matching we get some unlinked punched

records, for example due to the fact that occupation is punched for an individual who is not economically active. These unlinked punched records are not used henceforth. Punched occupation description will be missing for some economically active individuals. This may be due to the fact that some occupation description on the questionnaire is missing. Sometimes the descriptions may be present on the questionnaire but they have been omitted in the keypunching process.

8. All economically active individuals must of course be coded, at least into some of the "trash" categories designed for situations where the occupation is unknown. In connexion with the matching, code numbers for type of activity, industry, institutional classification and so on are obtained from the file of the economically active.

9. As a result of the matching we get a file which contains among other things:

- personal identification;
- punched and edited occupation description (with the exception mentioned above);
- industry code number;
- size of establishment.

10. This file is sorted according to edited occupation description and industry code numbers and matched against the computer-stored dictionary. If an edited occupation description is found in the dictionary, then occupation and SEI are coded.

11. The dictionary contains the usual two chapters. PLEX (the primary dictionary) and SLEX (the secondary dictionary) and it is described in § 14-15.

12. The manual coding is carried out on display consoles in two steps. The first manual coding (see § 27-29), is carried out without access to the questionnaires. The records which cannot be coded are left "empty" and are coded later on in the second manual coding (see § 30-32). In the second step the questionnaires are used. Then, the automatically coded records and the records coded in the first and second steps are merged into one file.

13. At last some SEI-code numbers are automatically corrected. This correction is made by means of a specific question on the questionnaire, where the variable associated with that question has been coded in an earlier step. This

question gives information whether you are an employer or an employee, which is an important aspect of the SEI-code.

III. THE DICTIONARY

14. The manual construction of dictionaries can be characterized as trial and error. At Statistics Sweden we have worked with two lists: list No. 1 is the expert coded file sorted with respect to code number and list No. 2 is the same file sorted alphabetically. These lists form the basis for the construction. List No. 1 is used to get some hints about the structure of the verbal descriptions sorted under a specific code number. We choose a frequency limit for coding of "high frequency" descriptions. All descriptions occurring 4 or more times are stored in the preliminary version of the primary dictionary which is scanned first in automated coding. We call this dictionary PLEX.

15. In order to get a coding degree of some magnitude we must include some variants of the high frequency descriptions stored. A possible solution is to recognize discriminating word strings. In the ideal situation one such string represents many variants of a certain description. Thus after storing the high frequency descriptions we start looking for discriminating word strings. These strings (or parts of words) are stored in a secondary dictionary. This secondary dictionary, called SLEX, is scanned if PLEX fails to code.

16. There must be an exact agreement between an input occupation description including any auxiliary information and a PLEX dictionary description to be considered a "match". PLEX is using industry, institutional classification and size of establishment as auxiliary information.

17. Since the coding operation was made in two steps, we have a most favorable situation for automated coding. First, type of activity, industry and some other variables were manually coded. Then the automated coding of occupation and SEI was carried out. This results in certain time-saving when it comes to publishing the variables coded in the first step. Besides, it makes it possible to use the auxiliary information in the automated coding process. We believe that the good result of the automated coding in the 1980 Census is, to a large extent, due to the fact that we could use auxiliary information.

18. SLEX contains word strings of the type "ADJUNK" (part of the word ADJUNKT which means something like "assistant master at secondary school"). The purpose is that one word string shall fit many variants of an occupation description.

19. Of course, it happens easily that a certain word string in SLEX fits the "wrong" occupation description. It is difficult to avoid such mistakes when building SLEX. One way to reduce the coding errors due to SLEX is to use auxiliary information, for example industry code numbers.

20. Our experience is that a SLEX for occupation descriptions without

auxiliary information produces too many coding errors. On the other hand, we believe that it is possible to build a powerful SLEX if one can use word strings of different length and other auxiliary information besides industry.

21. Sweden is divided into 24 counties and the coding is carried out one county at a time. When a "county" has been matched two lists are made.

22. The first list is an excerpt from "the frequency list". It contains the occupation descriptions which the dictionary has failed to code and which occur at least twice in the input file. When the coding of a county is terminated the frequency list is scanned and new occupation descriptions are entered into PLEX. Furthermore, the control lists mentioned in Section VU give supplementary information for corrections in PLEX. PLEX has grown from about 4,000 records to more than 12,000 during the production.

23. The other list, the "SLEX-list", shows the occupation descriptions which have been coded by SLEX. In the SLEX-list, coarse coding errors are easily discovered. SLEX has not grown as much as PLEX, because we have not had enough time to find and try new word strings. It contains slightly more than 500 word strings. As pointed out before, we believe that it would be possible to create a much more powerful SLEX, provided we would use auxiliary information.

24. The coding degree for the entire production was 71.5%, roughly 68% by PLEX and 3% by SLEX. The coding degree varied between the counties from 67.2% to 76.6%. Our goal was 70% so everything went a little better than planned.

25. The cost for running the matching program is negligible. Look at the following example. The descriptions for one county with 341,529 economically active individuals were matched against a PLEX containing 10,291 records and a SLEX containing 513 word strings. The result was:

	Number of coded records	Coding degree %
PLEX	246,652	72.2
SLEX	8,339	2.4
Total	254,991	74.7

The cost for this matching was 303 Swedish crowns (about 40 US-dollar).

26. Finally it should be mentioned that, according to our census experiences, the keypunching personnel shall be instructed to punch exactly what is written on the questionnaires (up to a pre-specified number of characters, in this case 30). We believe this gives the best combination of punching rate and quality.

IV. FIRST MANUAL CODING

27. After the matching against the dictionary almost 30% of the economically active population remains uncoded. The first manual coding is carried out on display consoles without access to the questionnaires. Twenty records are shown at the same time on the display consoles. The console shows the occupation description, the code numbers for industry, institutional classification, size of establishment and type of activity.

28. The coding is carried out by means of an alphabetical occupation list containing more than 12,000 official occupation names with associated occupation and SEI code numbers. The principle rule is that the coder must find "exactly" the same occupation in the occupation list as the one on the display console. When the correct occupation is found in the list, the associate code numbers are keyed on the display. Occupation descriptions which cannot be coded are left empty and these records are coded in the second coding.

29. We had forecasted that 20% of the records should be coded in the first manual coding. The outcome was 17.1%. The rate of coding in the first manual coding was 217 records per hour (including those that were left empty).

V. SECOND MANUAL CODING

30. In the second manual coding the remaining records are coded. The coding is carried out on display consoles with access to the questionnaires. We forecasted that about 10% of the records would remain at this last stage. The outcome was 11.4%.

31. The second manual coding is very time-consuming. In fact, this step is very similar to conventional coding of the roughly 10% most difficult descriptions. The rate of coding in the second manual coding was 27 records per hour.

32. As could be seen this coding in two steps makes things a lot easier. The coding rate in the first step can be kept on a very high level since coding is carried out without access to questionnaires.

VI. EVALUATION OF THE AUTOMATED CODING PROCEDURES

33. The resulting coding degree of occupation and SEI in the 1980 Census of Population was 71.5%. Calculations made prior to the decision to use automated coding showed that a coding degree of 60% would be profitable.

34. It should also be pointed out that the high coding rate (217 records per hour) in the first manual coding is to a large extent due to the fact that the occupation descriptions are entered into the computer which means that the

coding can be carried out without access to the questionnaires. This saves a lot of time.

35. Of course, we do not know the exact cost of an imagined system of conventional manual coding of occupation and SEI in this census, but we are convinced that the automated coding saved at least one million Swedish crowns (approximately 266,000 US dollars), i.e. 10% of the total coding cost for occupation and SEI.

36. Money, however, was not the only reason for using automated coding. It would have been impossible to get enough coding personnel at Statistics Sweden to do the coding in time. Furthermore, conventional coding would have been too boring. Automated coding reduced the number of records to be coded from about 4,000,000 to 1,200,000 and made it possible to use two coding systems, first and second manual coding.

37. We also believe that there is great value in having the occupation descriptions entered into the computer. An occupation description contains more information than a code number. This "extra" information might be useful to, for instance, medical researchers in the future.

38. In this census the evaluation study has not yet been finished. Coding of occupation is difficult, though. Many earlier evaluation studies show high error frequencies. In the 1975 Census of Population, for instance, the error rate coding occupation was estimated to a little less than 8%.

39. We have checked the SLEX-lists throughout the entire production process. We have also, as soon as the coding of one county was terminated, scanned the control lists, i.e. we have listed a sample of records and checked the code numbers in each county. This procedure has led to improvements of the dictionary and the coding instructions. These lists have also given us a coarse estimate of the error rate. We believe that the error rate will be lower this time compared with that obtained in the 1975 Census.

VII. THE FUTURE OF AUTOMATED CODING

40. Obviously automated coding might be a possible option when designing a coding operation. Its success is a function of language complexity, though. It seems that the Swedish language is more forgiving than English in this respect.

41. Automated coding is here to stay. Our labor market legislation makes it difficult to hire coding personnel for occasional efforts such as the coding in a census. We have to rely on our permanent staff and automated coding has emerged as the rescue when it comes to cutting work load peaks. So far, our strategy has been to put the easier variables to a test first. Now we have to proceed to the more difficult ones and make the dictionaries and the supporting routines more efficient.

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DIAGRAMS AND THEMATIC MAPPING IN THE SWEDISH POPULATION AND HOUSING CENSUS OF 1980 (a)

1. INTRODUCTION

Early in 1980 it was decided that computer-drawn graphics should be used as part of the presentation of the findings in the 1980 Census. The graphics should include both diagrams and maps. The large-scale thematic maps were to be based upon the fact that the Swedish population registers contain information about which real estate a person is living on and the fact that the cartographic work had been going on since 1978 as a trial. A geocartographical group already existed and involved cartographers, statisticians and computer specialists from government agencies. To handle the diagram production a new group was formed with partly the same people but only involving staff from the SCB. In 1980 SCB already had bought the American graphical program package DISSPLA and was planning to buy the Swedish-Danish package UNIRAS. A new drumplotter, BENSON 1222, was ordered to be delivered in the last part of 1980.

The main purposes of the graphical presentation were two. First of all, many users of census statistics wanted this kind of statistical presentation for their own analysis and were prepared to pay for it. Secondly, it would speed up the development of computer drawing in Statistics Sweden (SCB).

2. COMPUTER-DRAWN DIAGRAMS IN THE CENSUS

2.1 *The topics of the diagrams*

The topics of the diagrams should cover most of the census data and most of

(a) Report prepared by Mr Erik Liljegren - Statistics Sweden.

the regional levels. There ought to be both black and white diagrams based on vector-technique as well as raster-based diagrams in several colours. A catalogue containing twenty-six different diagrams was worked out and was then sent to the users of census data.

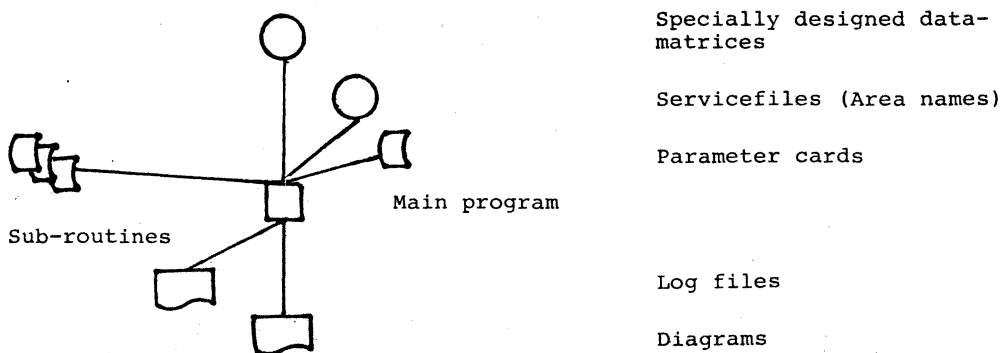
A classification of the diagrams by census topics shows that 10 diagrams dealt with the economically active population and with commuting, 5 with dwellings, 4 with household structure, 3 with the age-structure of the whole population and 3 were a mixture of topics. Most diagrams (19) described the situation in September 1980. Different parts of a municipality were compared with the same structure for the whole municipality in diagrams. In another 3 diagrams a structure in a municipality was compared with the corresponding structure for the whole country. Only one diagram showed results from two censuses, 1975 and 1980. Half the diagrams were drawn in raster-technique in colour.

Within a couple of months more than 10,000 pages of diagrams were ordered.

2.2 The main outline of a production system

In Sweden as well as in many other countries diagrams and maps had been drawn by computers with connected plotters for several years. All previous systems, however, were made for a relatively limited production of pictures. The group responsible for the graphics tried to find a production process suitable for a mass-production of pictures and at the same time find a balance between a system, just built to produce the pre-defined pictures, and total generality. The two available graphical programs systems are very similar both in sub-routines and contents, for instance they have the same alphabets and many algorithms

Fig 1. Outline of the production system



are the same. It ought to be possible to use the same application program for both raster and vector technique.

After some testing it was clear that it is cheaper and easier to make all the data preparations before entering the drawing programs. All input data must be presented in the form of a binary data matrix. One data-matrix represents one page of diagrams. This kind of data-matrices was also used in all tabulation programmes in the census. The next decision was to write an application program which used a number of subroutines to create a page of diagrams. Some elements on a page are always the same. We identified 10 elements such as lines, texts, legends, logotypes such as the census symbol, and of course one or more diagrams. Each of these elements was described as a parameter card. The parameter cards were used as input to the main program which handled all subroutines. Almost the same cards could be used both for vector- and raster-technique. To make it easier, two separate main programs were written: one for raster-technique and one for vector-technique and the differences are very small.

2.3 *The parameter cards*

The parameter cards are used to design the page of the diagrams. Most cards contain X/Y coordinates to position the elements on the page. The coordinate origo is always the lower left corner on the page.

<i>Card-name</i>	<i>Function</i>
START	gives the name of a drawing device and the size of the drawing area.
LINJE (LINE)	draws a line between two pairs of coordinates, the width of line and colour.
TEXT	contains the alphabet, style, height, colour and starting point together with a text string. The text can also be taken from a service file.
NUM	contains the same information as the TEXT-card but instead of a text string it collects a figure from the data-file.
SKR (Shading pattern)	in vector-technique it contains shading patterns and in raster-technique a colour-coded shading pattern.
LEG	draws the legend at a point chosen in the card and with chosen size.

ORIGO	this card is used when more than one diagram is to be drawn on the same page and contains the lower left corner for the figure.
FIGGS	gives the place and size of the logotype.
BRYT (Break)	contains information about the length of the identity field in the data-matrix.
FIGUR	gives the name of the drawing program, for instance a bar-program. It also consists of a number of parameters such as height of labels.

Two examples are given in Annex I and II. Annex I contains a diagram drawn with the vector technique and the parameter cards which were used to produce it. Annex II contains a diagram drawn with the raster-technique and the parameter cards which were used to produce it. Unfortunately, this diagram had to be printed in black and white because of the higher cost of colour-printing. Annex III contains ten other illustrations of drawings which were produced.

3. COMPUTER-ASSISTED THEMATIC MAPPING IN THE CENSUS

3.1 *Organisation*

As was mentioned earlier, a working group from three different government agencies already existed and had been working on a trial basis for some years. It was quite natural that this group was given the responsibility for the thematic mapping in the Census. This group consisted of two cartographers, one statistician, one geographer and one computer specialist. The group represented the three agencies which must cooperate in order to make thematic maps in Sweden.

3.2 *The basic ground for thematic mapping in Sweden*

In Sweden there is a long tradition of keeping administrative files; the population registration is more than 259 years old. The SCB has a copy of the whole population register for statistical purposes. Each individual has a personal identification number in the register which also contains the identification of the real estate where he lives. Thus it is possible to link the population register with a register of real estates. The real estate registration is

also very old in Sweden and goes back to the 16th century. Today's register is slowly being converted to an EDP based register. At the time of the 1980 census about 60% of the country was covered by a sub-register of the real estate register. The sub-register contains coordinates for the central point of each property. By linking the population register with the coordinate register it was possible to obtain coordinate-based census data.

The central Board for Real Estate Data (CFD) was responsible for the coordinate register, the SCB for the census statistics and the National Land Survey provided base maps and was also responsible for the reproduction process of the maps. All three agencies took an active part in the thematic mapping of the census and worked together in the geocartographical group.

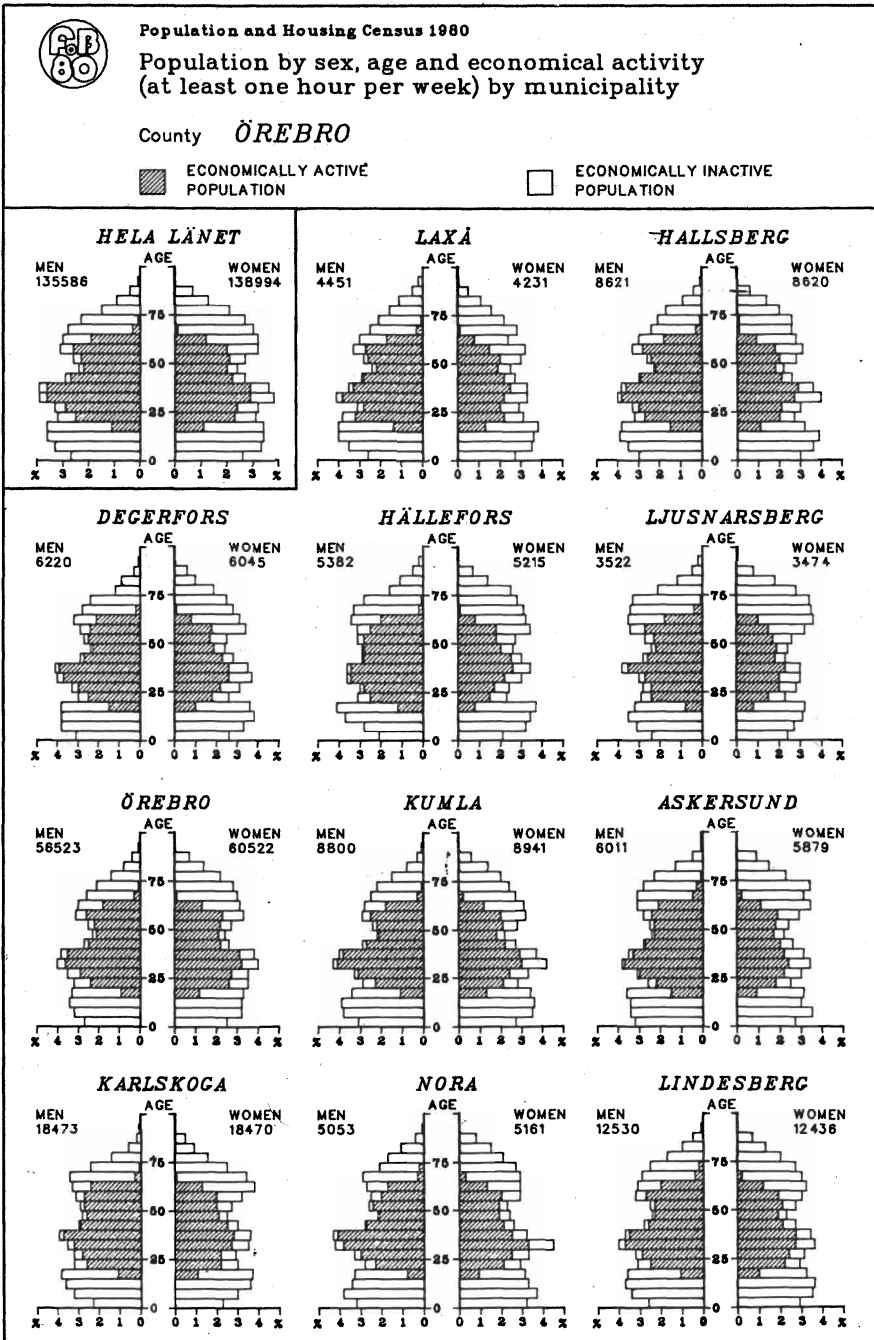
Cartographic methods

The group was responsible for an offer of 30 different thematic maps for regional and local planning. there were three kinds of maps in the offer; square grid net maps, dot maps and isarithmic maps. The maps could be ordered on two scales, one for fitting the A4-format, usual for reports, and one for the ordinary large scale base map. The most common scales are 1:250,000 and 1:50,000, respectively. The maps in the smaller scale are mostly dot maps. The dot-value varies depending on the geographical distribution of theme and with consideration to confidentiality. The maps on the large scale are mostly square grid net maps. Each square shows one to three values in each square, for instance three age-groups. The size of the square is often one by one kilometer.

Technique

The content of the maps is produced with a line plotter. A high quality drawing, placed on transparent film, is necessary for the reproduction process. The film is sent to the regional office of the National Land Survey where it is copied together with a base map. The base maps usually consist of several overlays from the general maps of Sweden. The copy is taken with a 40% dot raster in order to make it less black and to give the topography a real impression of background.

Annex I: Illustration of a diagram drawn with vector-technique



Parameter cards used to produce the population by sex, age and economic activity drawing with the vector-technique.

```

*****
START BENSON, V
TEXT R,C,2.0,,1,190.0,3.0'*'
TEXT R,C,2.0,,1,48.5,281.0,*P+OPULATION AND /H+OUSING /C+ENSUS /1980'
TEXT R,S,2.5,,1,48.5,259.0,'C+OUNTY'
TEXT I,C,3.5,,1,68.5,259.0,'&016,22'
TEXT R,C,3.0,,1,48.5,274.0,'P+OPULATION BY SEX, AGE AND ECONOMICAL ACTI*
TEXT VITY'
TEXT R,C,3.0,,1,48.5,269.0,'+(AT LEAST ONE HOUR PER WEEK) BY MUNICIPALI*
TEXT TY'
LINJE 20.0,245.0,200.0,245.0,2,1
FIGGS PG550,0,'0275,2700,0140,0140,1'
LINJ1 20.0,187.0,80.5,187.0,2,1
LINJ1 80.5,187.0,80.5,245.0,2,1
ORIGO 027,193,085,193,142,193,027,135,085,135,142,135,027,076,085,076
ORIGO 142,076,027,018,085,018,142,018
SKR 045120,000000
LEG 48.5,248.0,5.0,5.0,1
LEG 128.0,248.0,5.0,5.0,1
TEXT R,S,2.0,,1,58.5,252.0,'ECONOMICALLY ACTIVE'
TEXT R,S,2.9,,1,58.5,248.0,'POPULATION'
TEXT R,S,2.0,,1,138.0,252.0,'ECONOMICALLY INACTIVE'
TEXT R,S,2.0,,1,138.0,248.0,'POPULATION'
FIGUR PG604,33,'0000,0000,0500,0400,0022'
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TEXT R,S,1.8,,1,0.0,39.0,'MEN'
TEXT R,S,1.8,,1,40.0,39.0,'WOMEN'
TEXT R,S,1.8,,1,22.5,41.0,'AGE'
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NUM R,S,1.8,,1,40.0,36.0,29
BRYT 1,2
*****

```

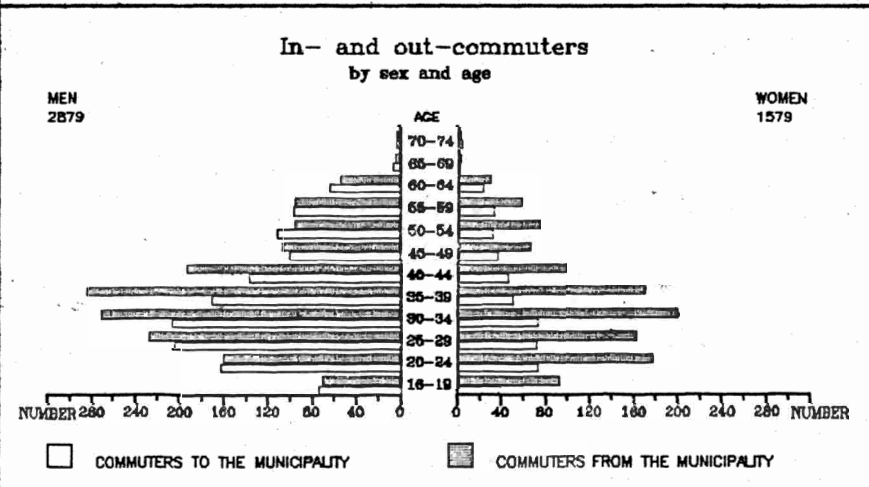
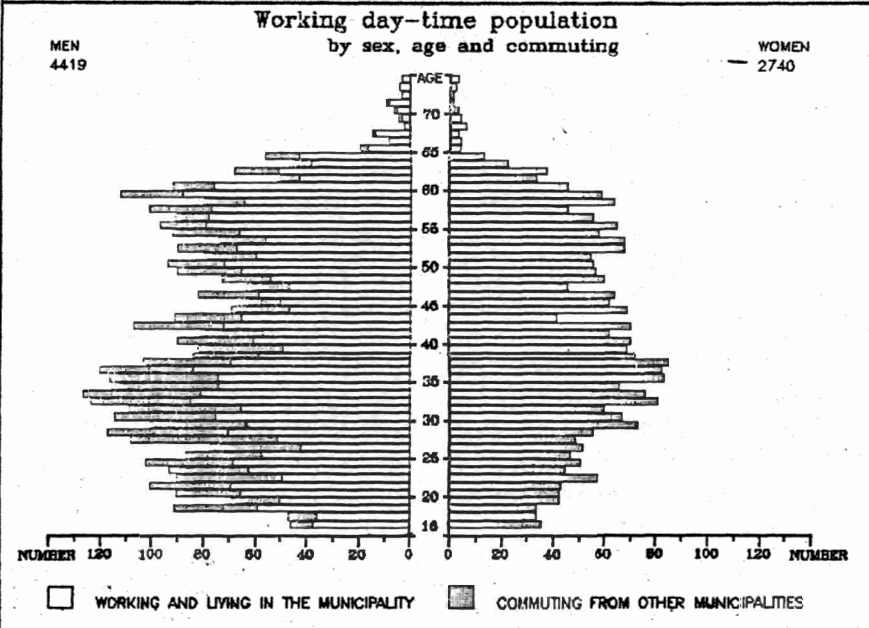

Annex II: Illustration of a diagram drawn with the raster-technique page 1



Population and Housing Census 1980

Working day-time population by sex, age and commuting

Municipality **HALLSBERG**



Parameter cards used to produce the working day-time population by sex, age and commuting drawing with the raster-technique.

START TRILOGG,V
 TEXT R,C,2.0,,1,190.0,3.0,'*'
 TEXT R,C,2.5,,1,48.5,275.0,'P+OPULATION AND /H+OUSING /C+ENSUS /1980'
 TEXT R,C,3.3,,1,48.5,260.0,'W+ORKING DAY-TIME POPULATION BY SEX, AGE'
 TEXT R,C,3.3,,1,48.5,253.0,'+AND COMMUTING'
 TEXT R,S,2.5,,1,48.5,245.0,'M+UMINIPALITY'
 TEXT R,C,3.5,,1,83.5,245.0,'&016,22'
 TEXT R,C,1.8,,1,104.0,31.0,'16-19'
 TEXT R,C,1.8,,1,104.0,35.5,'20-24'
 TEXT R,C,1.8,,1,104.0,40.0,'25-29'
 TEXT R,C,1.8,,1,104.0,44.5,'30-34'
 TEXT R,C,1.8,,1,104.0,49.0,'35-39'
 TEXT R,C,1.8,,1,104.0,53.5,'40-44'
 TEXT R,C,1.8,,1,104.0,58.0,'45-49'
 TEXT R,C,1.8,,1,104.0,62.6,'50-54'
 TEXT R,C,1.8,,1,104.0,67.2,'55-59'
 TEXT R,C,1.8,,1,104.0,71.8,'60-64'
 TEXT R,C,1.8,,1,104.0,76.4,'65-69'
 TEXT R,C,1.8,,1,104.0,81.0,'70-74'
 LINJE 20.0,240.0,200.0,240.0,1,1
 LINJE 20.0,110.0,200.0,110.0,1,1
 FIGGS PG551,0,'0270,2630,0150,0150,1'
 FIGUR PG615,33,'0300,1300,1560,0950,0018'
 SKR 000000,000003
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 LEG 112.0,115.0,5.0,5.0
 TEXT R,S,2.0,,1,40.0,115.0,'WORKING AND LIVING IN THE MUNICIPALITY'
 TEXT R,S,2.0,,1,122.0,115.0,'COMMUTING FROM OTHER MUNICIPALITIES'
 TEXT R,C,3.0,,1,72.0,235.0,'W+ORKING DAY-TIME POPULATION'
 TEXT R,C,2.5,,1,87.0,230.0,'+BY SEX, AGE AND COMMUTING'
 TEXT R,S,2.0,,1,30.0,230.0,'MEN'
 TEXT R,S,2.0,,1,175.0,230.0,'WOMEN'
 TEXT R,S,1.8,,1,105.5,223.5,'AGE'
 TEXT R,S,1.8,,1,106.5,131.0,'16'
 TEXT R,S,1.8,,1,24.0,125.0,'NUMBER'
 TEXT R,S,1.8,,1,182.0,125.0,'NUMBER'
 NUM R,S,2.0,,1,30.0,226.0,25
 NUM R,S,2.0,,1,175.0,226.0,29
 FIGUR PG617,993,'0300,0300,1560,0550,0018'

SKR 000000,000003

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LEG 112.0,15.0,5.0,5.0

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TEXT R,S,2.0,,1,122.0,15.0,'COMMUTERS FROM THE MUNICIPALITY'

TEXT R,C,3.0,,1,78.0,100.0,'I+N- AND OUT-COMMUTERS'

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TEXT R,C,1.8,,1,24.0,25.0,'NUMBER'

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BRYT 5,4

Annex III. Other illustrations of drawings and maps

Diagrams 1 to 6 were drawn with vector-technique in black and white.

Diagrams 7-9 were drawn by the raster-technique, and they are presented here in black and white. In the real production they were presented in several colours. Diagram 10 is an example of a square grid net map to the scale 1:50,000.



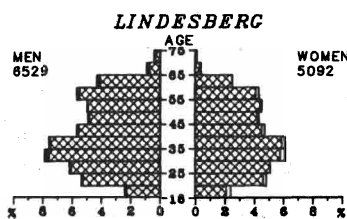
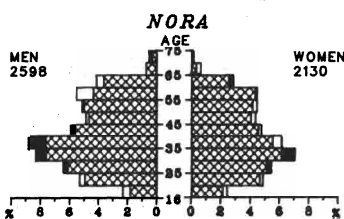
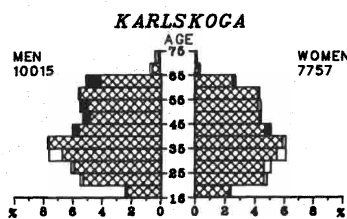
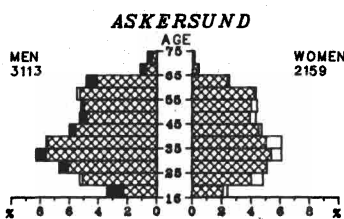
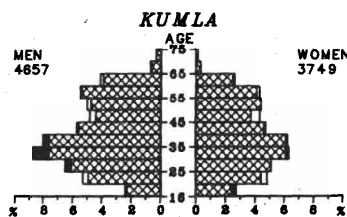
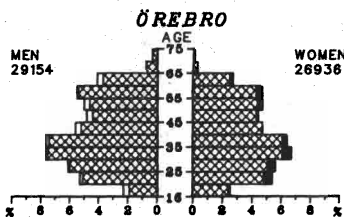
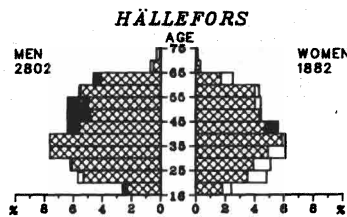
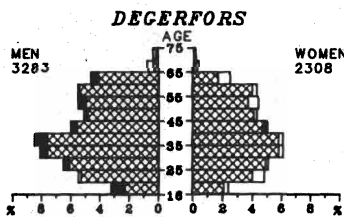
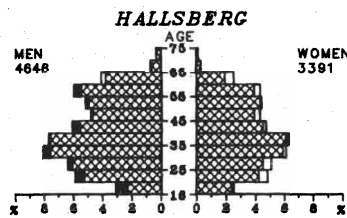
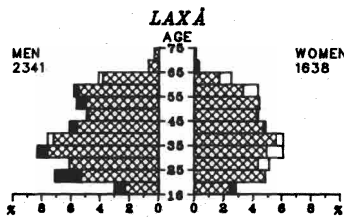
Population and Housing Census 1980

DRAWING 1

**Economical active population by sex and age
in the municipalities compared with the same
distribution for the whole county**

County **ÖREBRO**

EXCESS FOR THE MUNICIPALITY COMPARED WITH THE COUNTY
 DEFICIT FOR THE MUNICIPALITY COMPARED WITH THE COUNTY
 THE SAME



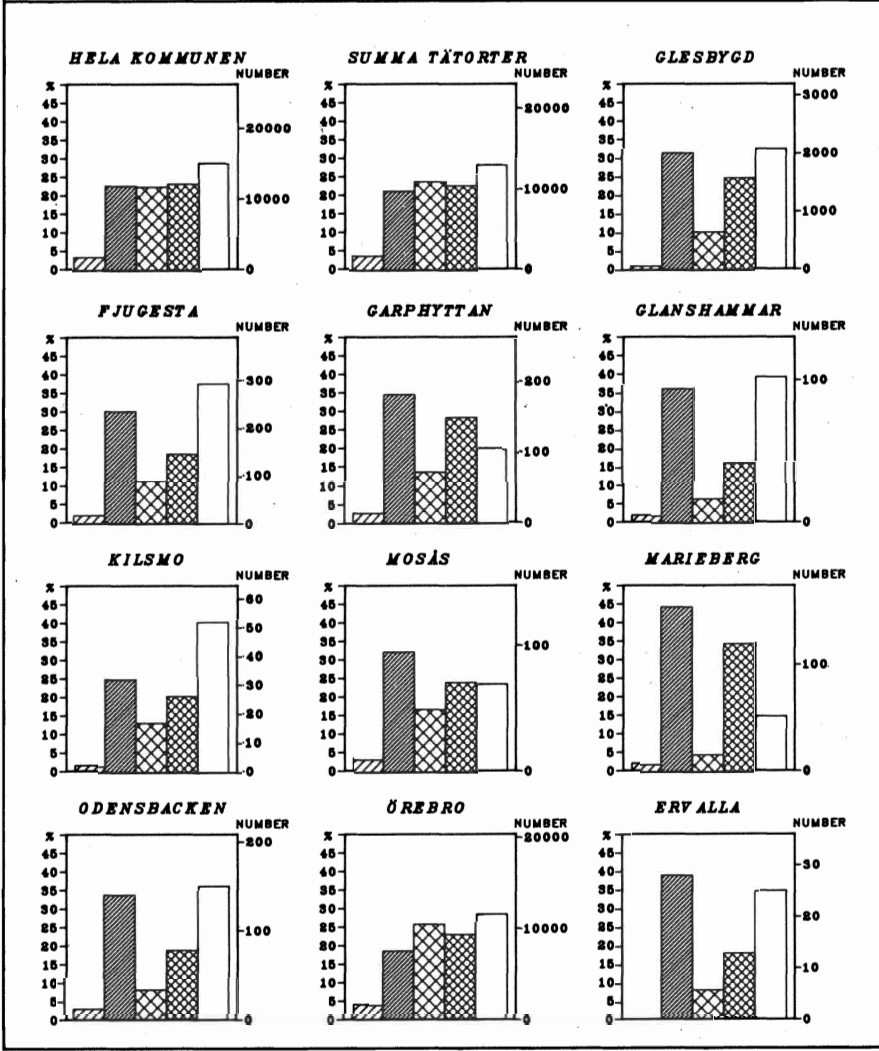


Population and Housing Census 1980

Household structure
Households with children, households without children
and households with pensioners by locality

Municipality **ÖREBRO**

HOUSHOLDS WITH CHILDREN		HOUSHOLDS WITHOUT CHILDREN		HOUSHOLDS WITH PENSIONERS	
	ONE ADULT AND AT LEAST ONE CHILD UNDER 16 YEARS OF AGE		ONE ADULT AGED 16-64 YEARS		AT LEAST ONE PERSON 65 YEARS OR OLDER
	TWO OR MORE ADULTS AND AT LEAST ONE CHILD UNDER 16 YEARS OF AGE		AT LEAST TWO ADULTS AGED 16-64 YEARS		

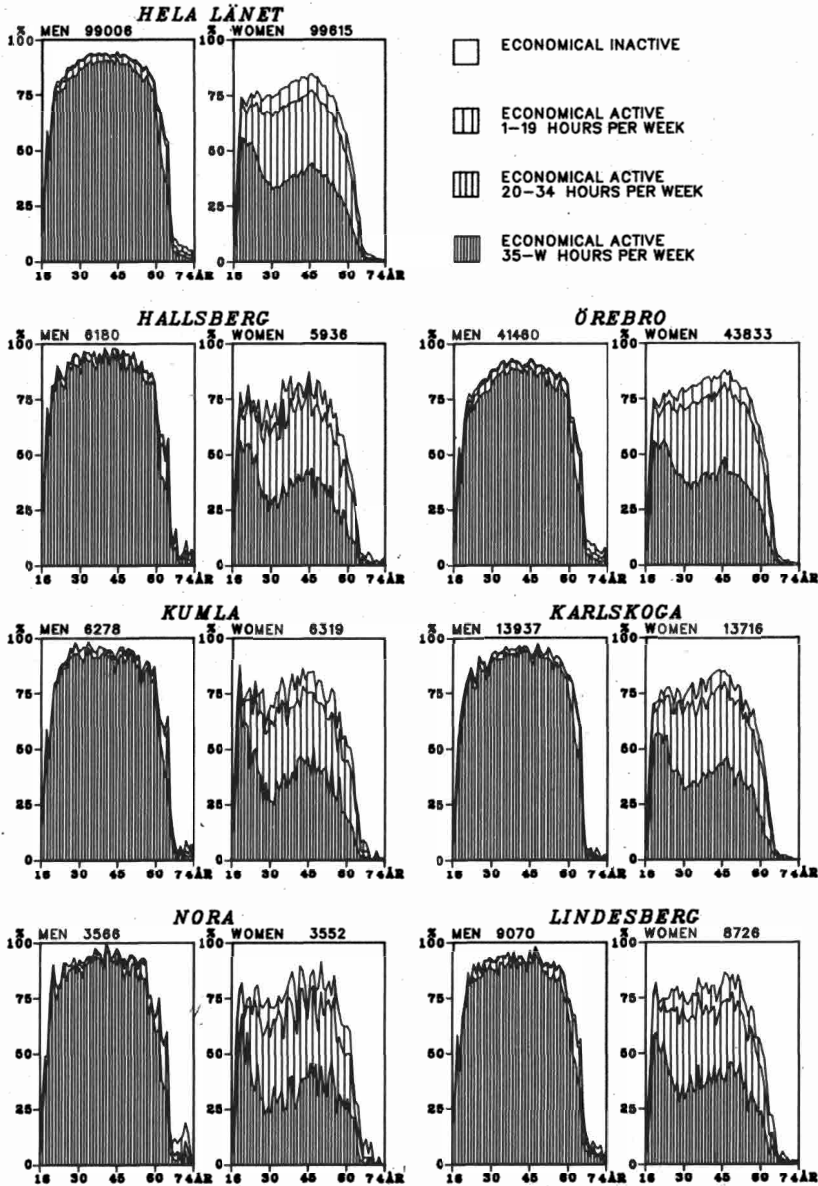




Population and Housing Census 1980

Population (16-74 years) by sex, age, economical activity and number of working hours

County ÖREBRO

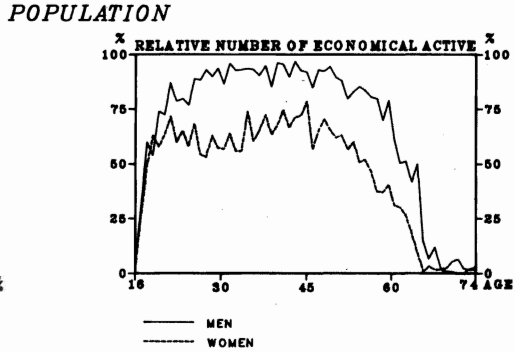
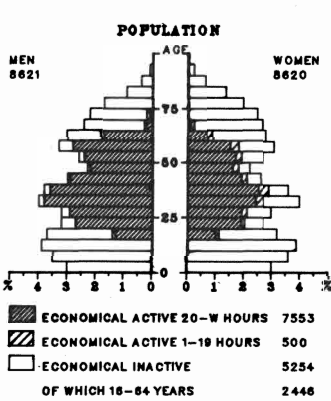




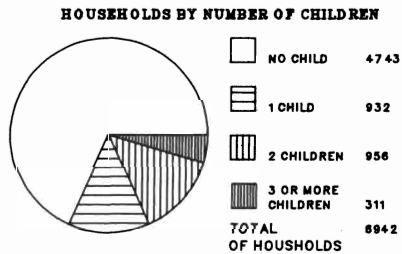
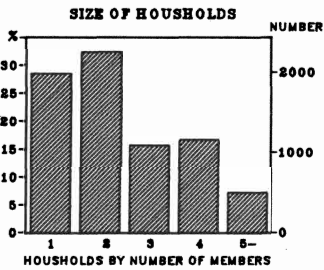
Population and Housing Census 1980

Overview of the findings in the census 1980

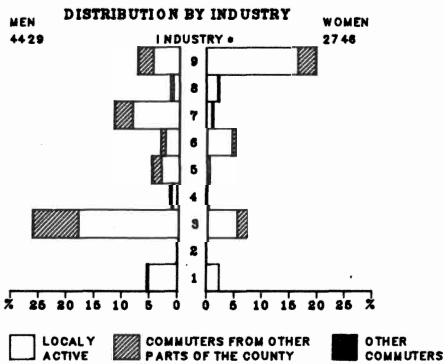
Municipality **HALLSBERG**



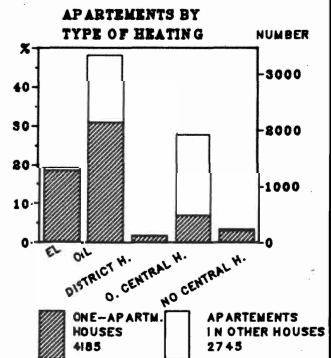
HOUSEHOLDS



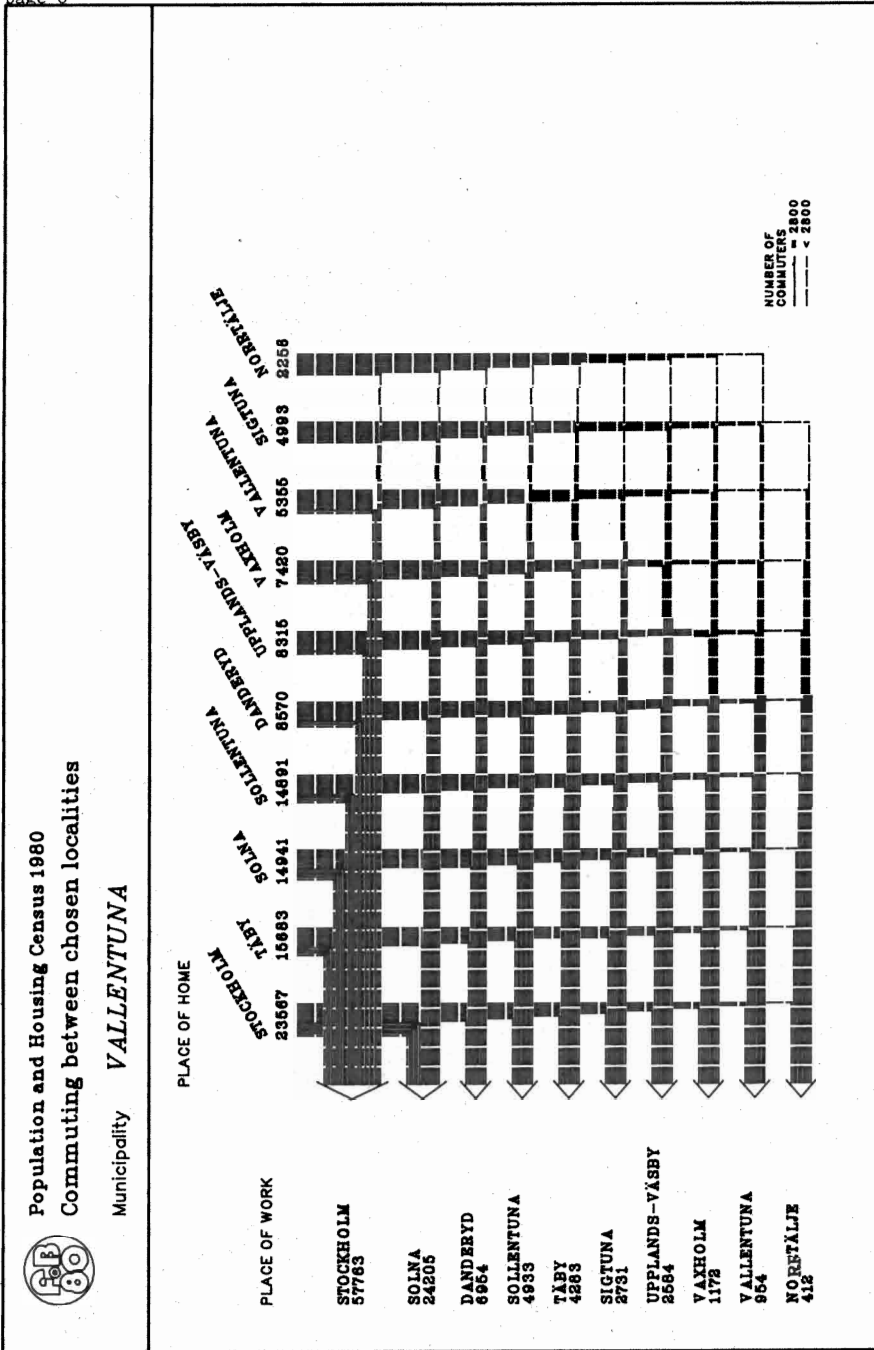
WORKING POPULATION

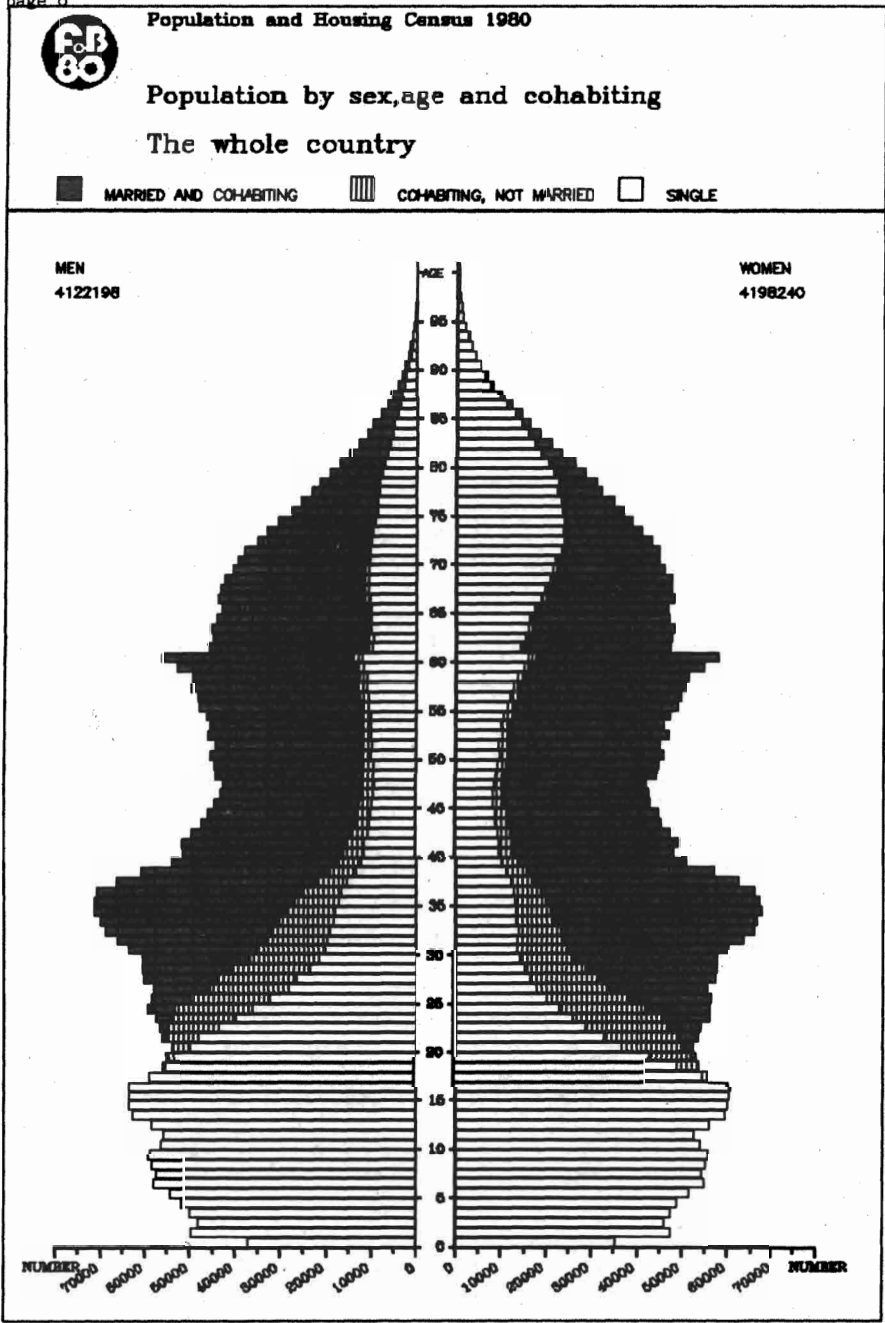


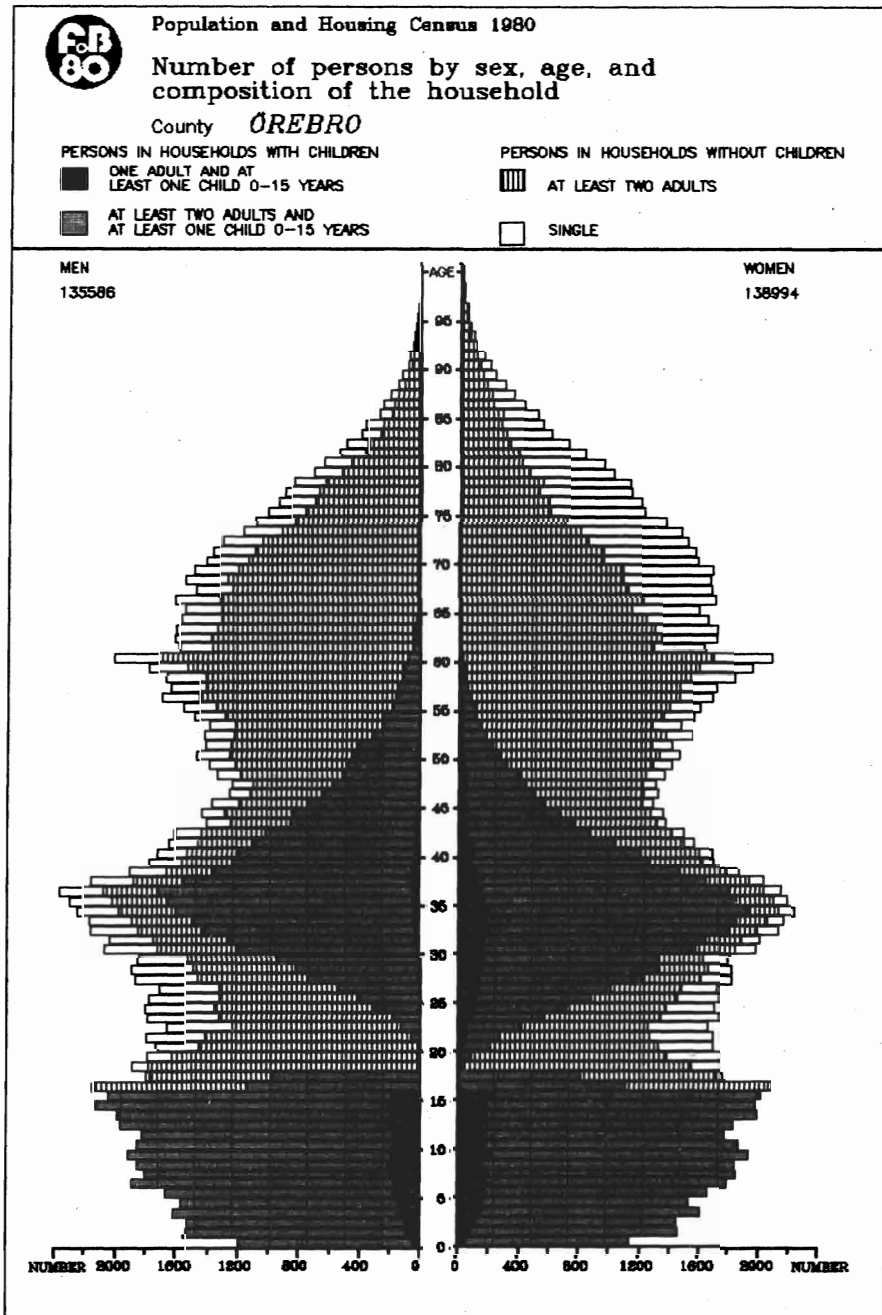
DWELLINGS



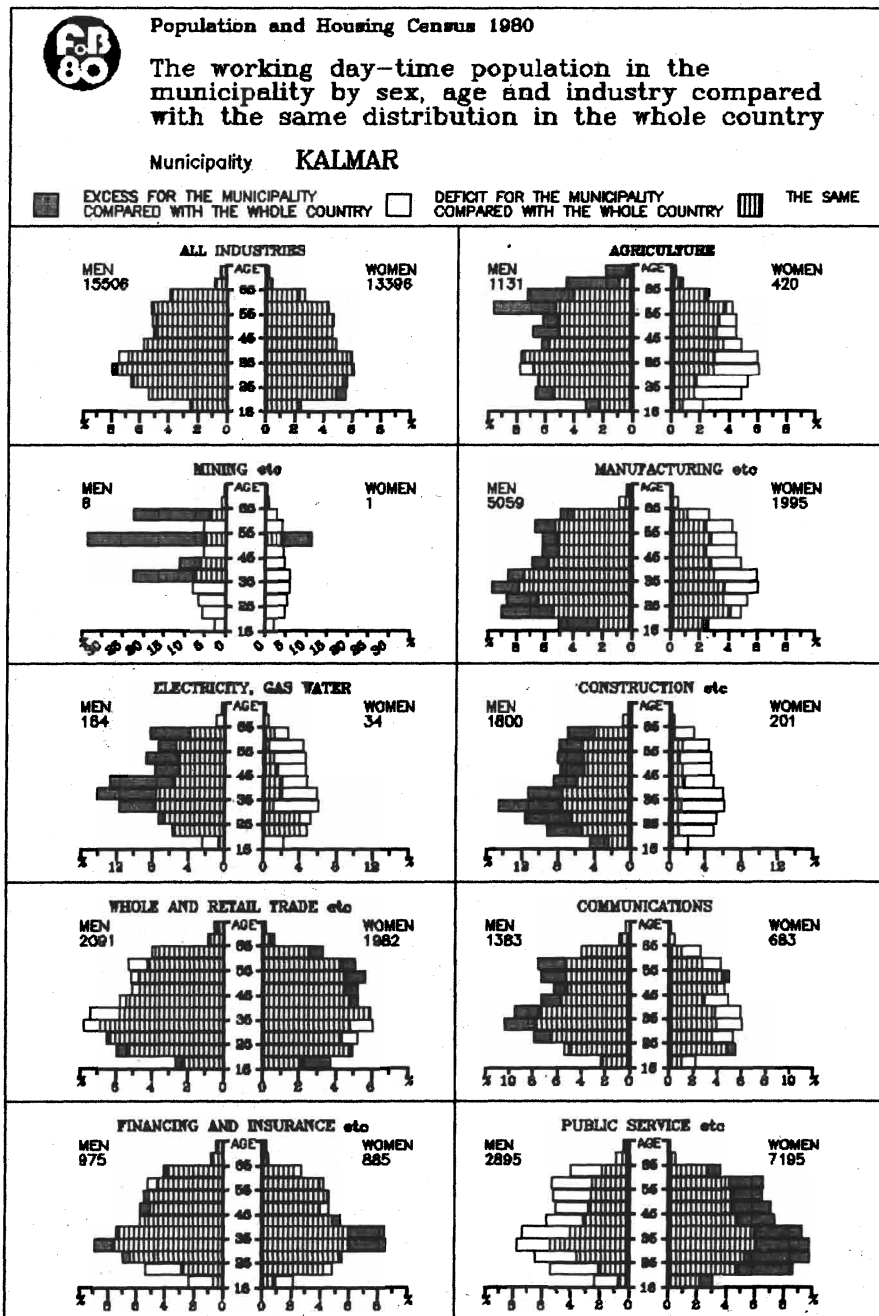
* 1 AGRICULTURE 2 MINING etc 3 MANUFACTURING 4 ENERGY PRODUCTION
5 CONSTRUCTIONS etc 6 WHOLE AND RETAIL TRADE 7 TRANSPORT etc
8 FINANCING, INSURANCE etc 9 PUBLIC SERVICE



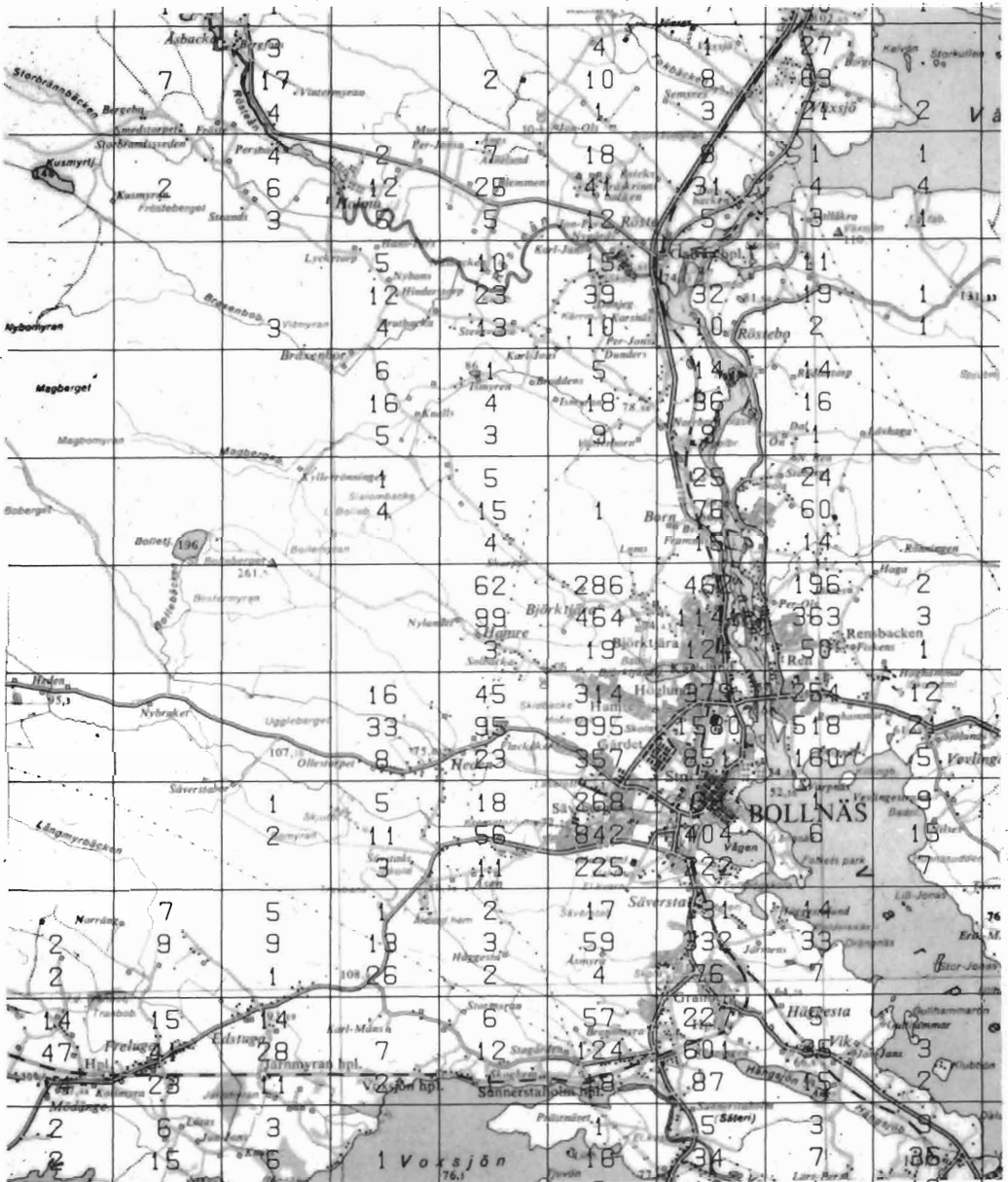




DRAWING 9



DRAWING 10



TRAVAUX PREPARATOIRES SUR LE TERRAIN EN VUE DU RECENSEMENT DE LA POPULATION ET DES HABITATIONS DE 1977 EN ROUMANIE (a)

En Roumanie, le dernier recensement général de la population et des habitations a été effectué le 5 janvier 1977, et le dénombrement s'est déroulé pendant 8 jours (5-12 janvier 1977).

Les unités du dénombrement, utilisées dans ce recensement, ont été: les personnes, les ménages, les noyaux familiaux, les habitations et les bâtiments.

Afin d'enregistrer les caractéristiques de la population et des logements on a utilisé *la méthode d'interrogation directe*, et le recueil des renseignements a été fait au domicile des habitants par des agents recenseurs, conformément aux libres déclarations des personnes recensées.

On peut apprécier que le recensement de 1977 a bien réussi, parce que:

a) il s'est déroulé sur tout le territoire national aux termes établis par la Commission Centrale de recensement;

b) entre les agents recenseurs et la population a existé une étroite collaboration et, par conséquent, ont été enregistrées des réponses correctes et complètes pour toutes les questions du recensement;

c) les résultats du recensement obtenus sur support magnétique ont été fiables.

Ce succès du recensement roumain de 1977 s'explique, pour la plupart, *par des travaux préparatoires sur le terrain* qui se sont déroulés dans une période d'environ une année avant le dénombrement.

Nous présentons, ci-dessous, quelques travaux effectués en vue de bien préparer le dénombrement de la population et des logements de 1977 en Roumanie.

(a) Rapport présenté par la Direction Centrale de la Statistique de Roumanie.

1. LE PARTAGE DU TERRITOIRE EN SECTEURS (DISTRICTS) DE RECENSEMENT

Le secteur (district) du recensement a été l'unité territoriale fondamentale pour l'activité des agents recenseurs afin d'enregistrer sur terrain les personnes, les logements et les bâtiments. Un secteur de recensement a été une partie du territoire ayant minimum 200 habitants (dans les zones de montagne) et maximum 300 habitants (dans les villes).

Le développement intense des villes de Roumanie d'après le recensement antérieur (1966) a déterminé la fondation de nouveaux quartiers avec de nouvelles rues et leur superficie a augmenté; par ailleurs, bon nombre des villages, à cause de leur développement économique et social, sont devenus des villes ou des centres ouvriers. Par conséquent, d'amples travaux sur le terrain se sont avérés nécessaires afin de délimiter les secteurs de recensement, les districts de conseil et de contrôle et les circonscriptions de recensement et, conformément à ces délimitations, d'établir le nombre des agents recenseurs, des recenseurs en chef et des responsables de circonscription de recensement pour chaque localité du pays.

La responsabilité pour tous ces travaux sur le terrain a été confiée aux Conseils populaires (Mairies) de chaque division administrative-territoriale: villes, communes suburbaines et communes.

1.1. *La liste des bâtiments, des logements, des ménages et des personnes*

Ce formulaire a été rempli sur le terrain dans toutes les localités (villes, communes suburbaines, communes) par des agents envoyés par les mairies; il comprenait les chapitres suivants:

- 1) le numéro de la maison;
- 2) le nom et le prénom du propriétaire de la maison ou du locataire principal ou, le cas échéant, le nom de l'administrateur des immeubles ayant plusieurs logements;
- 3) le nombre total des bâtiments;
- 4) le nombre des bâtiments qui ont des habitations;
- 5) le nombre total des habitations des bâtiments du point 4);
- 6) le nombre total des ménages des habitations du point 5);
- 7) le nombre des personnes qui habitent de façon permanente dans les ménages du point 6);
- 8) le nombre des places (la capacité) des unités d'habitation en commun (hôtels, hôpitaux, internats etc.).

1.2. *La liste des rues*

pour les communes et villes, contenant le nombre des bâtiments, des habitations, des ménages et des personnes.

Ce formulaire comprenait les chapitres suivants:

- 1) le nom des rues, des boulevards, des avenues etc.;
- 2) le numéro des maisons (du ..., au ...) avec deux colonnes: numéros pairs et impairs;
- 3) le nombre des bâtiments où se trouvent des habitations;
- 4) le nombre des habitations;
- 5) le nombre des ménages;
- 6) le nombre des personnes qui habitent de façon permanente dans les habitations du point 4).

Il faut signaler que les points (3-6) de ce formulaire correspondent avec les points (4-7) du premier formulaire (1.1).

1.3. *La liste des unités d'habitation en commun, pour les communes et les villes*

Ce formulaire a été rempli pour les unités d'habitation en commun du type *hôtel* (motels, chalets, hôpitaux, maternités rurales etc.) et du type *foyer* (écoles d'internes, foyers d'étudiants, orphelinats, foyers pour les personnes âgées etc.).

Il faut mentionner que les jardins d'enfants et les crèches n'ont pas été considérés comme unités d'habitation en commun quels que soient leurs horaires.

Ce formulaire comprenait les chapitres suivants:

- 1) le nom de l'unité d'habitation en commun (chaque unité séparée);
- 2) le nombre des bâtiments avec des unités d'habitation en commun;
- 3) la capacité (nombre des places) d'habitation en commun.

1.4. *La liste des villages*

contenant le nombre des bâtiments, des habitations, des ménages, des personnes et des unités d'habitation en commun. Ce formulaire comprenait 3 chapitres:

Ch. I - *La liste des villages*

- 1) les noms des villages;

- 2) les numéros des maisons (la première et la dernière maison);
- 3) le nombre des bâtiments;
- 4) le nombre des habitations;
- 5) le nombre des ménages;
- 6) le nombre des personnes qui y habitent de façon permanente.

Ch. II - Des habitations occupées situées séparément de l'emplacement d'un village

- 1) le village d'appartenance;
- 2) le nom de l'habitat et son genre (ferme, maison de garde forestière, maisons groupées, etc.);
- 3-6) idem ch. I;
- 7) la distance en km jusqu'au village d'appartenance.

Ch. III - Unités d'habitation en commun

- 1) le village où se trouve l'unité d'habitation en commun;
- 2) le nom et le genre de l'habitation en commun (internat, hôpital, dortoir pour les travailleurs, etc.);
- 3) le nombre des bâtiments;
- 4) la capacité (le nombre des places).

1.5.

Outre ces formulaires détaillés concernant les bâtiments et la population, ont été élaborés deux formulaires centralisateurs:

1) un formulaire centralisateur où ont été totalisées les données du formulaire 1.4. chapitre I, en obtenant des totaux pour chaque localité (ville, commune suburbaine, commune) et aussi, le total par département.

2) un autre formulaire centralisateur où ont été totalisées les données des formulaires 1.3 et 1.4 chapitre III, en obtenant les totaux pour les unités d'habitation en commun pour chaque localité et, aussi, pour chaque département.

1.6.

Le but de l'élaboration de ces formulaires (1.1 - 1.5) a été, comme nous avons déjà mentionné, de faciliter le partage du territoire en secteurs (districts) de recensement. Il faut signaler que seulement le premier formulaire (voir 1.1) a été

rempli sur le terrain par les agents des mairies tandis que les autres formulaires (voir 1.2 - 1.5) ont été remplis dans les bureaux conformément aux données inscrites sur le premier formulaire (1.1).

2. QUELQUES TRAVAUX CARTOGRAPHIQUES

Les travaux cartographiques ont été faits sur le terrain par les agents des services techniques des mairies pour toutes les localités du pays, comme suit:

1) pour les villes et pour les communes déjà systématisées ont été faits des travaux cartographiques complets;

2) pour les communes sans systématisation ont été faites seulement des esquisses limitées, contenant les frontières des villages, les routes, les ruelles, aussi bien que les cours d'eau, les voies ferrées etc.

Les principaux travaux cartographiques nécessaires à la délimitation des secteurs de recensement ont été les suivants:

2.1. *Le plan (les plans) à l'échelle 1:5.000*

qui a représenté le travail fondamental de la cartographie, a été fait pour chaque ville (même pour les villages systématisés). Le contenu de ce plan a été le suivant:

— *le support planimétrique principale*, c'est-à-dire le réseau des artères du trafic routier (rues, boulevards, places etc.) avec leur nom et les numéros des maisons aux intersections et aux extrémités des artères du trafic routier;

— *autres éléments de la planimétrie* qui pourraient être de bonnes limites pour les secteurs du recensement: cours d'eau, voies ferrées, terrains agricoles etc.) ou points de repère très connus (églises, monuments, édifices publics importants etc.), ainsi que les bâtiments ayant des habitations, mais qui se trouvent loin du territoire des constructions compactes. Ces maisons lointaines ont été mentionnées en cadre séparé avec la distance par rapport au centre habité;

— *des délimitations administratives:*

1) les limites d'une localité à l'égard d'autres localités voisines (sur le plan à l'échelle 1:5.000);

2) les limites extérieures du territoire contenant des bâtiments compacts (par exemple les nouveaux quartiers);

3) les limites des villages appartenant à une ville;

4) les limites des secteurs de la capitale du pays.

2.2. *Le plan (schéma) de l'assemblage*

à l'échelle 1:25.000:

- 1) *le support de planimétrie*, c'est-à-dire les artères de communication et leur nom;
- 2) *autres éléments de planimétrie* susceptibles d'être utilisés pour délimiter les secteurs de recensement (cours d'eau, voies ferrées, terrains agricoles etc.);
- 3) autres délimitations nécessaires: les limites des diverses parties des localités (quartiers, secteurs administratifs etc.); les limites à l'égard des localités voisines; les limites des villages pour les communes rurales comprenant plusieurs villages.

2.3. *L'esquisse sommaire*

des villes et des communes (communes suburbaines):

- 1) le support des artères principales de communication de toutes les localités composant une autre localité (par exemple, les villages qui composent une commune systématisée); les voies principales de communication (voies ferrées, routes, chemins etc.) entre le centre habité et les habitations éloignées;
- 2) quelques éléments de planimétrie (rivières, lacs, forêts etc.);
- 3) quelques délimitations, comme suit: les limites des localités qui composent d'autres localités; les limites du centre des villages etc.

Afin d'élaborer tous les travaux cartographiques on a utilisé les documents et les travaux nécessaires à la systématisation du territoire et des localités urbaines et rurales.

3. DES ELEMENTS ET TRAVAUX ACCOMPLIS POUR LE PARTAGE DU TERRITOIRE EN SECTEURS DE RECENSEMENT

Tous les travaux sur le terrain et dans les bureaux présentés ci-dessous (voir 1 et 2) ont eu pour but de faciliter le partage du territoire en secteurs (districts) de recensement, en secteurs de conseil et de contrôle et en circonscriptions de recensement.

3.1. *Le secteur (district) de recensement*

c'est l'unité territoriale fondamentale du recensement dans laquelle l'agent recenseur a fait le dénombrement de la population et des habitations.

Le secteur de recensement a été formé soit d'un seul bâtiment soit de plusieurs bâtiments situés dans la même rue (place, boulevard etc.) en fonction du nombre des bâtiments, des habitations et des personnes (y compris les unités d'habitation en commun).

On a formé des secteurs de recensement dans les unités d'habitation en commun (du type foyer et du type hôtel) ayant 40 places et plus:

1) un secteur (district) de recensement comprenait, en moyenne, 200-300 personnes, 65-120 habitations (appartements) et 40-80 bâtiments, *pour les villes*;

2) pour *les communes suburbaines et les communes*, un secteur de recensement comprenait, en moyenne, 200-250 personnes, 60-100 habitations et 60-100 bâtiments;

3) chaque *unité d'habitation en commun du type hôtel* constituait un seul secteur de recensement. Les unités ayant 240 places et plus constituaient 2 secteurs de recensement;

4) *les unités d'habitation en commun du type foyer* ayant 240-300 places constituaient un secteur de recensement.

3.2

Un secteur de conseil et de contrôle a été formé pour 5 secteurs de recensement et il a été dirigé par un agent recenseur en chef.

3.3

La circonscription de recensement a été formée dans les communes et dans les villes ayant 15.000 habitants et plus et elle a compris 10-12 secteurs de conseil et de contrôle; elle a été dirigée par le responsable de circonscription.

3.4

En conclusion, le partage du territoire des localités en secteurs de recensement, secteurs de conseil et de contrôle, et circonscriptions de recensement a été effectué en tenant compte des documents suivants, élaborés par les mairies:

1) la liste des bâtiments, des ménages et des personnes (1.1);

2) la liste des rues, pour les communes et les villes, contenant le nombre des bâtiments, des habitations, des ménages et des personnes (1.2);

3) la liste des habitations en commun pour les communes et les villes (1.3);

4) la liste des villages avec le nombre des bâtiments, des habitations, des ménages, des personnes et des unités d'habitation en commun (1.4);

5) le plan à l'échelle 1:5.000 pour les communes et les villes et pour les villages qui appartiennent aux villes; le plan d'assemblage à l'échelle 1:25.000 pour l'ensemble des communes et les villes;

6) le plan à l'échelle 1:5.000 pour chaque village et l'esquisse sommaire de l'ensemble d'une commune (avec les villages composants).

PREPARATORY WORK IN THE FIELD FOR THE 1977 POPULATION AND HOUSING CENSUS OF ROMANIA (a)

Summary

The most recent population and housing census in Romania was effected in 1977, from 5 to 12 January. The units enumerated were: persons, households, family units, dwellings and buildings.

The *direct interrogation method* was used to record the characteristics of the population and dwellings; the information was collected by enumerators at respondents' places of residence.

The 1977 census may be considered to have fulfilled its purpose since:

a) The whole of the national territory was covered, in accordance with the procedure laid down by the Central Census Commission;

b) There was close co-operation between the enumerators and the population covered, so that correct and complete replies were recorded to all the questions in the census;

c) The results obtained through tape recording have proved reliable.

The successful completion of the 1977 census is largely explained by the preparatory work done in the field over a period of about a year prior to enumeration.

The main preparatory work concerned the breakdown of the territory into census sectors (districts). It entailed for the local authorities in each area (municipalities, towns, suburban districts and rural districts).

The drawing up of:

- 1) A list of buildings, dwellings, households and persons;
- 2) For towns, a street list;
- 3) For towns a list of apartment blocks;

(a) Report prepared by the Romanian Central Statistical Office.

- 4) A list of villages;
- 5) Two centralizing forms for each locality; and
- 6) Certain cartographic work, namely preparation of:
 - A 1:5,000 scale plan for every town and even some villages;
 - A planimetric map showing road traffic arteries;
 - A diagrammatic over-all plan on scale 1:25,000 for each locality;
 - A brief outline description of each locality.

THE ORGANIZATION AND CONDUCTING OF POPULATION CENSUSES IN THE SOVIET UNION (a)

I. GENERAL BACKGROUND

1. Great importance is attached to population censuses in the Soviet Union. This is evidenced by the fact that the first Soviet census of 1920 was conducted only three years after the Great October Socialist Revolution of 1917, under conditions of foreign armed intervention and civil war in the country. The next population censuses were taken in 1926, 1939 and after World War II in 1959, 1970 and 1979. Each census was a valuable source of data on various aspects of population which are used in our socialist society to gain numerous goals; among them one might name long-range manpower balance sheets, construction, planning or production and construction facilities and other programmes such as public health and education projects. Census data are valuable for the large scale residential construction which is widely underway in the Soviet Union, for the investigation of problems of socio-economic development, perfection of public relations etc.

2. Population counts in the Soviet Union are of vital political significance. They testify to the achievement of the Soviet State in the field of social development; they show, among other things, that illiteracy has been eradicated in this country, the increase in the population's educational attainment in the years of Soviet power, the changes in the population's professional skills, and many other developments.

3. When setting up its population censuses the Soviet Union considers the national economy's vital needs and takes account of the recommendations elaborated by the United Nations Population Commission; due account is also taken of the recommendations adopted by the Standing Commission for the co-operation in the field of statistics of the Council for Mutual Economic Assistance (CMEA); according to the recommendations of those bodies popula-

(a) Report prepared by Central Statistical Board of the URSS.

tion censuses are to be conducted on a decennial basis.

4. The Council of Ministers of the USSR passes a special resolution regarding each population census, according to which the Central Statistical Board of the USSR (CSB USSR) is appointed as a body responsible for organizing and conducting the census and disseminating its results.

5. The actual enumeration and canvassing is undertaken by the Department of Population Censuses and enquiries. Each statistical agency in the Union and in autonomous republics, territories and regions has a particular division entrusted with all organizational matters, with conducting the census and with tabulating the results covering their respective territories.

II. POPULATION CENSUSES FRAME-WORK

6. To delineate between urban and rural populations when organizing a population census, maps of town settlements are revised or are newly-formed. Such maps make it possible to execute the next preparatory step of specifying the borders of town settlements, classifying street names and numbering houses and dwellings. Due cartographic materials are then prepared covering layouts of town settlements and district maps.

7. The specified district layouts and blocks of houses and the names of the streets, squares and the like are entered onto maps of town settlements and large villages. These regional maps contain schematical designs of households with their numbers and borderlines of rural Soviets and other settlements, rivers and highways connecting those settlements; the distance between the settlements to be enumerated is also marked on the regional maps.

8. These cartographic activities provide the basis for constructing a consolidated list of households in cities and towns, in large villages with a population of 5,000 and more, as well as lists of rural settlements of a specified population size. This material and other cartographic materials are used for census regionalization, that is, for breaking districts, towns and smaller territorial units into units such as enumeration districts, instructor districts and census sections.

9. Proper census regionalization is of great importance since it ensures the complete coverage of the census. It also provides the basis for valid estimates of the census personnel, for an equal distribution of workloads and the efficient use of census personnel. Census regionalization in the All-Union Population Census of 1979 was performed by local statistical bodies in accordance with average workload rates (number of respondents per enumerator) shown in table 1.

10. Work loads for census personnel varied depending upon the type of settlement as well as natural and geographic conditions. They were somewhat higher in densely populated areas with multi-storey buildings etc. and comparatively lower in sparsely populated areas (Northern, mountain and taiga – large

Table 1. - Average load rates per census section, 1979 All-Union Population Census

	In urban settlements	In rural areas
Enumeration district	630 persons	530 persons
Instructor district	4-5 enumeration districts	4 enumerator districts
Census division	8 instructor districts	6 instructor districts

Siberian forests) as well as in areas with small private cottages. A total of 15,000 census sections were formed in the country, 115,000 instructors and more than 600,000 enumeration districts in 1979.

11. The census personnel, enumerators, canvassers, instructor-supervisors, heads of census sections and their deputies, was duly selected in accordance with the number of specified areas. The staff of each census area was also supervised by local officers – deputy heads of local statistical bodies. The census personnel was selected from professional statisticians, and from those employed in industrial and other establishments and organizations, students and professors of higher educational establishments. All of them took part in conducting the census on an off-the-job basis with their salaries reserved for them, as well as average wages or scholarships secured for the period of the census; after the completion of the census they were also awarded special bonuses.

Table 2. Off-the job periods for census personnel

	Off-the-job periods	
	Urban settlements	Rural areas
Enumerators	18 days	20 days
Instructor-supervisors	28 days	30 days
Heads and deputy heads of census sections	58 days	58 days
Deputy heads of local statistical bodies	3.5 months	3.5 months

12. About 900,000 persons including the reserves were employed; while conducting the All-Union Population Census of 1979 more than 750,000 persons were immediate participants in all census activities.

13. The success of each population census to a considerable degree depends on how much the population knows about the significance of the census and its objectives and dates; people should also know about the items included in the census questionnaires and be well informed about the proper way to answer them. To provide the people with substantive information, an extensive

information campaign was organized during the census. Those activities were undertaken by professional statisticians with active assistance from various establishments and organizations, public bodies included. The information campaign was participated in by more than 1 million persons including professional lecturers, professors, and other kinds of personnel. To aid them in their information campaign, the Central Statistical Board of the USSR published a booklet "The All-Union Population Census is the Common Cause of the Nation"; similar booklets were published in some republics and regions. Newspapers and magazines published a series of articles on this subject; there were special radio and tv broadcasts, and a topical film "Grand Count in the Country" was released. Colourful posters and instructional wall sheets were issued, as well as special postal envelopes and stamps, pocket calendars, match-box labels etc. Prior to the taking of the census newspapers issued editorials describing the importance of the census and calling for well balanced efforts in conducting the All-Union population census.

III. SOME METHODOLOGICAL GUIDELINES

14. It is now a tradition that population censuses are conducted in the Soviet Union in January (17 January 1939, 15 January 1959 and 1970, 17 January 1979). The middle of the month and of the week is preferable because these are the periods of the least population mobility. Data obtained as of the beginning of the year are more suitable for demographic estimates. The year ending with "nine" is chosen; it allows us to use the census count while constructing the next USSR Five-Year Plan of Economic and Social Development. Thus, the results of 1979 were widely used in the development of the Eleventh Five-Year Plan for 1981-1985.

15. The date of the census meets the international recommendations relating to population censuses.

16. One of the most important tasks while organizing a population census is the questionnaire design, that is, the compilation of the list of items to be included on the census schedule and other census forms. The amount of census organization activities is determined by the need for data concerning economic and State performance, the demands of planning and scientific bodies, as well as recommendations of international agencies. All drafts of the design are widely discussed with the experts concerned. The 1979 draft design was discussed at conferences and meetings of demographers and other experts, and was also discussed in detail with the personnel of the State Planning Committee, ministries and scientific bodies.

17. The 1979 census design comprised 16 items, including 11 items enumerated on a complete basis since they were related to the entire population; five more items were included in a sample, covering 25 per cent of the

permanent residents. Thus there were two types of census schedules: one with 11 items of complete count and the other with 16 items on a sample basis.

18. The items included on the questionnaires for complete count were:

- 1) Relationship to the head of the family;
- 2) Sex;
- 3) For a permanent resident who is temporarily absent on the census date: the reasons for the absence; the duration of absence;
- 4) For a temporarily present person: the permanent residence address; the period of absence from one's permanent residence;
- 5) Age (year of birth, born prior to, on or after 17 January);
- 6) Marital status;
- 7) Nationality; for foreigners – name the citizenship;
- 8) Mother tongue; name any other fluently-spoken language (one of the nationalities inhabiting the Soviet Union);
- 9) Education;
- 10) Type of educational establishment (for those studying);
- 11) Source of subsistence.

19. The sample schedule included the above 11 items and, in addition:

- 12) Place of work (name of the establishment, collective farm, agency or subsidiary plot);
- 13) Occupation (capacity or job performed);
- 14) Social group;
- 15) Duration of permanent residence in this place:
 - a) residing permanently since birth ("Yes" or "No");
 - b) if "No", then since what period of time;
- 16) In the case of a woman: number of children born.

20. The census schedules used in 1979 were of a principally new form. During the previous censuses the items were either written down or marked by underlining one of several pre-printed responses. The answers were then coded and then transferred onto other media and entered into the computer. While conducting the population census of 1979 the majority of the items were answered graphically and were recorded by the enumerators. Only four items – those concerning nationality, language, place of work and occupation – were recorded verbally because of their multivariety. After the census, the answers were coded by the local statistical bodies – those of the regions also by means of graphic marks. After that the data recorded by the enumerators and coded by the local statistical bodies were entered onto magnetic tapes. Recording was made with the help of OCR Devices and computers. Thus the 1979 census schedules were used simultaneously as media to be used by computers. This

type of data processing essentially simplified and accelerated the preparation of census materials for mechanical tabulation.

21. The major methodological guidelines used while conducting the All-Population Census of 1979 were as follows:

- the census was conducted by enumerators who inquired the population with recorded data filling the questionnaires;

- the population was enumerated by place of residence (even if temporary) and not by place of work;

- the enumeration started at 8.00 a.m. (local time) on 17 January 1978 and lasted eight successive days, until 24 January; midnight (00.00 a.m.) of 17 January 1979 was considered as the moment of enumeration;

- enumerators made rounds of all premises where people resided (or were subject to reside); the answers were recorded without substantiating the statements.

22. The census personnel was strictly prohibited from disclosing the data obtained through the enumeration to anybody (this was put down on the census schedules).

23. To prevent an undercount and re-enumeration the following check-in procedures were performed; check-in questionnaires were issued, census certificates were issued and follow-up procedures taken.

24. Check-in questionnaires covered those persons who were not sure to be enumerated at the place where they happened to be at the moment of enumeration (00.00 a.m. 17 January 1979). The check-in forms also contained items with a detailed address where the respondent might be enumerated as a permanent or temporary resident. After the check-in the form was forwarded to the particular address to be matched with enumeration schedules. If the respondent was already enumerated the check-in form was cancelled; otherwise data were transferred from the check-in form to the census schedule.

25. Census certificates were issued to all those persons who were enumerated as temporary residents or who were in trains, ships, at railway and bus stations, airports, harbours etc. Census certificates were also given to those persons for whom the check-in forms had been filled in as well as to those who were supposed to go somewhere (at least for one day) during the period of enumeration and post-enumeration field checks (17 to 31 January 1979 inclusive). Therefore, the check-in form was given to avoid the undercount and the census certificates were issued to avoid the re-enumeration.

26. After the census, in the period from 27 to 31 January 1979, a sample post-enumeration field check was carried out to cover living premises and to check if there were any undercounts or re-enumeration; the check covered 25 per cent of the enumeration districts. Tests were made of whether the records about temporary absence and temporary residence were correct. The experience

proved that such post-enumeration field checks ensure higher accuracy of the census counts, contribute to higher responsibility of enumerators' activities and guarantee complete coverage.

IV. TABULATION OF POPULATION CENSUS COUNTS

27. The tabulation programme of the All-Union Population Census of 1979 was made by the Department of Censuses and Surveys of the CSB USSR considering national peculiarities and needs in data relating to population; due account was also taken of the corresponding international recommendations on the subject. The draft programme was widely discussed by Soviet statistical bodies, with central and local State and management administration and planning and scientific bodies participating.

28. The tabulation programme comprised 54 tables with absolute data and 33 tables with derived data. The total number of items contained in all tables exceeded 200 million; regional cross-reference data pertained to tables covering territorial units (e.g. district, region and Union republic levels).

29. The smallest administrative units – districts – accounted for the largest information files. One highlighted various demographic, national, cultural and socio-economic features relating to each particular district, town settlement or city as well as to rural areas with a population of 5,000 and more. These data were obtained through the complete census (items 1-11 of the census questionnaires). Republican and provincial levels contained aggregate indicators including all district items, as well as sample survey data and combined tables covering both complete and sample data. The results of the 1979 Population Census were shown separately for urban and rural population by males and females, and for the entire total population of the country.

30. The tabulations of the Population Census of 1979 consisted of two successive stages:

- 1) data processing preliminary procedures;
- 2) the tabulation procedures proper.

31. All preliminary efforts were undertaken by the Union Republic and territorial, regional and town settlements statistical bodies. They comprised the collation of the census schedules by areas, check-in procedures and coding of completed census schedules. To achieve this purpose a temporary division was formed attached to local statistical bodies with the number of staff totalling 36 persons per 1 million persons to be enumerated.

32. The coding of the population census schedules comprised four steps:

— Step I: the verification of the validity and of the completeness of census schedules covering the complete counts (items 1-11); the coding of

answers to questions pertaining to nationality, mother tongue and other fluently spoken language(s) of the nationalities comprising multinational Soviet State;

— Step II: the verification of the validity and completeness of the census schedules filled out on a sample basis; the coding of answers relating to place of work of the respondents and their occupation;

— Step III: check-in procedures to test the validity of coding performed while executing steps I and II;

— Step IV: all requisite paperwork done in connection with census counts and all work necessary for dispatching the coded census schedules to the census computer.

33. Coding was effected through specific graphic marks entered into specified fields on the right of the census schedule.

34. While preparing the census schedules for data processing due attention was also paid to marks made by the enumerators and to the physical properties and condition of the census schedules (whether they were secure or not). One had to highlight some faded marks which might be misinterpreted by reading devices or to erase faulty marks. Considering the entity of graphic marks one might say that they were in proper condition for further data processing and no additional efforts were usually necessary.

35. After the coding the census schedules thus processed were dispatched from the statistical bodies to the computing centres. The technological approach to the population census tabulations envisaged a decentralized input of primary data in computers and recording them on magnetic tapes. To this effect some 29 computer centres were charged with the processing of the population census counts with supervisory functions being assigned to the Central Computing Centre (CCC) located in Moscow City. All computing centres (except for the Central Computing Centre) were initiated by batches of local statistical bodies comprising some 5-6 statistical agencies in the neighbouring provinces; each of those combined computer centres was capable of processing data relating to some 7 million or 10 million persons. The data input from the census schedules in computers was performed through the OCR devices of the "Blanc II" type.

36. While recording the data on magnetic tapes according to specified software some check-in procedures were also employed to estimate the validity of the graphic marks made and of some automated correction procedures for errors made during previous data processing. These correction procedures were used to find missing graphic marks and surplus marks; in this case such marks were "recovered" or "erased", respectively. Corrected data were used to code all requisite procedures to be used in further processing the census counts.

37. The duly processed census counts were transferred onto magnetic tapes from the combined local computer centres to the Central Computer Centre to be

further processed in a centralized mode. Upon the reception of the magnetic tapes and after checking to testify to their validity, some specific logic control methods were applied to correlate the answers given to various items of the census questionnaire, covering both individual respondents and some household members. This correlation permitted us to reveal any logically incompatible combinations of attributes, in which case the computers secured the automated correction of the errors. Then for each territorial unit aggregate tables with absolute data were constructed which were used by the computer to collate with all the requisite data covering all territories chosen for this check-in procedure. The totals computed through samples were then combined with the complete or sample survey counts and were then interpolated to the entire entity. The algorithms thus produced ensured the complete identity of the data in tables combining complete and sample survey data; arithmetic correlation and the balancing of the data obtained were then used. Absolute numbers for some relative indicators were obtained; all tabulation efforts terminated with the printing out of summary tables according to the priority schedule of the census counts by specific layers.

38. The entire tabulation programme of the Population Census of 1979 lasted less than two and a half years and comprised the following five stages:

— Stage 1 (completed by November 1979): the main results of tabulation, including the population distribution by sex, age, nationality, language, educational attainment, type of educational establishment completed, marital status and means of subsistence.

— Stage 2 (completed by July 1980): socio-economic and cultural features of the population by provincial and republican levels.

— Stage 3 (October 1980): socio-economic and cultural features of the population by district levels.

— Stage 4 (completed by December 1980): characteristics of nationalities residing in the Soviet Union.

— Stage 5 (completed by June 1981): the number and composition of families; population distribution by the period of permanent residence, fertility.

39. The resulting tables were photostated or xeroxed to obtain the necessary number of copies. For the operative provision of local administrative or planning bodies with due census data, all the magnetic tapes containing the relevant tabulated data were sent by the Central Computer Centre upon their compilation to the respective combined computer centres formed for processing the census counts in the field; these computer centres then printed the processed material and disseminated them to local bodies.

PROBLEMS ENCOUNTERED IN DIFFERENT PHASES OF THE CENSUS THE CASE OF THE UNITED KINGDOM (a)

INTRODUCTION

1. A census of population and housing was carried out in the United Kingdom in 1981. The census was conducted separately in England and Wales by the Office of Population Censuses and Surveys, in Scotland by the General Register Office (Scotland), and in Northern Ireland by the Census Office of the Northern Ireland Department of Health and Social Services. In all the countries the census reference was the night of 5/6 April 1981. Most of this paper will relate to the operations in England and Wales but reference will be made to the experiences of the other countries where there were important differences.

2. The fieldwork phase of the census in England and Wales and in Scotland was carried out using a specially recruited force of some 103,000 enumerators (England and Wales) and about 15,000 enumerators (Scotland) to list the household spaces, to deliver forms and to collect them. Each enumeration district (ed) covered an area containing on average about 180 households (1) (about 500-600 people) in England and Wales. In Scotland the average was about 110. In N. Ireland there were special problems which meant that a number of forms had to be returned by post.

3. During processing the questions were treated in one of two ways. For most of them answers were recorded in tick boxes and needed little additional coding. These were edited automatically by computer and processed on a 100 per cent basis. A few questions however, such as occupation, industry, workplace, and higher educational qualifications, did require substantial manual coding and to reduce the time and cost involved these items were processed on a 10 per cent sample basis only. (In N. Ireland all items were processed on a 100 per cent basis). All data were input to magnetic tape using processor controlled keying (PCK) equipment. About 1,500 people were recruited on a temporary

(a) Report prepared by the Office of Population Censuses and Surveys.

basis in England and Wales for the coding and keying work.

4. Before detailing the main problems which arose in the pre-enumeration, enumeration and post-enumeration phases, it is important to make a general comment to set the background against which the problems should be viewed. Whereas in N. Ireland there were major problems experienced at the time of enumeration, the 1981 Census in Great Britain (i.e. England, Wales and Scotland) passed without any major difficulty or untoward incident. Of course it is hard to imagine any operation on the scale of a population census being entirely trouble free but the problems listed in this section were 'problems' in a relative sense only. The main reasons for the generally smooth progress of the 1981 Census are thought to be as follows.

- a) The census procedures were kept as straightforward as possible.
- b) The form itself was short and relatively uncomplicated – it contained just 21 questions which was the shortest and simplest form for 50 years.
- c) There were no questions included on the form which in general were controversial or which touched public sensitivities.
- d) All the questions were considered essential and could be well defended in terms of their use and relevance.
- e) An effective, though relatively inexpensive, publicity campaign was mounted – among other things this made use of a series of very useful Topic Sheets which anticipated and gave well prepared answers to most of the questions raised about the census.
- f) Confidentiality was strict and well maintained – for example no uses of census data were allowed which might be interpreted as threatening to the confidentiality undertakings which were given.
- g) There was early planning of processing and computing systems.
- h) Many of the key staff, especially in senior positions, had accumulated experience from previous censuses.

PROBLEMS IN THE PRE-ENUMERATION PHASE

5. Perhaps the main group of problems experienced during the pre-enumeration phase arose because of uncertainties and changes that had to be made as a result of government decisions to cut public expenditure and to reduce civil service manpower. For example the geographical planning of eds required the recruitment of 50 clerical staff in October 1979 but this was prevented at the time by a government three-month ban on civil service recruitment. Although exemption from the ban was later granted for census preparations, two and a half months had elapsed by then so that this aspect of planning work had to be compressed into a much shorter period than had been

anticipated. Consequently much less checking was possible than was thought desirable although, in the end, no major difficulties resulted.

6. In order to reduce the cost of the census the original budget was cut by 16 per cent. One measure was to economise on the maps issued to the field workers and this later led to complaints in a number of cases that the maps were out of data and/or of too small a scale. It was felt that, particularly at the peripheries of built up areas, more maps at the 1:2,500 scale should have been used where available rather than the 1:10,000 maps which were frequently used – (although there is no direct evidence that this led to undercoverage in the areas concerned).

7. Other measures for reducing costs also had the effect of simplifying the census and it is arguable whether these should be listed as problems (since they reduced the amount of information that could be obtained from the census), or as welcome developments (because they contributed to the smooth passage of the census operations). For example the procedures for counting 'dwellings', as opposed to household spaces, were dropped as an economy measure and because it was thought that the information could be deduced from elsewhere. Also, although information on post codes for each address of enumeration was collected, it was not processed in England and Wales because to do so would have incurred substantial costs in allocating post codes to those addresses where the information had not been given (about 25 per cent of households) and in keying the data since each code comprised six to eight digits. However post code data for address of enumeration were processed and used in Scotland although not in N. Ireland.

8. The only other problem during the pre-enumeration stage worth mentioning here arose because the final shape of the census form was not decided until about a year before the census was due to be conducted and this gave barely sufficient time in which to get all the census forms printed. The lateness in finalising the forms was due partly to uncertainties about whether or not a question on race or ethnic origin would be included (in the end and after extensive testing it was decided not to include such a question) and partly because when the final plans for the census were debated in Parliament in March/April 1980, one of the questions which was to have been cut was restored. Nevertheless, in spite of these delaying factors, the 20 million or so copies of the forms were printed and delivered in time.

PROBLEMS IN THE ENUMERATION PHASE

9. In general the enumeration itself went remarkably smoothly. Out of 18 million households in England and Wales fewer than 6,000 refused to complete a form or a part of the form (about 0.03 per cent). Although compliance with the census is compulsory it was decided not to institute legal proceedings against

most of these for various reasons such as compassionate grounds or other mitigating circumstances, or because there was not sufficient evidence to justify prosecution. However, about 700 were prosecuted – and nearly all the prosecutions were successful.

10. In N. Ireland the picture was very different. In some areas there was a campaign of non-cooperation which included the public burning of forms. In some areas enumerators were physically intimidated and in the most tragic incident of all, an enumerator working in Londonderry was murdered. As a result of all these difficulties, at the end of the fieldwork period on the 9th April, a large number of forms were still outstanding. After extensive effort on the part of the census authorities the great majority of the forms were subsequently returned by post and it is estimated that eventually 98.7 per cent of the forms were received.

11. By contrast the problems experienced by the census offices in England and Wales and in Scotland were very minor. But there were some which ought to be mentioned. For example there were problems in locating all households, especially in inner city areas and particularly in Inner London. The effects of these are discussed in the paper on evaluation.

12. The completed forms for one enumeration district in South London were destroyed when the enumerator's house was burned during the Brixton race riots: the ed was subsequently reenumerated.

13. Particular problems arose with the classification of households as vacant or absent. Post-enumeration enquiries showed that for the most part vacant addresses were correctly identified as such, but enumerators were also asked to make a distinction between vacant properties which were 'new', 'under improvement' or 'other'. This was not so successful and it is estimated that some 30 per cent of vacant properties were wrongly classified. The classification of households as absent when in fact there was somebody at the address on census night was a major cause of the under enumeration found by the post enumeration survey. It is probable that enumerators sometimes submitted an absent household return rather than continue the effort to contact somebody at an address. About nine per cent of households recorded as absent were found during post enumeration studies to have contained people on census night. In future censuses the absent household procedures will need to be reviewed to see if improvements can be made.

14. Finally in this section mention should be made of the special procedures that were designed for the enumeration of persons who spent census night aboard British registered commercial ships in British ports. Unfortunately, at the time of the census, there was a strike among customs officials who were to be used for the enumeration. It is estimated that as a result perhaps 5,000 persons were not enumerated and although the numbers were small the likelihood is that they concentrated in particular occupational groups. However a number of them will have been entered as usual residents on forms completed at addresses

elsewhere in Britain so although they will have been missed from the population counted on a 'present' basis they will have been included in the counts of usual residents.

PROBLEMS IN THE POST ENUMERATION PHASE

15. Perhaps the biggest problem to occur in the post-enumeration phase was a processing error which resulted in an estimated 100,000 persons in England and Wales being counted as present at their usual address on census night when in fact they were absent. Although this did not effect those statistics produced on the basis of the usually resident population for an area, it did affect the counts of the population present on census night. The error arose when the keying operators had to key '1' for a person present and '2' for a resident absent on census night. On the comparatively rare occasion when '2' ought to have been entered, indicating that a usual resident was away on census night, '1' was nevertheless keyed on a number of occasions. Although all keying was verified the error still occurred and there are some grounds for supposing that the supervision was at fault. The keying supervisors were mainly temporary employees and in retrospect it is felt that it would have been better to have used permanent staff from within the census office.

16. However there were problems too, which would be even greater if permanent staff were used, in finding a sufficient number of persons in the two areas where the processing offices were situated, who had sufficient experience of data processing to act in a supervisory capacity.

17. Another problem that has arisen in the post enumeration phase has been that, for a number of good reasons, analyses of census results have used a variety of population base - e.g. the population present on census night, the usually resident population calculated from answers given about absentees at the 'home' address, and the usually resident population calculated from answers given about absentees at the 'away' address, i.e. where they spent census night. Each of these gave a somewhat different figure for the population. In addition there was a preliminary count of the population based on enumerator returns and a series of population estimates (provisional, final, etc.) for which various adjustments were made to the census figures to take account of, for example, under enumeration, the processing error already mentioned and persons abroad for whom nobody was at home to complete a census form on their behalf. Some confusion has been expressed by users of census data over the number of different population figures. However the different figures served different purposes and all are considered necessary. For the future it is likely that efforts will need to concentrate on giving clearer explanations rather than on reducing the number of different bases.

18. The great majority of the 1981 Census results have been produced

within the set timetable and considerably in advance of the timetable achieved for any other census in Great Britain in modern times. For example many of the volumes have been published over a year quicker than their counterparts from the 1971 Census. Nevertheless there has been criticism that results published three years or more after the census took place (as the last tables in the scheduled output will be) will be published too late to be of much use. This is an important point and for future censuses ways need to be found for producing the census results, especially those topics at the end of the queue, even quicker than from the 1981 Census.

19. The progress in producing the 1981 Census output in good time has been achieved in spite of the difficulty of maintaining a team of experienced computer programmers and clerical processing staff to complete the census output. As the end of the main bulk of the work came in sight a number of these staff left or transferred to other work and these have proved very difficult to replace.

This average number of households included premises which did not contain people on census night – either because the whole household was absent that night or because the premises were vacant. The average number of households per ed which contained persons was 160 — this is the figure used in poster 4 on Small Area Statistics.

ЧЕХОСЛОВАЦКАЯ ПРАКТИКА ПОДГОТОВКИ, ПРОВЕДЕНИЯ ПЕРЕПИСИ НАСЕЛЕНИЯ И ОБРАБОТКИ ЕЕ ИТОГОВ

Доклад представлен Федеральным статистическим управлением Чехословакии

I. Юридическое обеспечение проведения всеобщих переписей населения в ЧССР

Всеобщие переписи населения, домов и квартир в Чехословакии проводятся на основе Закона о единой системе социальноэкономической информации № 21/1971 федеральным статистическим управлением после утверждения Правительством ЧССР решения о проведении этого мероприятия.

Постановлением Правительства ЧССР по вопросу проведения переписи населения (далее сокращенно ПН) 1980 года были определены задачи Федерального статистического управления (далее сокращенно ФСУ) и республиканских статистических органов в связи с проведением переписи в условиях федерального устройства ЧССР, а также задачи остальных органов государственного управления. В задачи ФСУ входило прежде всего обеспечение унифицированной в общегосударственном масштабе методики и определение способа проведения переписи и обработки ее результатов. В статистических органах национальных республик преобладали работы организационного и контрольного характера. Собственно перепись проводится национальными комитетами в соответствии с методическими и организационными инструкциями, изданными ФСУ в сотрудничестве в центральными статистическими органами национальных республик.

В указанном выше Законе определяется всеобщая обязанность населения в подаче соответствующей информации в ходе проведения переписи (исключение составляют только лица, обладающие правом дипломатической неприкосновенности и другими привилегиями), а также формулируются принципы специальной охраны данных относящихся к отдельным переписываемым лицам, от использования в нестатистических целях. Это означает, что статистические органы могут предоставлять информацию только в форме агрегированных данных.

Даже на данные, относящиеся к обитателям или объекту односемейных или двухсемейных домов, распространяется эта защита в соответствии с указанным положением, предусмотренным законом.

II. Долгосрочная подготовка к проведению переписи населения

1. Дата и содержание Переписи населения 1980

Дата ПН-1980 года была определена в соответствии с международной рекомендацией, заключающейся в том, чтобы проводить подобные мероприятия обычно в конце десятилетия. Выбор месяца проведения ПН, точнее критического дня, опре-

деляется прежде всего необходимостью и возможностью обработки предварительных (срочных) итогов с учетом распределения рабочего времени в течение недели, например, с учетом маятниковой миграции к местам работы или учебы. В соответствии с нуждами системы государственного управления в качестве критического момента ПН была выбрана полночь с 31-го октября на 1-ое ноября 1980 года.

Всеобщая ПН-1980 охватывала все физические лица, которые на критическую дату постоянно проживали в ЧССР, за исключением лиц, пользующихся дипломатическим иммунитетом и привилегиями, а также лиц, на которых распространялись специальные конвенции. Перепись квартир распространялась подобным же образом на все квартиры, постоянно заселенные (обитаемые) за исключением квартир лиц, не подвергающихся переписи, а также на все остальные помещения, предназначенные для проживания.

Основная, а можно сказать, стандартная программа ПН, начиная с 1961 года, содержит все рекомендованные основные характеристики, а также многочисленные характеристики, необходимые для удовлетворения внутригосударственных потребностей.

В основном программа ориентирована на обследование постоянно проживающего населения, переписных (цензовых) домохозяйств, квартирных домохозяйств и уровня (условий) проживания.

При практическом применении международных рекомендаций возникли две проблемы. Во-первых, проблема перевода чехословацкой классификации занятий ISCO, наличие различий которых обуславливает то, что для нужд международных сопоставлений можно представлять данные только за первую ступень группировки, предусматриваемой классификацией ISCO. Во-вторых, дело касается проблематики домохозяйств, так как данные по категории домохозяйств, ведущих совместное хозяйство, служили скорее для обеспечения сопоставимости данных, получаемых при проведении выборочных обследований населения, и в преобладающей части обрабатывались за категорию переписных домохозяйств. Поэтому эти данные о домохозяйствах обрабатывались, начиная уже с сентября 1970 года. Данные о квартирных домохозяйствах и переписных (цензовых) домохозяйствах наблюдаются, начиная с переписи, проведенной в 1961 году.

2. Метод проведения переписи

При чехословацких переписях населения применяется метод самопереписи, что позволяет сократить штаты счетчиков переписи и использовать их на других работах, связанных с проведением переписи. При этом не снимается их обязанность помогать населению в формулировке ответов на вопросы в случаях просьбы со стороны отдельных лиц. Поэтому использование этого метода связано с необходимостью проводить более тщательную подготовку счетчиков переписи и ревизоров, а также более обширную подготовку населения к этому мероприятию, и повышает требования, предъявляемые к упорядочению и точности формулировок отдельных вопросов и уточнению или дополнению данных.

3. Обеспечение полноты переписи

Предпосылкой к получению исчерпывающих результатов ПН, имеющей весьма важное значение, особенно, если речь идет о требованиях, касающихся подробности данных, получаемых и за наименьшие населенные пункты, является обеспечение охвата переписью всех обитаемых объектов.

В период, предшествующий проведению переписи, в Чехословакии проводится проверка нумерации домов и состояния регистрации населения. Такая работа проводится на всей территории страны, начиная с 1978 года. В результате принятия этих мер было достигнуто значительное улучшение в точности и полноте нумерации домов.

Важной составной частью долгосрочной подготовки к проведению ПН-1980 было проведение ревизии основных единиц поселения, которая охватила также всю территорию Чехословакии. Основные единицы поселения при переписи являются территориальные единицы, которые позволяют осуществить увязку переписных участков в административные единицы высшего порядка. Ревизия основных единиц поселения проводилась в период 1979-1980 гг. За период, истекший после 1 июля 1980 года вплоть до проведения переписи, случаи уточнения в этой сети были единичными.

Весной 1980 года была реализована последняя фаза территориальной подготовки к переписи, а именно: выделение переписных участков, разработка их описаний и подготовка соответствующих перечней номеров домов, входящих в состав отдельных переписных участков. Размеры переписного участка определялись на уровне примерно 100 квартир.

4. Подготовка счетчиков переписи

В проведении ПН-1980 обязанности счетчиков переписи и ревизоров были возложены на 70 000 человек - работников национальных комитетов, которые должны были участвовать в проведении ПН, и на работников статистических органов всех ступеней.

Ввиду многочисленности этого аппарата подготовка его была организована многоступенчато.

На информационных курсах руководящих работников национальных комитетов были объяснены главные проблемы переписи и содержание работы штата национальных комитетов.

Содержанием курсов для работников, обеспечивающих руководство проведением переписи в областях, районах и населенных пунктах страны (часть этих лиц позднее стала инструкторами счетчиков и ревизоров переписи), было изложение методических аспектов и вопросов организации переписи. Эти курсы проводились в областном масштабе.

Инструктажи счетчиков и ревизоров переписи в отдельных районах ориентировались на конкретные методические и организационные проблемы с учетом местной

специфики. В ходе дальнейшей подготовки органы государственной статистики предоставляли конкретные консультации, которые проводились вплоть до окончания переписи.

5. Подготовка населения к проведению переписи

В связи с использованием метода самопереписи была разработана обширная концепция пропаганды, проводимой среди населения.

Пропаганда была направлена прежде всего на объяснение общественного значения всеобщей переписи населения и использования ее результатов. В доступной форме население было информировано о методике и организации переписи, что создавало у людей конкретное представление о проведении переписи.

Достижению поставленных целей способствовал и ряд статей, публиковавшихся в печати, а также передачи по радио и телевидению, особенно специальные передачи для молодежи.

Кроме того, в рамках пропагандирования значения ПН использовались и другие возможности, например, выпуск почтовой марки, посвященной этой акции, наклеек на спичечных коробках и др.

6. Содержание переписной документации (переписных бланков)

При проведении переписи населения 1980 использовались три вида переписных бланков. В первую очередь это были «домовые листы», содержавшие характеристики отдельных зданий, с тем, чтобы некоторые данные этого вопросника могли использоваться при обработке и как характеристики отдельных квартир. Далее использовались «переписные листы», на основе которых собирались данные в рамках переписи квартир и проживающего в стране населения. Третьим видом вопросника был «переписной листок», в который вносились данные об отдельных лицах, проживающих в заведениях гостиничного типа (общежитиях, гостиницах и т.д.). Переписной листок одновременно использовался и для регистрации данных о лицах временно отсутствующих в месте своего постоянного жительства.

Домовые листы заполняли счетчики переписи на основе отчетов собственника дома. Одновременно этот лист использовался для записи и агрегирования выбранных данных о квартирах и лицах, проживающих в доме, которые служат для получения сигнальных итогов.

Переписной лист предназначен для внесения населением данных и содержит рубрики для заполнения записями о лицах и рубрики с предварительно напечатанными возможностями альтернативных ответов, касающихся квартир и оснащенности домохозяйства. Кроме того, переписной лист содержал инструкции по ответам на более сложные вопросы, рубрики, в которых ответы на контрольные вопросы формулировались словами (например, о временном присутствии и отсутствии постоянно проживающих лиц), а также рубрики для заполнения сводными данными о лицах, проживающих в квартире, регистрируемых счетчиком переписи.

Переписной лист был составлен так, чтобы можно было впоследствии кодировать внесенные в него данные.

Переписной листок по своему содержанию был аналогичен переписному листу с той лишь разницей, что в листок не вносились данные о квартирах и все записи в нем касались только одного лица.

Все вопросники были составлены так, что позволяли проведение ручного суммирования в целях ускоренного получения результатов счетчиками переписи, при одновременной возможности удовлетворения тех требований, которые предъявляются к документации, поступающей в машинную обработку.

7. Концентрация обработки итогов переписи населения

Обработка результатов переписи проводилась по двум этапам.

На первом этапе осуществлялась ручная суммаризация примерно по 100 показателям (сигнальные итоги). Публикация этих результатов постепенно была проведена уже в марте-апреле 1981 года. На уровне районов сигнальные итоги были в распоряжении уже в начале февраля 1981 года.

На втором этапе машинной обработке подверглись окончательные итоги переписи по отдельным территориальным уровням.

На наинизшем уровне обрабатывались 17 комбинированных таблиц, содержащих в общей сложности 1 363 показателя за каждую единицу поселения. На более высоком уровне территориальных комплексов данные обрабатывались в группировке по типам населенных пунктов и основных единиц поселений.

На уровне районов и областей обрабатывалось около 60-ти комбинированных таблиц. Обработка данных за города с численностью населения в 50 тысяч и более жителей и за выбранные города с населением менее 50 тысяч человек, проводилась в таком же масштабе.

На уровне национальных республик и всей страны также обрабатывалось около 60-ти таблиц, содержащих детальные комбинированные данные, главным образом о населении, плодovitости женщин, квартирах, переписных домохозяйствах, о маятниковой миграции к местам работы или учебы.

Значительные масштабы табеляции и за наименьшие единицы позволили получить ряд ценных информации о деталях в территориальном разрезе. Результаты переписи использовались для разработки прогнозов перспективной численности населения и домохозяйств на период до 2020 года и для составления баланса трудовых ресурсов и потребностей в них в зависимости от уровня образования.

III. Календарный план проведения переписи населения

1. Этапизация проведения ПН

Собственно перепись была начата в последнюю неделю октября 1980 г. раздачей вопросников по квартирам и учреждениям. Окончание переписи было запла-

нировано на 6-ое ноября 1980 г. (для укрупненных переписных участков на 9-ое ноября 1980 г.). До этого срока счетчики переписи должны были сдать ревизорам полученную документацию. После проведения и комплектации этой документации за соответствующий участок ревизоры передали материал своему национальному комитету в период от 12-го до 18-го ноября.

В период 15-21 ноября материалы переписи передавались местными национальными комитетами соответствующему районному национальному комитету, где их превзяли уже работники районного статистического отделения Чешского статистического управления или Словацкого статистического управления.

2. Обязанности счетчиков и ревизоров переписи

Лица, выделенные для проведения переписи в качестве счетчиков и ревизоров дают официальную присягу и пользуются правом неприкосновенности лиц, исполняющих официальные общественные обязанности. Для исполнения работ, связанных с проведением ПН, эти лица освобождены от работы на необходимое для этого время (максимально до 10 рабочих дней), при сохранении заработной платы и с оплатой за работу, проведенную в ходе переписи. Значительную часть счетчиков переписи и ревизоров составляли пенсионеры.

В среднем на одного счетчика переписи приходилось 100-120 квартир. В их основные обязанности входило установление контактов с континентами переписываемого населения, т.е. на них возлагалась обязанность обеспечить распределения всех бланков переписи по квартирам, предоставить населению необходимые информации, проверить полноту и правильность данных, приведенных в ответах на вопросники, превзятых от населения. В некоторых случаях счетчики заполняли бланки сами на основе ответов лиц преклонного возраста или больных. Счетчики обязаны были проверить правильность и полноту проведения переписи на порученном им участке, т.е. обеспечивали дополнение и тех лиц или квартир, которые по каким-либо причинам не были включены в описание переписного участка. В обязанности счетчиков входила и обработка сводных данных в объеме, установленном программой получения сигнальных итогов за отдельные квартиры, заполнение домовых листов и комплектация материалов для передачи их ревизорам.

Ревизоры переписи руководили работой, как правило, пяти счетчиков и осуществляли проверку их работы. Следующая обязанность ревизоров заключалась в приеме заполненных вопросников от счетчиков и дополнительное включение лиц, которые сами заявили о своем существовании (прибытии, присутствии), в проведении суммаризации сигнальных итогов за дома, переписные участки и свой ревизорский округ. Работа ревизоров заканчивалась проведением упорядочения (согласно предписаниям) материалов переписи и передачей их соответствующему национальному комитету.

3. Отношение населения к переписи

Тщательная подготовка переписи и обширная кампания по пропаганде ее значения проявилась в высокой активности участия населения в проведении переписи,

в полноте заполнения документации переписи и в обеспечении полноты переписи вообще.

IV. Период после проведения переписи населения

1. Деятельность органов государственной статистики в период, предшествующий машинной обработке данных

После проведения переписи населения деятельность работников органов государственной статистики была направлена на решение трех основных задач: проведение контроля полноты переписи, суммаризация и публикация результатов и кодирование данных о населении, связанное с контролем остальных данных, приведенных в ответах на вопросники.

Проведение контроля полноты данных за переписываемые лица обеспечивали статистические органы на основе взаимного сопоставления данных двойной регистрации лиц, находящихся в критический момент переписи вне места своего постоянного жительства. Эти лица учитывались как присутствующие в месте их фактического пребывания и далее как отсутствующие в месте постоянного жительства.

Указанные выше работы проводились в период с 20 ноября по 10 декабря 1980 года, так что за исключением некоторых специфических случаев в распоряжении имелась уже полная совокупность данных о постоянно проживающем населении, служивших для подготовки сигнальных итогов.

Проведение контроля полноты переписи населения имело очень большое значение. Данные о численности населения, полученные в ходе переписи, способствовали уточнению данных о численности населения, рассчитанных в демографическом балансе (уточнение составило три десятых процента) и числе статистически учитываемых квартир (половина промилле).

Результаты контроля почти исчерпывающим образом отразились в сигнальных итогах, которые были обработаны в районных органах государственной статистики в течение последующих четырех недель. Их общегосударственная обработка была закончена в начале февраля 1981 года. В связи с продолжением проведения контроля сигнальных итогов в объеме 104 показателей публиковались постепенно, начиная уже с 1 марта 1981 года.

Важная задача последующего периода заключалась в кодировании данных о населении с проведением одновременного контроля остальных данных, внесенных в вопросники.

Кодирование проводилось децентрализованно в так наз. центрах кодирования, начиная с середины октября 1981 года.

2. Обработка окончательных итогов переписи населения

Методическая подготовка обработки заключалась в определении некоторых первичных характеристик, на основе которых определялись взаимосвязи между основными данными, а также в определении хода собственно обработки. Составной

частью обработки были также и пересчеты данных 1970 года о населенных пунктах и территориальных комплексах высшего порядка на административно-территориальную структуру, действующую в критический момент переписи. Результаты этих работ использовались как для проведения логического контроля результатов переписи населения 1980 года, так и в последующих аналитических работах.

Запись данных переписи населения на магнитные ленты проводилась децентрализованно в областных вычислительных центрах органов государственной статистики.

Центральная обработка, проводимая в общегосударственных масштабах на ЭВМ Федерального статистического управления, охватывала все фазы обработки данных за отдельные районы, включая табеляцию требуемых выходов данных, а также суммаризацию за территориальные комплексы высшего порядка. Центральная обработка заканчивалась печатью соответствующих выходов данных.

3. Публикация и анализ итогов переписи населения

Окончательные итоги переписи населения 1980 года, обработанные за основные единицы поселений, населенные пункты, районы, области, национальные республики и в целом за ЧССР, передавались пользователям постепенно в период с апреля по декабрь 1982 года. С переписью населения непосредственно увязывалось проведение обследования «Микроперепись 1981», в результате которой были получены данные о денежных и натуральных доходах квартирных домохозяйств и другие информации, дополняющие перепись.

Постепенная обработка итогов переписи населения и их непосредственное предоставление центральным органам, национальным комитетам всех ступеней, научно-исследовательским институтам и высшим учебным заведениям позволило этим органам и учреждениям немедленно воспользоваться полученными результатами переписи населения в своей руководящей или научной деятельности.

На основе результатов переписи населения 1980 года и их сопоставления с данными предшествующих переписей, Федеральное статистическое управление ЧССР разработало ряд тематических анализов динамики развития народонаселения, семей и домохозяйств, экономической активности населения, изменений в уровне проживания и оснащенности домохозяйств, повышения уровня образования населения изменений структуры населенных пунктов и др. Особое внимание в анализах уделялось развитию молодого поколения и населению нетрудоспособного возраста. Полные и частичные анализы итогов переписи населения были разработаны также в Чешском статистическом управлении и в Словацком статистическом управлении, а также в областных органах государственной статистики.

Кроме результатов переписи населения и их анализов, изданных в публикациях органов чехословацкой государственной статистики, в специальных журналах и в прессе, Федеральное статистическое управление обеспечивает непосредственное представление данных соответствующим пользователям в соответствии с их специфическими запросами или требованиями.

Об обработке окончательных итогов переписи населения, домов и квартир, проведенной в 1980 году, Федеральное статистическое управление в апреле 1983 года представило сводную информацию Правительству ЧССР.

V. Некоторые предложения по подготовке следующей переписи населения

На основе опыта, полученного в результате проведения переписи населения 1980 года и с учетом международного опыта, накопленного в этой области, при подготовке последующей переписи будет целесообразным проанализировать прежде всего связи между методом переписи и используемыми при этом вопросниками, а также между способом обработки данных и степенью их использования, целесообразно было бы также взвесить возможность расширения круга показателей, наблюдаемых на основе выборочного метода.

Конкретно в ЧССР будет изучаться возможность использования считывающих устройств при применении метода самопереписи, или же возможность проведения переписи при помощи опроса населения специально выделенными для этого работниками переписи.

Опыт проведения переписи населения 1980 г. показал, что объем массива данных и число контрольных связей между машинограммами различных типов настолько велик, что на будущее представляется актуальной необходимость использования ЭВМ для формулирования и оптимизации процесса издания данных переписи населения и взаимоувязки машинограмм.

Для исследования некоторых специальных проблем представляется целесообразным в ходе обработки данных переписи населения создать выборочную совокупность, базирующуюся на данных всеобщей переписи населения и позволяющую применять более сложные математико-статистические методы при анализе изучаемых проблем.

Наличие массивов данных ПН-1970 и ПН-1980 позволяет решить вопрос использования уже агрегированных данных для проведения перерасчетов территориальной структуры, или же для отражения сопоставлений, проводимых по времени в стандартных выходах. Кроме всего прочего, взвешивается возможность использования имеющихся в распоряжении входных данных ПН-1970 или ПН-1980 в целях изучения социальной мобильности населения, развития домохозяйств и условий проживания.

PREPARATION AND HOLDING OF THE POPULATION CENSUS IN CZECHOSLOVAKIA AND PROCESSING OF RESULTS (a)

Summary

The legal basis for conducting general population and household censuses in Czechoslovakia is provided by Act No. 21/1971 on the unified social and economic information system. The Act lays down the main principles underlying the organization of the census, sets out the obligations of organizations and the population in respect of State statistics, and guarantees the protection of individual data from utilization for other, non-statistical purposes.

Population censuses are held at the end of each decade, and the last general population census in Czechoslovakia was carried out on 1 November 1980. The census is conducted on the basis of *de jure* presence and the principal method used is the "self-recording" method (although the census is also conducted on the basis of the place where each person is actually staying at the time of the census).

The census programme was largely standardized in 1961 and contains all the principal items as well as a considerable part of the recommended additional items. As compared with international recommendations, the Czechoslovak census covers three levels of households: dwelling units, independent households, and households considered as such for census purposes (this category is determined by the kinship of the persons comprising the household).

To ensure the completeness of the census, checks are carried out of population records and house numbers, and of the network of settlement units which form the basis of census districts (each census district comprises approximately 100 dwelling units). In addition, completeness of coverage was checked after the census by comparing the records of persons temporarily

(a) Report prepared by the Czechoslovak Federal Statistical Agency.

absent from their place of permanent residence with those of persons actually present at the place of their temporary residence.

The last population census was carried out by about 7,000 persons, most of them enumerators and supervisors selected by national committees from among citizens morally and professionally qualified to do such work. They were formally sworn in and enjoyed the immunities of persons exercising official public duties.

Three main types of forms were used in the 1980 population census: "house lists" for the house census, "census lists" for the census of individual dwellings and the persons residing in them, and "census forms" for listing individuals residing in institutions of various kinds (hospitals, hostels, homes for the aged, etc.). The questionnaires were drawn up in such a way that the results could be added up by hand and that they could be used as input documents for mechanical processing.

The summary results (104 indicators) were processed by hand and published within the 5-6 months following the census. Mechanical processing of the final results was begun six months after the census and was concluded with the publication of the last results at the end of 1982.

The final results were worked out in considerable detail: 17 combined tables were prepared for each of 27,000 inhabited localities and 7,500 settlements, a set of 60 tables for each larger geographical unit and a further 60 tables with detailed grouping for the national republics.

Because of the excessively detailed nature of the results obtained, special attention will have to be given in preparing the next census to the question of utilization of these data and to the method of obtaining and processing new data (question of random surveys), as well as to the extensive use of computer techniques and computers for the formulation and optimization of processing methods and the co-ordination of print-outs.

STUDY TOPIC (ii)

National Experiences in the Usage of Sampling in the Different Stages of the Census.

Discussion leader: Dr M. Ebert (German Democratic Republic).

Papers prepared by:

- Bulgaria
- Canada
- Federal Republic of Germany
- Italy
- Norway
- Poland
- United Kingdom

**TEXT OF OPENING ADDRESS
AND SUMMARY OF DISCUSSION (a)**

**USAGE OF SAMPLING METHODS IN DIFFERENT PHASES OF THE
CENSUSES OF POPULATION IN ECE COUNTRIES IN OR AROUND 1980**

First of all I wish to thank the Secretariat and Istat (Istituto Centrale di Statistica) for giving us the opportunity, at this seminar, to discuss the rich experience with sampling methods used in the preparation for and the conduct of censuses. But I would also like to note that the "Handbook of Population and Housing Census Methods", especially part IV, "Samplings in connexion with population and housing censuses", issued by the United Nations Statistical Office, has provided all countries with a good, general foundation regarding the use of sampling methods in the various phases of a census.

In 1983 the Secretariat sent a questionnaire to all ECE Member States in order to collect data on the application of the recommendations for population and housing censuses in the 80s and, if necessary, to work out new recommendations for the censuses to be taken around 1990.

This questionnaire was also used to determine how the various countries applied sampling methods. The results have been summarized in document CES/SEM. 17/2.

I believe that it would be advisable for us to deal with the following topics in the further discussion on the use of sampling methods in the various phases of a census:

1. We should discuss the various fields of application recommended so far, consider their advantages and disadvantages, and at the same time specify and complete the list which we have before us.

2. To the extent it appears advisable and correct, we should define and recommend new areas of application in censuses with regard to sampling

(a) Prepared by Dr M. Ebert.

methods. But at the same time we should also confirm the fields of application which have been practiced so far.

I may be allowed to make a few summary comments on the issue, i.e. the use of sampling methods in connexion with censuses. On this issue, a number of countries have provided the seminar with very instructive and constructive documents about their experiences with the use of samples. I would like to make an attempt to pick up a few ideas out of the wealth of materials and to assign them to the various fields of application where samples are used in censuses.

1. TESTS OF CENSUS PROCEDURES

In the "Handbook of Population Census Methods" census tests have been defined as

"all types of tests connected with a census, whether a questionnaire test only, a limited field-trial, or a comprehensive experimental census".

During the preparation for a census one faces the problem of having to choose among various procedures, questions, time and cost factors. In countries of the ECE region the field of application of census tests is very broad, and can be seen from the list given in document CES/SEM. 17/2. When these tests are made on a sampling basis, one will often have found the optimum solution with a high level of precision. Since samples have this scientific, statistically safe basis, they can highly contribute to getting reliable answers in planning a census. Thus, for instance, samples were used:

a) in the 1981 census in Canada for testing questionnaire wording, trying new collection procedures, and estimating time and cost requirements for the full census;

b) in censuses in Norway good experience has been collected in using samples for pre-tests of the collection methods, the questionnaires and the information campaign;

c) in the census of the Federal Republic of Germany also pilot surveys had been made for these tasks.

In making census tests one should be aware of the fact that it is not always possible to use sampling methods. Thus, for instance, in the 1980 census in Italy a test survey was made, *inter alia*,

"to test the forms for the optical reader, both to confirm the feasibility of using such a device as well as to point out

the likely defects in their completion and to study the expedients in order to avoid them at the time the census is taken".

As a result of these census tests it was then decided not to use optical readers.

In the German Democratic Republic the Census Act stipulates the conduct of test censuses for the purpose of making thorough preparations for the national census proper. The basic objective of these test censuses is to find out how the theoretically elaborated scientific and organizational principles of census work in practice, taking into account both urban and rural conditions.

The purpose of a test census conducted in a rural district with a population of 132,000 was, apart from the usual objectives,

"the replacement of the punched card procedure used during census processing by optical sensing devices in order to reduce manual work and speed up the census evaluation".

The inhabitants of the area chosen for the test received census forms of varying design with the aim of developing a form equally suited to the public and automatic reading techniques.

It proved impossible to reach this objective on the basis of just one test census, so that another 5 series of tests were carried out with different objectives in mind.

The census organization was geared to the requirements of using cards without holes, the forms which were to be completed by the public and read automatically were developed, and the employment of census supervisors for the main part of the evaluation work tried out in practice. A number of less extensive tests led to the production of suitable paper for the census forms and to their design in terms of colour and layout.

In general, it may certainly be said that in many countries the preparation for a census, in practice, includes trial censuses or pilot surveys in order to test the most different tasks connected with a census.

2. ENUMERATION OF TOPICS IN ADDITION TO THOSE FOR WHICH UNIVERSAL COVERAGE IS REQUIRED

Looking at the summary worked out by the Secretariat on this complex of issues on the basis of replies given by the various countries, we will notice that this method is used by relatively few countries. That's why it would be desirable to clarify the reasons for it in the discussion.

The documents submitted to the seminar on this question show that

particularly in the PR of Bulgaria, Canada, and the PR of Poland samples on demographic phenomena are made together with the full form of the census.

In the PR of Bulgaria two additional samples were taken together with the census in 1975. The first sample gave statistical information on fertility used as a point of departure for an in-depth analysis of the situation in this field. A second sample dealt with migration processes and the demographic, occupational and social characteristics of migrants.

The PR of Poland also made investigations into fertility and migration processes on a sampling basis together with the censuses.

During the preparation for the 1981 census in Canada various versions of the questionnaire, each having a different combination of questions for certain groups, were examined. As the main advantages one considered the reduction in the maximum number of questions which would have had to be answered by each individual. However, these advantages were felt to be outweighed by the disadvantages, among them being complication of collection and data processing procedures and the extra burden on enumerators.

We know that in many countries the needs for reliable demographic data have grown in the last few years. But we also know that a census questionnaire cannot be boundlessly extended in order to prevent it from becoming too big a burden on individuals and households. Besides, the period during which the results are calculated and the costs have to be limited. In addition, the experiences of some countries show that it is not necessary to collect all demographic and other census data on a full basis. Is that not a challenge to make broader use of sampling methods in the considered complex of tasks?

In the document and the discussion by the distinguished delegate from the Federal Republic of Germany we have read and heard about broader fields of application of sampling methods between the censuses. I think it must also be possible to use sampling methods within the censuses to minimize the questions which are a burden on individuals and households.

3. POST-ENUMERATION FIELD CHECKS

We know that during the conduct of censuses there is no procedure which would keep the results of interviews with households and individuals completely free of errors. Nevertheless, the users of census results expect, of course, that they would meet high quality requirements. Thus, it has proved good to find out or determine certain types of errors and their size orders by post-enumeration checks on a sampling basis. In this connection, the main purpose of post-enumeration checks is certainly that the user of the data can be informed of the accuracy of census results, but also that census bureaus would get some degree of confidence in the full coverage of the census.

Thus, for instance, after the 1981 census in Canada a reverse record check was made to identify non-coverage of individuals and households.

In Great Britain a post-enumeration check was made immediately after the census in 1981. It was used to assess the coverage of the census and the quality of response to the questions. For this purpose, five samples were taken, which were called: visual list sample; vacant/absent sample; non-residential sample; quality check sample and multi-household sample.

In my opinion, it is necessary in the use of post-enumeration checks to distinguish between the purposes they are intended to serve. If one expects precise, quantitative data on the evaluation of census results, for instance, for the determination of the extent of under — and over — coverage, random sampling should be used. For all other purposes it will certainly suffice to make post-enumeration checks which have no sampling character.

In the PR of Bulgaria a post-enumeration check was made immediately after the population census. This control census covered all persons, living permanently or staying temporarily in ordinary housing units or in group quarters in residential or non-residential buildings.

4. QUALITY CONTROL OF DATA PROCESSING

It is certainly difficult to assign all control procedures used during a census with the purpose of ensuring an excellent quality of the census results, according to the 6 points of the nomenclature as presented in document CES/SEM. 17/2.

There will certainly be some points of contact with the preceding, third complex.

Perhaps, it is possible to distinguish between these two complexes in the sense that:

a) the use of samples as described in the section "post-enumeration field checks" relates, above all, to the identification of error sources and their implication for census work, whereas;

b) the present section deals with the use of sampling methods in all phases of census work, such as correct coding of census data; the preparation of data to be processed either with punched cards or with magnetic tapes; additional checks or quality controls of coding during data processing and the verification of tabulation or also some computing operations.

There will, certainly, be also countries which will not do without more comprehensive or even total controls of recorded data on individuals, households or apartments, but will identify and abolish wrong data by logical checks made according to certain fixed algorithms. But recently, as can be seen from the summary made by the Secretariat, sampling methods have been used to a considerable extent. In this connection, preference is likely to be given to those

methods which are also used in industry to check on the quality of serial production. In any case, this method will imply lower cost than a quality check made on a full basis.

5. ADVANCE TABULATION OF SELECTED TOPICS

We know that in case of a full census, above all if it is organized as a combination of a population census with a housing census, the interval between the data of the census and the complete publication of census results is very long. This discrepancy cannot be completely removed by the use of modern computers, either. The expectations of users with regard to the prompt delivery of the main data of the population census are high.

That's why sampling methods have repeatedly been used in the latest censuses in a number of countries for advance tabulations of selected topics.

The greatest benefit of using sampling for obtaining advance tabulations is speed, since sample results can be obtained in only a fraction of the time needed to make the same tabulation for all census units.

Another point to mention about advance tabulation is that comparisons can be made in due course between the provisional figures based on samples and the final ones obtained in the traditional manner. In the use of samples for advance tabulations of data, profit can also be taken from the efficient use of small sample units (for instance, apartments or households), since these small census units are easy to select.

Thus, for instance, in Italy together with the census a systematic sample of households, one out of 50, equivalent to 2% of the universe, was selected from the magnetic tapes containing the information inferred from the census questionnaires. It has been assessed that the rate of sampling has been chosen with due consideration of both the sample error and the processing time.

In the PR of Bulgaria a sample was taken on the basis of a one-stage cluster with the housing unit serving as cluster. The clusters themselves were selected by several independent sub-samples in order to simplify the estimation of the stochastic error of characteristics. However, the selection of the sample required some additional effort on the part of enumerators who had to copy the selected census questionnaires themselves. As a matter of course, advance tabulation on the basis of sampling also has certain disadvantages, such as, for instance, possible delays in the full processing of data; provision of data on demographic and other characteristics only for relatively large areas and also that in view of the provisional character of the results they may cause less public interest.

6. FINAL PROCESSING AND TABULATION

A number of papers submitted to the seminar underline cost and time as the

basic factors which are decisive of the total census and thus also with regard to the use of sampling methods. Consequently, sampling methods are used either to reduce or to expand the size of processing of the census results.

a) Certain demographic, housing and other characteristics are only needed by large areas and for the country as a whole. Through sampling, it is possible to obtain tabulations for such areas with small sampling errors and at a much reduced cost and in shorter time than on a complete basis.

b) On the other hand, it may be very advantageous to use a sample for expanding census tabulations, for instance, for getting additional information of only a limited population sample or on a certain complex of investigations.

In my opinion, this last aspect will gain importance also with regard to future censuses. Above all, in the sense that certain cross tabulations between various census complexes such as between the population census, on the one hand, and the housing census, on the other hand, will be made possible in a comparatively easy way.

As you see, we have very big experience in the use of sampling in ECE countries. These interesting questions were also described very instructively and constructively in all reports.

**THE EXPERIENCE OF THE PEOPLE'S REPUBLIC OF BULGARIA
IN A SAMPLE APPLICATION AT THE DIFFERENT STAGES
OF THE POPULATION CENSUS (a)**

The last population and housing census of the People's Republic of Bulgaria was taken on 2 December 1975. It differs from the other censuses taken so far in a sample application at all its stages, namely:

1. during the census, along with the comprehensive form a population sample has been used for a detailed study of phenomena which are of great importance for our country — fertility and migration;

2. to estimate the reliability of the information obtained during the census, immediately after the census-taking process two control censuses have been taken — for completeness of the coverage and the accuracy of the registration;

3. a sample survey has been carried out at the data processing stage, when in the shortest time data on the major socio-demographic characteristics were required to satisfy the urgent needs of the managing bodies.

The methods of the sample surveys will be described here in brief.

I. SAMPLE STUDY

a) Sample study of fertility

1. The purpose of the study

The fertility problem, being a problem of present interest in our country, led us to decide to include in the census programme a special sample survey. The

(a) Report prepared by the Committee for the Integrated Social Information System for the Council of Ministers of the People's Republic of Bulgaria.

purpose of this survey was to obtain information on the broad socio-demographic characteristics of the women and assess the influence of some factors on fertility.

2. *The target of the survey*

The target of the survey for the study of fertility were women between the age of 15 and 54, married (*de jure* or *de facto*), divorced or widowed and enumerated as a constantly present population or as temporary absent persons. The contingent of the surveyed women was greater than the fertility group so as to ensure comparability with data obtained during the census of 1965, the total fertility being surveyed for the period 1970-1975.

3. *Tools of survey*

The tools of the survey include a personal questionnaire accompanied by an instruction guide.

The questionnaire consists of four basic parts, which include characteristics on fertility:

a) data on women's children and marriages: marital status, age, number of children born alive, education and occupation during the birth of the first three children born alive, serial marriage, age at the moment of marrying and at the dissolution of the marriage;

b) data on the husbands of the married women from their last marriage — age, education, occupation and social group;

c) data on the housing conditions of the woman — ownership of the household, number of rooms;

d) data on the woman and the household - how the dwelling is used, number of household members, woman's age, education, occupation and social group.

4. *Method of survey*

The survey for the study of fertility was conducted through an inquiry, which was done by women-interviewers, specially trained for this purpose.

5. *Model and scope of the sample*

The sample model for the study of fertility used a one-stage cluster approach, divided into areas, the cluster being the enumeration area. The districts and the places of residence (town, village) have been used as area indications. Furthermore, during the formation of the sample, a serpentine,

respectively a spiral arrangement of the enumeration areas was used according to the size of the settlement within each district.

With the help of all these methods we managed to reduce the stochastic errors in the surveyed characteristics.

The scope of the sample amounted to 121,000 women.

6. Assessment of the accuracy of the obtained results

The stochastic accuracy of the obtained results was estimated through the calculation of the confidence intervals with guarantee probability 0.95 according to the method of the interpenetrating subsamples.

For each table of the elaborations programme a respective table with the calculated stochastic errors was generated. The number of the maximum errors proved to be within the estimated boundaries.

Much statistical information (tables) has been accumulated on the basis of the fertility sample survey and a profound analysis has been made of the fertility situation and its trends.

b) Sample study of migration

1. Purpose

The purpose for the study of migration has been to obtain detailed information on the migration processes in our country, which will make it possible to analyse the causes for the migration and the changes that took place in the occupation, branch affiliation, social group and membership of the migrants.

2. Target of the survey

The target of the survey were those persons whose permanent residence on 2 December 1975 was different from the permanent residence on 1 December 1965, and for the children born after 1 December 1965 from the permanent residence of the mother during their birth.

3. Tools of survey

The tools comprised a questionnaire, accompanied by an instruction guide. The questionnaire has an introduction and three parts:

The introduction contains general characteristics which identify the migration questionnaire with the census questionnaire, as well as an instruction for the persons for whom it should be filled in.

Part I - "Data on migration" contains five questions: place of residence on 1 December 1965 (respectively for those, born after 1 December 1965 the place of residence of the mother during the birth of the child), number of migrations during the surveyed period, the year of the last migration, place of residence before last migration and the causes for the migration.

Part II - "Data on the migrant immediately prior to his migration to the settlement, where on 2 December 1975 he lived permanently" — contains questions which help to ascertain the major socio-demographic characteristics of the migrant immediately prior to his last migration — marital status, education, economic activity according to the social group, production sphere, branches of the national economy and the main groups of occupations.

Part III - "Characterization of the migrant by 2 December 1975" — contains several major socio-demographic characteristics of the migrants during the surveyed period by the moment of the general population enumeration. The answers to the questions in this part have not been filled in by the census takers but by those who code the questionnaire transferring the answers to the respective questions from form "A".

4. Method of registration

The sample survey for the study of migration has been conducted by the census takers by an interview.

5. Model and scope of the sample

The survey on migration has been conducted on a one-stage cluster sample, the cluster being the enumeration area. The sample has been divided into areas. The characteristics "district" and "place of residence" (town, village) have been used as an area indication.

The scope of the sample amounts to 67,000 migrants.

6. Stochastic accuracy

The stochastic accuracy of the obtained results has been estimated through the calculation of the maximum errors (the semi-widths of the confidence intervals) in the characteristics with a guarantee probability 0.95 according to the method of the interpenetrating subsamples. For this purpose the sample has been formed by five independent subsamples through a systematic selection from the comprehensive lists of the enumeration districts (separately for the town and village areas).

Detailed information was received during the statistical survey and published together with an analysis of the migration processes during the 10-year period (1 December 1965 - 2 December 1975).

II. CONTROL CENSUSES

During the census taking process which is a great statistical undertaking, covering the whole population of a country and conducted by thousands of census employees, errors occur, although all possible measures are taken to avoid them. They are the errors in the coverage of the population and housing units and the errors of the registration. That is why an up-to-date census should be followed by the so-called control censuses. Their main objective is to inform census users of the degree of accuracy of the obtained results.

Two types of control censuses are carried out — to check the comprehensiveness of the coverage and the accuracy of the registration. It is necessary to mention here that the census of 1965, which was taken on 1 December, was followed by two control censuses — one to check the population coverage and the other to check the registration accuracy. Therefore, besides some experience in the taking of control censuses, we have at our disposal the necessary information for the scientific planning of these surveys.

a) Control census of the comprehensiveness of the population coverage

1. Purpose

The control census had two purposes:

a) to supply the necessary information on the errors made during the census coverage of the population and;

b) to assist the organizers of the future censuses pointing out those errors that occur the most frequently, as well as the causes for their occurrence.

2. Coverage

The control census covered all persons, living permanently or staying temporarily in ordinary housing units or in group quarters in residential or non-residential buildings.

The control census had been effected immediately after the population census.

3. Tools

The tools for the control census consisted of questionnaires about the main characteristics of the inspected persons and enumerators, accompanied by an instruction guide.

4. *Methods for conducting the control census*

The control census has been performed by a detailed interview, which has been carried out by 506 inspectors – employees at the District statistical offices. Each inspector has observed two enumeration areas and has made a personal visit to 12-15 residences.

5. *Model and scope of the sample*

The model of the sample has been a two-stage cluster one, the cluster on the first stage being the enumeration area, and on the second stage the housing unit. One thousand enumeration areas have been selected and from the latter every tenth housing unit. The scope of the sample amounted to 26,000 persons.

6. *Assessment of the stochastic accuracy of the results*

The stochastic errors for the main characteristics have been calculated according to the formula for a two-stage cluster approach.

The general results from the control census for the comprehensiveness of the coverage during the census on 12 December 1975 are as follows:

- non-enumerated persons - about 3.1 per cent;
- enumerated twice - 3.7 per cent;
- net error (+) - 0.6 per cent.

The results show that the census has been taken at a high degree of population coverage comprehensiveness.

b) Control census for the accuracy of the registration

1. *Purpose*

The control census for the accuracy of the registration had two purposes:

a) to ascertain registration errors for some of the main characteristics of the general population and housing census programme and thus show to what an extent the census results are reliable and;

b) after analysing the results from the control census to outline activities to reduce the registration errors in future censuses.

2. *Target of the control census*

The target of the control census for the accuracy of the registration were all persons and housing units enumerated on 2 December 1975.

3. Tools

The tools for the control census of the registration accuracy consisted of questionnaires with four characteristics for the person to be inspected (age, education, marital status and migration) and two characteristics for the housing units (living area and subsidiary area) and a questionnaire for the census enumerator with five characteristics (sex, age, marital status, education and place of residence).

4. Method of registration

The control census for the accuracy of the registration has been conducted by an interview, carried out by employees from the District statistical offices.

The information that has been collected during the control of the registration accuracy refers according to its content to the moment of enumeration, i.e. 0 hour on 2 December 1975.

5. Model and scope of the sample

The control for the accuracy of the registration has been conducted on a two-stage cluster sample, the cluster at the first stage of the selection being the enumeration area and the unit at the second stage of the selection the housing unit, where all persons have been surveyed.

6. Stochastic accuracy of the results

For all characteristics the stochastic errors have been calculated according to the formula for a two-stage cluster approach. The result thus obtained show that the registration errors in the population characteristics are comparatively small, i.e. the accuracy of the registration is high.

The results and the conclusions made after the control censuses of 1975 will help the organizers of future censuses, focusing their attention on those errors which occur the most frequently and their sources, as well as to the selection of the most appropriate census takers with the aim to achieve even greater coverage and accuracy in future censuses of the population and the housing.

III. SAMPLE SURVEY

1. Purpose and objectives

The use of a sample survey is prompted by the necessity to supply the managing bodies in a short period of time with the main census results and thus satisfy their most pressing needs.

The last census of the population and housing in our country was taken on 2 December 1975. The term for obtaining the comprehensive results in comparison with the previous censuses had been comparatively shorter (one year). Nevertheless, a decision had been taken to work out a sample survey of the census material with the aim to obtain the results for the major socio-demographic and socio-economic characteristics three — four months after the census conclusion — by the end of March 1976.

2. Programme for the sample survey

The sample survey had to supply information on those characteristics and their combinations, which were of great importance for the managing bodies. First and foremost these were the major characteristics — sex, age, marital status, place of residence (town, village) and district and the main socio-economic characteristics — education, occupation, production branches, production spheres, occupation groups, sources of the means of existence as per family members number and households members number.

3. Model and scope of the sample

When choosing the model of the sample, the requirement that the sample survey of the census material should be effected separately from the comprehensive one played a decisive role, which necessitated the questionnaires included in the sample to be copied by the enumerators themselves. In order to make this additional burden on the part of the enumerators minimum and evenly distributed at the same time, a decision had been taken to carry out the sample survey on a one-stage cluster sample, the cluster being the housing unit.

The sample covered 43,000 enumeration forms and 146,000 persons — permanent population.

4. Stochastic accuracy of the results

The estimation of the stochastic errors of the characteristics requires much calculation on the exact meaning of the intercluster correlations of each characteristic. To overcome this obstacle the clusters are selected through several independent subsamples. This selection allows the use of the interpenetrating subsamples method for the calculation of the stochastic errors of the characteristics without the values of the intercluster correlations.

The maximum stochastic errors proved to be within the estimated boundaries. On the basis of the sample survey for a very short period of time the results had been published together with an analysis of the major socio-demographic and socio-economic characteristics of the population.

The experience in the application of the sample method for the survey, data processing and control of the coverage and accuracy gained during the census of the population and housing in 1975 will serve as a basic for wider application of this method in the forthcoming census of the population and housing in the People's Republic of Bulgaria at the end of 1985.

THE USE OF SAMPLING IN THE 1981 CENSUS OF CANADA (a)

I. INTRODUCTION

1. The history of the census in Canada dates back more than three hundred years, when Jean Talon conducted the first census in the colony of New France in 1666. In 1867, the British North America Act created the Dominion of Canada, and also established the Census of Canada. Under this act, a census was to be taken in 1871 and every tenth year thereafter. Its main purpose was to determine population distribution as a basis for the drawing of electoral boundaries. More recently, census statistics have been used to calculate per capita grants to provinces and municipalities, to determine economic and social policies, to plan industrial development and to estimate needs for schools, roads and many other public services. To fill the growing need for more frequent data, a series of quinquennial censuses began in 1956 and continued in 1966 and 1976.

2. By contrast, the development of statistical sampling is a relatively recent phenomenon. However, sampling has quickly gained acceptance in a variety of settings. It is used, for example, by accountants in auditing financial statements, in industry for controlling the quality of items coming off a production line, and by the takers of opinion polls and surveys in producing information about a population's views or characteristics. In general, the motivation to use sampling stems from a desire either to reduce costs, to obtain results faster, or both. The disadvantage of sampling is that the results based on a sample may not be as precise as those based on the whole population. However, when the loss in precision (which may be quite small when the sample is large) is tolerable in terms of the uses to which the results are to be put, the use of sampling is often cost-effective. Furthermore, the reduction in the scale of a study achieved through using sampling may in fact lead to a reduction in errors from

(a) Report Prepared by D. Royce - Statistics Canada.

non-sampling sources, thus compensating to some extent for the loss of precision resulting from sampling.

3. This paper discusses how census-taking and sampling were combined in the 1981 Census of Canada. Section 2 gives a brief history of sampling in past Canadian censuses. Section 3 describes the primary application of sampling, namely the collection of all but the basic census data from a sample of households. Sections 4, 5 and 6 discuss some other uses of sampling, from census planning and implementation to the evaluation of data quality. Section 7 concludes with some thoughts on the role of sampling in census taking and a brief description of plans for the 1986 census.

II. HISTORY OF SAMPLING IN CANADIAN CENSUSES

4. Sampling was first used in the Canadian Census of Population and Housing in 1941. In 1941 most housing questions were asked on a 1 in 10 sample basis. The sample of households was selected at the enumeration stage. Also, a 1 in 10 sample of Enumeration Areas was selected in Head Office for the purpose of advance publication of certain economic and family data. In the 1951 Census all housing questions were asked only of a 1 in 5 sample of households. Households with numbers ending in 2 or 7 received the sample housing questionnaire. A 1 in 5 sample of households was again used for housing questions in the 1961 Census and, in addition, the same sample households were asked some further population questions on migration, fertility and source of income. The sample questionnaires were dropped off by the enumerator during the main Census enumeration and were picked up by the same enumerators later.

5. The 1971 Census saw several major innovations in the method of census-taking. The primary change was from the traditional canvasser method to the use of self-enumeration for the majority of the population. This change was prompted by the results of several studies in Canada and elsewhere (Fellegi, 1964; Hansen et al., 1959) that indicated that the effect of the enumerator was a major contribution to the variance of Census figures in a canvasser census. Because the magnitude of this effect grew in proportion to the size of the enumerator's assignment, the minimum effect would theoretically be realized with one enumerator for each respondent. In a practical sense, this meant making every respondent his own interviewer. Thus the use of self-enumeration was expected to reduce the variance of census figures through reducing the effect of the enumerator, while at the same time giving the respondent more time and privacy in which to answer the census questions — factors which might also be expected to yield more accurate responses. This was especially true for housing and income questions where the respondent might need to refer to personal records.

6. The second aspect of the 1971 Census that differentiated it from any earlier census was its content. The number of topics covered and the number of questions asked were greater than in any previous Canadian census. Considerations of cost, respondent burden, and timeliness versus the level of data quality to be expected using self-enumeration and sampling led to a decision to collect all but certain basic characteristics on a one-third sample basis in the 1971 Census. In all but the more remote areas of Canada, every third private household received the "long form" which contained all the census questions while the remaining private households received the "short form" containing only the basic questions covering name, relationship to head, sex, date of birth, marital status, mother tongue, type of dwelling, tenure, number of rooms, water supply, toilet facilities, and certain coverage improvement items. All households in pre-identified remote enumeration areas and all collective dwellings received the long form.

7. The content of the 1976 Census was considerably less than that of the 1971 Census. Furthermore, the 1976 Census did not include the questions that cause the most difficulty in collection (e.g., income) or that are costly to code (e.g., occupation, industry, and place of work). Therefore, the benefits of sampling in terms of cost savings and reduced respondent burden were less clear than for the 1971 Census. Nevertheless, after estimating the potential cost savings to be expected with various sampling fractions, and considering the public relations issues related to a reversion to 100% enumeration after a successful application of sampling in 1971, it was decided to use the same sampling procedure in 1976 as in 1971.

III. SAMPLING DURING DATA COLLECTION IN THE 1981 CENSUS

8. By the 1981 Census, the benefits of sampling had been firmly established. In preparation for that Census an extensive study of the feasibility of using several alternative sample designs was undertaken. As well as the short form/long form sampling design, sample designs using interlocking samples were considered. With this type of design, several different versions of the questionnaire, each with a different combination of content groups, are used. This methodology was used in the 1970 U.S. Census utilizing three questionnaires and was tested in the U.K. Census in 1974 using ten questionnaires. The main advantage of interlocking sampling is the reduction in the maximum number of questions to be answered by any one person. It also permits different sampling ratios to be used for different questions if this is desirable. However, these advantages were felt to be outweighed by the disadvantages, among them being complication of collection and data processing procedures and the extra burden on enumerators. The method also limits analysis, since questions which do not appear on a common questionnaire cannot be cross-tabulated. As well,

the sample size available for those cross-tabulations which are possible is generally less than with the short form/long form design.

9. Sampling at the processing stage was also considered. This technique was used in the U.K. Census of 1981. The procedure has the advantages of standardizing all operations through to the end of field collection, of equalizing respondent burden (though at the maximum level), and of having the unused data available for further research and evaluation. However, the procedure is more expensive than sampling at collection, it more severely limits the length of the (single) questionnaire, and it risks the possibility of adverse publicity since a large amount of data collected at considerable cost would not be used.

10. Following this review, it was decided to repeat the 1971 and 1976 methodology in 1981 with the only major question being the choice of the sampling fraction. The process of choosing a sampling fraction involved a careful consideration of five factors: data quality, cost, respondent burden, timeliness, and possible operational problems.

Data Quality

11. The direct effect of a reduction in the sampling fraction is to increase the Total Standard Error (TSE) of all Census figures that are based on sample data. For example, the increase in TSE is about 20% for a change from 1/3 to 1/4, and about 38% for a change from 1/3 to 1/5. The effect of this increase on the usefulness of sample data is highly dependent on the size of the estimate. For large numbers (e.g., Canada or provincial totals), the data would remain highly reliable, but for small geographic areas or detailed cross-classifications, an increase in TSE could render the data unreliable, in the sense that the sampling error is too high for the purposes intended. This judgement is, of course, somewhat a subjective one, since the potential uses of the data cannot always be known. However, specifically identified problem areas, such as tabulations for Prince Edward Island (Canada's smallest province) and detailed industry by occupation tabulations, were studied to assess the effect of a change. In most cases, the number of unreliable cells increased by about 10-20% in going from 1/3 to 1/5. Such an increase was felt to be the maximum that could be tolerated.

Cost

12. Estimates of the cost savings which could be achieved were identified in three major areas, specifically enumerator pay, coding of long form items and data entry (Table 1). These savings were out of a total census budget of approximately \$ 100 million. In addition, unquantified savings were expected in other areas such as printing costs, shipping charges, edit and imputation and

tabulation. These unquantified savings were felt to more than offset any additional costs of modifying the weighting system to accommodate a different sampling fraction.

Table 1. Estimated Cost Savings (\$ 000) for Various Sampling Fractions

COST	1/4 versus 1/3	1/5 versus 1/3
Enumerators	493	788
Coding	616	1,000
Data Entry	585	950
TOTAL	1,694	2,738

Respondent Burden and Timeliness

13. The benefits of a lower sampling fraction in terms of a reduced respondent burden and improved timeliness were acknowledged, but were not as easy to quantify. As an approximation, however, it was noted that a change from 1/3 to 1/5 would mean a 40% reduction in the number of long forms to be completed by respondents. Comparable savings in the time required for labour intensive processing operations such as coding and keying were also expected, meaning that results could be released earlier than in previous censuses.

Operational Factors

14. Special operational considerations also influenced the choice of a sampling fraction. For example, a one in four sample would have required a special control mechanism to ensure that the dwelling pattern within certain types of buildings (e.g., duplexes) did not lead to systematic selection of a particular dwelling type. A suggestion to use 100% enumeration in Prince Edward Island in order to overcome data quality problems was also rejected largely on operational grounds, as well as on the basis that other provinces might request similar treatment.

15. The final decision for a 20% sample was regarded as the best balance among the various considerations referred to above.

Implementation of Sampling

16. Data for more than 98% of the population were collected by self-enumeration in the 1981 Census. In all self-enumeration areas, a one in five

systematic sample of occupied private dwellings was selected to receive a long form (Form 2B) containing all census questions. The remaining private dwellings received a short form (Form 2A) containing only the basic census questions (name, relationship to person one, sex, marital status, mother tongue, date of birth, type of dwelling, tenure, and coverage improvement questions). Within each enumeration area (EA), a random start (1, 2, 3, 4 or 5) was specified to indicate which was the first dwelling to receive the long form.

17. All dwellings in those areas enumerated by the canvasser method (about 2% of the population) received the Form 2B. The Form 2B was also completed for all collective dwellings. Information on unoccupied private dwellings was recorded on a Form 2A except for canvasser areas where a Form 2B was used.

18. In sampling terminology, the sample can be described as a stratified systematic sample of private occupied dwellings using a constant one in five sampling rate in all strata (enumeration areas). As a sample of persons, it can be regarded as a stratified systematic cluster sample with each dwelling as a cluster.

19. In order to minimize the risk of any deviation from the specified procedure for selecting the sample, the basic drop-off or delivery procedure required the Census Representative (CR) to pre-plan a route covering all dwellings in his/her EA following certain rules about the order in which city blocks and rural roads were to be enumerated, and then to visit each dwelling and leave a census questionnaire. The selection of the sample, i.e., the decision as to which type of questionnaire to leave at each occupied dwelling, was facilitated by the Visitation Record (VR), the document in which the CR listed each dwelling in his/her area. This document was printed so that every fifth line was shaded to signify that a Form 2B should be delivered. The random start was implemented by deleting either zero, one, two, three or four lines at the start of the VR according to whether the fifth, fourth, third, second or first dwelling in the EA was to be the first to receive the long form. Thereafter, the dwelling listed on each shaded line automatically received the long form. These procedures were spelled out in the CR's Manual and emphasized in his/her training. In addition, the route followed by the enumerator was checked by his/her supervisor. In most cases, this check was a simple one, since most urban areas in Canada have a regular pattern of house numbers.

Estimation from the Census Sample

20. Any sampling procedure requires an associated estimation procedure for scaling sample data up to the full population level. Mathematically, an estimation procedure can be described by an algebraic formula that shows how the value of the estimator for the population is calculated as a function of the

observed sample values. However, in a survey or census in which a wide range of characteristics is collected, or in which the estimation formula is at all complex, the procedure of applying a formula separately for each estimate required is not feasible. The approach taken in the census (and in many sample surveys) is to split the estimation procedure into two stages: (a) the calculation of weights (known as the weighting procedure); (b) the summing of weights to produce estimated population counts. Any mathematical complexity is then contained in step (a) which is performed just once, while step (b) is reduced to a simple process of summing weights which takes place at the time a tabulation is retrieved. Also, since the weight attached to each sample unit is the same for whatever tabulation is being retrieved, consistency between different estimates based on sample data is assured.

21. In the case of the special populations which received the 2B questionnaire on a 100% basis, the sample counts were equivalent to the total population counts. Weights of 1 were thus applied to all members.

22. For the one-fifth sample, the simplest method of weighting would have been to assign a weight of 5 to each person and household. However, in the case of the census sample, there is a great deal of supplementary knowledge available about the population being sampled in the form of basic 100% data at every geographic level. Such information can be used to reduce the sampling error of the estimates made from the census sample. However, it can also be a source of confusion for data users, in the sense that the sample estimates are not always consistent with all the population information at every geographic level. Whenever a cross-tabulation of a sample variable and a 100% variable is produced, the tabulation has to be based on sample data. This results in estimated marginal totals for the 100% variable which may differ from the corresponding population figure appearing in a tabulation based on 100% data. The weighting procedure used in the census thus has two specific goals: (1) to reduce the sampling error of the estimates made from the census sample, and (2) to minimize the inconsistency between total population and weighted sample counts for small geographic areas and for important subgroups of the population.

23. One of the most common estimation techniques which uses supplementary information to improve sample estimates and to ensure sample population consistency is ratio estimation. The procedure consists of defining important subgroups of the population (e.g., age-sex groups within province) and, for each subgroup, counting the number of units of the population in the subgroup (N) and the number in the sample (n). Each sample unit in the subgroup is then assigned a weight equal to N/n .

24. This procedure can lead to substantial reductions in standard error in many situations, and will also ensure consistency between sample estimates and population figures for the chosen subgroups and combinations of these subgroups. However, although the procedure will tend to improve consistency for

smaller subgroups (e.g., single years of age), it will not ensure consistency for these smaller subgroups, nor for subgroups defined in terms of other basic characteristics. One could consider extending the procedure to subgroups defined as the cells in a cross-classification of all relevant 100% characteristics, but as the subgroup becomes smaller the procedure becomes unstable (i.e., the standard error of the estimates increase). The challenge, therefore, is to retain the advantages of ratio estimation without suffering the instabilities of using small subgroups.

25. The solution adopted is to carry out ratio estimation iteratively for two distinct and exhaustive sets of subgroups until the weights converge. This procedure, known as the "raking ratio estimation procedure (RREP)", has been used since the 1971 Census. The operational details and the statistical properties of the RREP are described in Brackstone and Rao, 1975 and Arora and Brackstone, 1977. The important point to note in this procedure is that the size limitations (to avoid instability in the estimators) apply only to the row and columns totals and not to the individual cells of the matrix (some of which could even be empty).

26. There are two parameters in the RREP which are crucial to the question of consistency between sample estimates for 100% characteristics and the corresponding population figures. The first is the choice of the geographic area or weighting area (WA) within which the RREP is applied. The second is the choice of the variables forming the subgroups.

27. The WA is the geographic area for which exact agreement is ensured for total counts of persons and households for those subgroups used in the RREP. From the point of view of consistency for small areas, the smaller the WA the better. However, the smaller the WA the less detail is possible in the variables used to form the subgroups. The compromise adopted for the 1981 Census was the following:

- a) a WA should contain between 3,000 and 7,000 persons;
- b) WA boundaries should respect the boundaries of Census Divisions and, as far as possible, of Census Subdivisions, Census Tracts and Federal Electoral Districts;
- c) a WA should be made up of whole EAs and should generally be connected.

28. These constraints represented the ideal situation only, and in most situations they could not all be satisfied simultaneously.

29. Variables defining the subgroups for use in the RREP were chosen using two criteria. First, a strong correlation between the variables and the sample characteristics was important in minimizing the sampling error of the sample estimates. Secondly, the need to ensure consistency for important population subgroups, such as those frequently used for cross-classification in published tabulations, influenced the choice of variables. Two different sets of variables

were used in 1981, one for person weights, the other for household weights. For example, for calculating person weights, age-sex-marital status formed one set of subgroups while family status — mother tongue formed the other.

30. Associated with each set of subgroups was a collapsing strategy designed to prevent the occurrence of small population counts, empty row or column totals for the sample, and extreme ratios of population count to sample count. In theory, an optimal strategy for forming weighting subgroups would have been to use all categories of all 100% variables, and then use the collapsing strategy until the size constraints on row and column totals were met. In practice, however, such a strategy could not be implemented because of the computer storage constraints and the complex programming that would have been required. The collapsing strategy actually implemented was specified manually, and was designed to preserve the homogeneity of the collapsed rows or columns as much as possible and to retain the most important subgroups.

31. Operationally, the RREP was almost fully automated. Weighting areas were formed using a program that took into account EA population, geographic co-ordinates of EA centroids, and the geostatistical areas (Census Divisions, Subdivisions, etc.) in which the EA was located. The program provided a listing of the weighting areas thus formed and allowed changes to be made manually if appropriate. Once the weighting areas had been fixed, the cross-classification of data, the collapsing of subgroups, the calculations of weights and the assignment of these weights to records on the data base took place entirely within the computer.

Evaluation of Sampling and Weighting

32. Although a full evaluation of the sampling and weighting procedures has not been completed, a few points can be noted.

33. First, the sampling method chosen was as simple as possible both in terms of the selection procedure itself and in terms of its effects on other Census operations. Although more complex designs might have had some advantages, e.g., lower sampling error, there is a danger that a complex method would be implemented incorrently and would thus increase, rather than decrease, the total level of error. As well, the direct savings in both cost and time due to sampling could be lost in other census operations.

34. Secondly, the weighting procedures were not completely successful in meeting the objective of sample-population consistency. Not all weighting areas respected all geographic boundaries, and subgroups of the variables used in the RREP did sometimes have to be collapsed. These deviations from the ideal weighting procedure did produce occasional anomalies in the data which required explanation. However the problems were relatively isolated and did not disrupt the planned production of data.

35. Finally, even if the weighting had been completely successful there would still remain discrepancies between tabulations based on 100% data and those based on sample data, simply due to sampling variation. These differences were especially noticeable for small geographical areas (e.g., EAs) or for small subgroups of the population. Thus there will always be a need to alert the user to these differences and the reasons for them.

IV. THE USE OF SAMPLING IN CENSUS PLANNING

36. In an undertaking as important and expensive as a national census, a primary consideration in the choice of the methods and procedures to be used is their reliability. Sampling can play an important role in planning improvements to census procedures and in lowering the risk of census taking. It can be used for testing questionnaire wording, trying new collection procedures, and estimating time and cost requirements for the full census. Studies can either be conducted in advance of the census or built into the census process itself, for use in future censuses. Results from such studies do not always have to be nationally representative to be beneficial; in fact, in some cases, it may be more effective to focus attention on specific problem areas. This section describes a few of the planning tests that made use of sampling.

Questionnaire Testing

37. A series of modular tests of alternative questionnaire wordings was carried out prior to the finalization of the 1981 questionnaire. Some of these tests attempted to improve questions which had proved problematic in previous censuses. Others were designed to check for problems in new questions. In addition, a test of a bilingual short form questionnaire, rather than the usual separate English and French questionnaires, was conducted.

38. The methodology used for the bilingual questionnaire test was typical. Four test sites across the country where the potential problems with a bilingual questionnaire were expected to be most severe were selected. A sample of dwellings was selected in each site using the 1971 Census as a frame. A random half of the dwellings in each site received a bilingual questionnaire, while the other half received a unilingual questionnaire in the majority language of the area. The final decision not to use a bilingual questionnaire was reached after an analysis of response rates and respondent comments.

Testing of Collection Methods

39. In the more urbanized areas of Canada, respondents mail back their completed questionnaires, while in the rural areas the questionnaires are picked

up by the CR. For farm operators, who are required to complete a Census of Agriculture questionnaire as well, drop-off and pick-up are carried on concurrently with the Census of Population and Housing. In planning for 1981, it was decided to examine the potential benefits and drawbacks of using a mailback methodology in all self-enumeration areas of Canada.

40. Two test sites were selected, in eastern and western Canada, and a test using the mailback methodology was conducted in June of 1977. The test used the 1971 questionnaire, with minor modifications, and adhered as closely as possible to all of the usual census enumeration procedures, including publicity campaigns, field editing, follow-up and quality control.

41. A number of factors were considered in making a final decision on whether to extend the mailback procedure. These included costs and timeliness of the collection operation, public reaction to the mailback method and the quality of response. After a detailed analysis, it was recommended that the pick-up methodology be retained in the rural areas for 1981.

Testing and Evaluation of Editing Procedures

42. Editing of completed questionnaires takes place at several stages of the collection process. The first stage is a series of checks made by the CR on each questionnaire as it is received back from the respondent. Every questionnaire which fails this edit is followed up by telephone or, if necessary, in the field. The 1981 Edit Sample Study attempted to evaluate the cost-effectiveness of this edit, in terms of the cost of follow-up and the resultant improvement, if any, in data quality.

43. To make such an evaluation, it was necessary to capture the responses as received from respondents before any editing took place. A sample of questionnaires was drawn from the post office mailbags during the ten days following Census day, and the sampled questionnaires were then transcribed onto separate forms. Using the data from this study, it is possible to simulate the effect of alternative edit rules on edit failure rates and the consequent field follow-up costs. By linking the data to the final questionnaires received in Head Office, the effect of the edit rules on data quality can also be assessed. Results of the study conducted in 1981 are not available at the time of this writing, but will be used in planning for the 1986 Census.

V. THE USE OF SAMPLING DURING CENSUS IMPLEMENTATION

44. Sampling was also used at several points during the actual operation of the census. This chapter describes two of the most prominent applications: quality control and "random additions".

Quality Control

45. The work of enumerators in the field, and the work of clerks in regional processing offices, were subject to quality control. In both cases, decisions as to whether completed work was acceptable were made on the basis of random samples of questionnaires selected from each batch of work and checked for accuracy and completeness. In the case of enumerators' work, specially trained Quality Control Technicians were employed to check each EA before questionnaires were sent to the regional offices for further processing. The QC Technician's work was in addition to, and independent of, certain basic checks performed at an earlier stage by the enumerator's supervisor.

46. Within regional offices, the major operation subject to quality control was the coding of write-in answers (e.g., industry, occupation, place of work). Figure 1 illustrates the quality control cycle. For each EA, a «noter» would pull a sample of questionnaires and code them on a special noting form. After the coding clerk had completed his/her work, the sample-coded questionnaires would be compared with the corresponding noting forms. Any discrepancies were identified by an adjudicator who would attribute an error to the noter or the coder. Any EA's containing coding errors which exceeded the acceptable tolerance level were returned to the coding operation for corrections. Since each coder handled many batches, the quality control analysis could be extended to determine whether an individual clerk's work was such that he/she should be retrained or removed.

47. Quality control was also applied to the data entry operation, and in this case it was almost completely automated. Data were first keyed into the computer with no interaction between computer and operator. Once a batch was completed, the computer automatically selected a sample of forms for verification, using quality control specifications and a random number generator programmed into the system. The original and verified versions of the entered data were compared within the computer, and the decision to accept or reject the batch was made automatically.

Random Additions

48. As well as adjustments to the Census population figures to account for sampling, adjustments are also made to account for known deficiencies in the coverage of dwellings, individuals and households. These adjustments are based on two studies, the Temporary Residents Check and the Vacancy Check, which are described in detail below. These studies provide estimates of coverage error rates at a relatively aggregated level (e.g., province by dwelling type by number of occupants). Adjustments are made by randomly assigning the errors to EA's,

adjusting the corresponding EA level counts, and adjusting the weights of randomly selected persons and households within the EA. For example, suppose as a result of the Vacancy Check that an additional apartment with two persons was to be assigned to an EA. The count of the number of vacants in that EA would be reduced by one and the count of households and persons would be increased by one and two respectively. Correspondingly, a Form 2B apartment with two people would be randomly selected from the EA and the weights assigned to the household and the two persons in it would all be increased by 1.

Temporary Residents Check

49. Persons away from their usual place of residence on Census night were to be enumerated at their temporary residence on a special individual questionnaire (called a Form 3) which, among other items, asks the address of their usual place of residence. Such persons should also have been included as permanent residents at their usual residence. Recognizing that many persons away from home on Census night would not be enumerated at their usual residence (particularly where a whole household was away), a random sample of persons enumerated as temporary residents on Forms 3 was selected and each selected person was matched against the Census questionnaire for his usual residence to see whether or not he had been enumerated there. In this way, the estimated number of temporary residents missed at their usual residence was established. These estimates were then used to add the required number of persons to the final data base.

Vacancy Check

50. The Vacancy Check Study was designed to verify the accuracy of the classification of dwellings as "unoccupied". The methodology consisted of selecting a sample of about 1,250 EA's and re-enumerating all dwellings within the selected EA's which were originally classified as unoccupied. This re-enumeration was done soon after the census itself by specially trained census enumerators and using a specially designed questionnaire. The study permitted the estimation of the number of dwellings classified as unoccupied which were in fact occupied, the number of individuals and households missed as a result of this misclassification, and the number of dwellings that should have been classified as unsuitable for occupancy instead of unoccupied. Again, these estimates were used to adjust the final counts on the census data base.

VI. THE USE OF SAMPLING IN DATA QUALITY EVALUATION

51. Sampling is also used extensively in evaluation studies aimed at measuring the quality of census data. Two such studies are described: the Reverse Record Check for measuring undercoverage in the Census of Population and Housing, and a Census — probability survey micromatch used for measuring response errors in the Census of Agriculture.

52. The primary purpose of the Reverse Record Check (RRC) is the estimation of the number and characteristics of persons and households missed by the census. The basic methodology involves the construction of a list of persons who should have been enumerated in the 1981 Census from sources independent of that census. The four sources are:

- (i) persons enumerated in the 1976 census;
- (ii) births from 1976 to 1981, from vital statistics records;
- (iii) immigrants from 1976 to 1981, from immigration records;
- (iv) persons missed in the 1976 census, from the 1976 RRC.

53. A sample of persons is selected from each of these four frames, and a tracing operation is undertaken to determine their 1981 Census addresses. The census record for each address is then searched to determine whether the person was enumerated. Each case not found enumerated is followed up in order to confirm the 1981 Census address.

54. At the end of these tracing — searching — follow-up operations, each case is classified into one of five basic results: a) enumerated; b) missed; c) deceased; d) emigrated or e) no-trace. The last category, no trace, is in effect a non-response category. In 1981 the no-trace rate was 3.4%, in 1976 it was 4.8%. Results are weighted to the population to account for the sampling from the various frames and for the no-trace category. A wide variety of tabulations of persons and households missed by the 1981 census can then be run.

55. The basis for studying the quality of the 1981 Census of Agriculture counts was comparison with alternative, independently collected agricultural data. The major sources of comparable data were two annual probability surveys, the Agriculture Enumerative Survey and the Farm Enumerative Survey, which together produced estimates for the majority of the country. The surveys covered the same major land use, livestock and farm operating expense items as the census, and were conducted just one month after the census. However the quality of response was felt to be superior due to the use of more experienced and highly trained interviewers. Macro-level comparisons of survey estimates with the corresponding census estimates provided an indication of possible overall biases in the data.

56. In order to study census and survey response differences at the individual farm level, records from the two files were matched in a computerized linkage operation. The name, address and telephone number of the

operator of each survey farm were used to identify the corresponding census record. A manual resolution of non-matches was also carried out. Thus, by comparing the values recorded on the census and surveys for records linked during the micro-match, differences in response could be isolated from variations in totals due to coverage.

VII. CONCLUSION

57. Today, the use of sampling as a method of reducing costs, lowering overall respondent burden and producing results more quickly has, with few exceptions, been understood and accepted by the public. To the practitioner, sampling's proven advantages have meant that it is now applied not only in data collection but in virtually every aspect of census-taking.

58. Nevertheless, the decision to use sampling must still be made with care. For example, sampling is already used to make adjustments to census figures for certain sources of undercoverage, and the possibility of other sample-adjustments is now being debated. In addition, as census-taking becomes more expensive there may be pressure to replace some aspects of conventional methodology, such as field follow-up of non-respondents, with estimation based on sample data. Such potential applications of sampling are sure to generate controversy, since they imply a movement away from the traditional concept of the census as a count of each and every individual. The resultant effect on the public's perception of the census and their continued willingness to support it will be an important factor in deciding how sampling should be used.

59. As well, the increasing use of administrative data as an alternative source of small-area statistics will affect the future of sampling in the census. While in some countries administrative data have to some extent replaced conventional census questions, such data sources are seen in Canada as being complementary to the Census. Future statistical programs will likely see greater integration of data from censuses, sample surveys and administrative records, and the application of modelling methods to produce estimates for small areas will no doubt increase.

60. For the immediate future, however, plans for the 1986 Census call for a repeat of the 1981 methodology, again with a one in five sampling ratio. Nevertheless, the effects on cost and data quality of a one in seven or a one in ten fraction have been examined. An evaluation of the weighting procedures used in 1981 is still underway, and further research and development in this area may be needed. Again, sampling will play a prominent role in census planning, in quality control of collection and processing, and in evaluating the quality of census data. For example, several proposed questions on disability have recently been tested in a supplementary sample survey to the monthly Labour Force Survey.

61. As mentioned at the start of this paper, the census has a long history in Canada, and this tradition has played a significant role in its success. Sampling is by comparison a new technology, but it is doubtful that the richness and variety of data which the modern census produces would be possible without it.

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NATIONAL EXPERIENCE REGARDING THE USE OF SAMPLE SURVEYS DURING THE VARIOUS PHASES OF CENSUS-TAKING (a)

INTRODUCTORY NOTE

1. Official statistics in the Federal Republic of Germany have for a long time been making use of the sampling procedure. More than 45 different statistics are continuously compiled by means of sample surveys (1). Wherever the possibility offers itself, sample surveys are employed by official statistics. For the preparation, the execution or the processing of a complete enumeration, or for embarking upon a new sample survey, it is always possible to draw upon extensive experience with sample surveys. The various possibilities of making use of sample surveys had in 1960 already been dealt with in detail (2).

2. The purpose of the present contribution is to show in particular the experience gained by official statistics in the Federal Republic with respect to the employment of sample surveys before, during and after exhaustive enumerations. The emphasis is on population statistics, or to be more specific, on the population and occupation censuses conducted up to now. As far as the employment of sample surveys in the various phases of large-scale censuses is concerned, official statistics are in a position to rely on experience going back as far as the early fifties. A focal point in this development was reached with the 1970 population census. In this census, the knowledge gained during the two preceding decades was integrated to such an extent that it was justified to speak here of a comprehensive utilization of the possibilities of sample surveys during the various phases of a large-scale census. The experience gained from the large-scale census of 1970 forms the basis for the mutually supplementary employment of sample surveys and exhaustive enumerations in official statistics during the time after the 1970 population census up to the time of preparation for the new population census originally scheduled for 1983.

3. The possibilities of using samples in the various phases of a large-scale census will be dealt with under two aspects which are decisive for their

(a) Report prepared by the Federal Statistical Office of the Federal Republic of Germany.

Chart 1: Use of Sample Surveys During the Various Phases of a Large-Scale Census

Time aspect	Aim					
	Preparation	Easing the burden of respondents Extension of the contents	Aspect of data protection	In-depth investigation Current estimation	Descriptive checks	Cost reduction
Prior to the census	Micro-census as a test of the characteristics covered Pilot surveys	Easing the burden of respondents and extension of the contents by shifting questions to preceding sample surveys	Better guarantee of respondents' anonymity by sample surveys			Cost saving by shifting questions to preceding sample surveys
During the census	for data collection	— Sample using the sampling frame of previous censuses (Ex.: 10%-sample for the 1970 population census using the frame of the 1968 census of building and dwellings) — Sampling during the survey by the enumerators (Ex.: 10%-sample for the 1956 census of buildings and dwellings)	Better guarantee of respondents' anonymity by sample surveys		Immediate checks	Cost saving by a reduction of the expense for data collection and coding, since the more extensive characteristics are largely covered by the sample part (Ex.: Questions on "education" in the complete and sample parts of the 1970 population census)
				Extension of the possibilities of evaluation by differentiated questions in the sample part (Ex.: 10%-sample for the 1970 population census) (Ex.: Education)	Birthday (alphabetic) checks Checks of characteristics	
During the census	for processing					
After the census		Easing the burden of the respondents and extension of the contents by shifting questions to subsequent continuous sample surveys or newly introduced samples (Ex.: 1%-housing sample survey, 1957, following the 1956 census of buildings and dwellings)	Better guarantee of respondents' anonymity by sample surveys	Current adjustment by continuous (e.g. annual) sample surveys (Ex.) Microcensus; monthly, annual and supplementary surveys for the census of distribution)		Cost reduction by shifting questions to subsequent continuous sample surveys

employment. One of these aspects concerns the question as to the timing of the use of sample surveys, while the other relates to the aims pursued by the sampling procedure in connection with large-scale censuses.

4. The combination of the question concerning the time and the aim of the employment of sample surveys during the various phases of a large-scale census constitutes the framework for the further discussion of the experience acquired in this respect by official statistics of the Federal Republic of Germany. The preceding schedule is to give a first outline of the combination of the two aspects. The further development of this contribution is orientated on the aspect

of the timing of the employment of sample surveys. Then, at each of the individual points in time, the specific aims of the employment will be dealt with, discussing in addition to fundamental methodological explanations, important instances of positive as well as of negative experience by way of the example of various large-scale censuses.

I. THE EMPLOYMENT OF SAMPLE SURVEYS PRIOR TO A LARGE-SCALE CENSUS

a) *Execution and results of pilot surveys on a sampling basis*

5. As an indispensable part in the preparation of large-scale censuses, sample-type pilot surveys provide important information, for instance with respect to the utilization of new collection and processing techniques and to the reaction of the respondents to a catalogue of questions which had been modified as against previous large-scale censuses.

6. As early as the 1950 population census, pilot surveys were performed in some «Kreise» as well as in several larger cities of the Federal Republic, which primarily served the purpose of testing the survey forms (3).

This had been combined with an opinion poll covering 500 respondents designed to test the *attitude* of the respondents with regard to the census operation (4). Although the results obtained via these pilot surveys could only be fragmentary, they nevertheless gave a clear indication that certain mental reservations and negative attitudes towards the census on the part of the population had to be expected, all of which could also render the recruiting and employment of enumerators more difficult.

7. In addition to the first inquiries conducted in late 1958/early 1959, which were limited to a test completion and general sizing up of the question programme by the staff of the Federal Statistical Office and the Land statistical offices, three pilot surveys in all were performed in preparation of the 1961 population census (5). The time schedule, contents and scope of the pilot surveys were designed in such a way that the experience gained with each survey could be taken into consideration for the following inquiry. As far as the question programme of the population census was concerned, it became manifest that questions relating in particular to health and old age insurance, or employees' pension schemes, respectively, as well as questions with regard to secondary economic activities and the coverage of seriously handicapped persons, would yield results of only limited or dubious value. These findings led the federal ministries concerned to agree to a reduction of the question programme and a shifting of these question complexes to the sample surveys of the microcensus (where these questions are continuously being covered up to the present time). The results of the pilot surveys for the 1961 population census, moreover, confirmed the experience gained already on the occasion of

the 1950 population census, namely the fact that without the provision of adequate expense allowances there is hardly any change of finding a sufficient number of able and willing enumerators. Another major objective of the pilot surveys was the testing of the technical prerequisites of a total operational check (Red-White Action) for determining the completeness of the entries and the coverage of persons with additional housing accommodation at their disposal. On the basis of the pilot surveys it was decided not to use this labour and cost-intensive operative check procedure with the 1961 population census but to replace it by descriptive checks on a sampling basis (alphabetic check).

8. The necessity of a well-timed and thorough sequencing became particularly evident on the occasion of the 1961 census. Especially the electronic data processing installations which in 1961 were employed for the first time, gave an indication of the new and better possibilities with regard to data processing and the ascertainment of results for future large-scale censuses, all of which however also showed the necessity for greatly increased demands to be made with respect to operative planning and time scheduling. Especially gaining in importance in this connection were the pilot surveys aimed at testing the new collection and processing techniques.

9. The great impact of intensive preliminary investigations also found expression in the fact that a specific legal foundation (6) was created for the very purpose of the preparation of the 1970 population census, which made it possible to perform a total of six pilot surveys in the period from November 1965 to May 1969. The surveys covered approximately 150,000 households with about 420,000 persons. The following points could be mentioned as the main objectives of evaluation:

- the selection of the most favourable collection procedure;
- the designing of the questionnaire as far as content and form are concerned;
- the testing of the available data processing installations as the basis for an expeditious and cost-saving processing of the data;
- the perception of problems arising as a result of the planned conversion of the questionnaires from multi-person forms, as used in 1950 and 1961, to machine-readable one-person forms;
- the selection of a high-capacity document reader as a means of making the data input as efficient as possible;
- the introduction of automatic error correction which in conjunction with the intensification of automatic credibility tests should bring about a further improvement of the quality of the results.

10. While the pilot surveys mainly confirmed the findings of preceding censuses as far as the contents of the questionnaires were concerned, the great importance of intensive pilot surveys for the preparation of the 1970 census

operation manifested itself especially with regard to the developments in the sector of data processing — 'and here in particular with respect to data acquisition. The extent of the testing of several types of document readers for efficiency and their impact upon the formal design of the questionnaire, as well as the organization of the census operation and the reaction of the respondents to the redesigned questionnaires, had been necessary because official statistics could in this respect not draw upon any experience from preceding censuses.

11. In preparation for the new census planned initially for 1981, three test inquiries were conducted in the years 1978 and 1979 for the purpose of probing the now, as against 1970, revised questionnaires for their technical quality, as well as for the intelligibility of the questions and the accuracy of the replies. Also tested was the reading of the redesigned questionnaires by the devices available for that purpose.

12. When the Law on the 1983 Population Census was finally passed in late March of 1982, there was only about one year left until census day on 27 April 1983. Although the law had made provisions for up to three pilot surveys, only one further pilot survey could actually be performed during this short time. The results of the pilot surveys, which in comparison to the 1970 population census featured a reduced programme, again clearly showed the great significance that must be attributed to such preparatory investigations. The successful accomplishment of the tasks set for the pilot surveys in advance of the 1983 population census could however, to a considerable degree, be assured only by the fact that it was possible to fall back upon the manifold experience gained through the pilot surveys for the 1970 census as well as the pilot surveys conducted in preparation of the 1975 census of buildings and dwellings (7).

Excursus: Sample surveys as a basis for planning public relations work

13. The significance of broadly based public relations work in preparation of the 1961 population census was derived from the experience gained with the 1950 census. The Federal Statistical Office and the Land statistical offices had come to the understanding that it was advisable greatly to extend the scope of public relations work compared to the efforts made in connection with the 1950 census. Three surveys on a sampling basis had also actually been conducted as part of the planning and execution of public relations work. A "study of orientation" provided significant information for the conception of public relations work with regard to the attitudes of the population towards statistics in general and the population census and some other related questions in particular. Public relations work moreover had been subjected to "efficiency checks" which were based on two inquiries (2,000 persons) prior to and after conclusion of the publicity campaigns. These controls not only made it possible to assess the success of individual public relations measures and publicity

media, they also conveyed a clear picture of the attitudes of the population with respect to the population census and how these attitudes were subject to change.

b) The employment of continuous sample surveys in preparation for large-scale censuses

14. Another possibility of using sample surveys in preparation for a large-scale census is the microcensus. As continuous annual representative statistics of population and economic life, featuring a sampling fraction of 1% of the population (roughly 600,000 persons), the microcensus has since 1957 been an essential part of official statistics of the Federal Republic of Germany. Not only does it stand in a close connection with the population and occupation census as far as the organizational and technical level is concerned, but it also serves on the other hand itself as a basis for other sample surveys (8). Particularly with regard to the preparation of a large-scale census, the microcensus can accomplish the following tasks:

a) in a similar way as with pilot surveys, questions which are to be included in the next large-scale census for the very first time, can be tested as to the degree they are understood by the respondents, or whether there exists more or less strong resistance on the part of the respondents against complying with the questions listed;

b) as far as exhaustive enumerations such as censuses of population, occupation, housing and non-agricultural local units are concerned, there are limitations to the scope of the question programme. More differentiated questions often overburden the respondents and thus contribute to a lowering in the quality of results. Questions of that kind should be shifted to the sample surveys — such as the microcensus — which are conducted directly preceding the large-scale census. Official sample surveys are performed with the assistance of trained interviewers. This makes it possible to ask much more complicated questions than with an exhaustive enumeration. In addition to disburdening the respondents, and to enlarging the contents, the shifting of questions to preceding sample surveys also offers a better protection of the anonymity of respondents under the aspect of data protection, because not all persons, but only some of them, which in the case of the microcensus amounts to only 1% of the population, are covered by the inquiry. This procedure moreover contributes to a reduction of costs for the large-scale census.

II. THE USE OF SAMPLE SURVEYS DURING A LARGE-SCALE CENSUS

15. Also as far as the employment of sample surveys during the census is concerned, official statistics in the Federal Republic of Germany can draw upon

abundant experience. A distinction has to be made here between the possibilities of using sample surveys during the actual census-taking on the one hand, and during data processing on the other. In addition to the discussion of the findings resulting from the execution of the 10% — sample survey for the 1956 census of buildings and dwellings and for the 1970 population census, the following should also give some insight into the experience acquired with the use of sampling procedures for checking complete enumerations.

a) Experience gained from the use of sample surveys during the collection phase

16. Within the scope of the "1956/57 housing statistics", a sample survey was for the first time in Germany integrated into a comprehensive complete enumeration. The representative part of this survey performed with a sampling fraction of 10% was not an independent survey, but represented a simultaneously performed part of the complete enumeration. It was hoped this would disburden the respondents and reduce the work load of processing the data. But it should be mentioned that this procedure imposed heavy demands on the census organization. The greatest risk however was seen in the fact that the sampling was done only during the actual execution of the census by enumerators who, with certain exceptions, had no real conception of sampling techniques. In spite of all efforts to provide the enumerators with precise, and at the same time as simple as possible, directives for performing the selection, it soon became evident that a great number of the approximately 500,000 enumerators (in some areas more than 30%) did not comply with the directives where it was clearly stipulated that every tenth dwelling had to be provided with a questionnaire which featured an enlarged question programme as against the one used for the census itself.

17. As a result of the simultaneous execution of a representative sample survey with the exhaustive enumeration, where as in this case the sampling was only done during the collection phase, it can be said that this procedure has on the whole not proved successful. In the subsequent complete enumerations conducted during the sixties, the procedure was therefore no longer followed in this manner. It has also become evident that the organizational effort necessary for subdividing a statistical survey of this size into a total part and a representative part, seems to be meaningful only if the representative part is designed in such a way that it will constitute a noticeable disburdening of the collection units not to be included in the sample. Compared to the question programme of the complete enumeration part, the 10%-sample mentioned had covered only three additional topics. What is more, the preparation of the sample itself should already have been more intensive in order to arrive at reasonable results. A sample evaluation in the processing phase would probably also have been sufficient here.

18. What was very expedient on the other hand, was the 1%-follow-up survey performed some months later within the scope of the 1956/57 housing statistics. Here, the survey material of the complete enumeration and of the 10%-sample was used as the sampling frame which, due to the employment of interviewers, permitted the more in-depth coverage of topics. In contrast to the 10%-sample, the question programme for this survey had been considerably enlarged as against the questionnaire for the complete enumeration part. The execution and evaluation of the follow-up survey could, mainly on account of the large number of the survey characteristics covered, be accomplished only with great effort, because there was as yet no experience available with sample surveys of this size conducted with the help of interviewers. The insights gained were therefore of particular significance, both with regard to the further use of samples in following up on exhaustive enumerations as well as with respect to the microcensus conducted for the first time about 5 months later (9).

b) Particular features of the 10%-sample of the 1970 population census

19. In spite of the not altogether satisfactory experience with the 10%-sample survey for the census of buildings and dwellings performed within the scope of the 1956/57 housing statistics, another sample survey on the collection level was again introduced for the 1970 population census. The following reasons were decisive for conducting a sample survey within the scope of the 1970 population census:

— as a result of the increased demand for information, there ensued a considerable extension of the question programme which, if all topics had been fully covered, would have led to considerable increases in costs;

— the enlargement of the census programme had to a certain extent produced more complicated questions, which required the employment of particularly well-trained and highly qualified enumerators. Furthermore to be considered in this connection was the coding of the difficult questions which also called for well-trained personnel. By dividing the question programme up into a total and a representative census part, it was in principle possible to shift the more difficult questions to the representative part, and to specially select and train the enumerators and/or coders assigned to that part;

— in the enumeration districts of the total part, it was possible to considerably reduce the burdening of the households with respect to the inquiry, as well as to cut down on the work load accumulating with communities and enumerators in connection with the checking of the completed survey forms;

— due to the selection and training of particularly well-qualified enumerators and coders, it was easier to orient the programme of the repre-

sentative census part toward more difficult questions and thus to consider specific evaluation wishes, than would have been possible with a conventional population census.

20. The essential difference in the 10%-sample survey performed as part of the 1956/57 housing statistics was however the fact that the sampling did not have to be done as late as during the collection phase. The sampling frame drawn upon was the total number of enumerators' lists used for the 1968 census of buildings and dwellings. This procedure made it possible to avoid an overburdening of the enumerators with additional tasks of sample selection and their manifest negative consequences for the execution and analysis of the sample part. The following chart presents a concise outline of the content of the 1970 census and the breakdown of census topics according to those questions which had to be answered by all persons and those to be answered by only 10% of the population (Chart 2).

21. In contrast to the 10%-sample of the 1956/57 housing statistics, it had been possible here, as a result of the considerable enlargement of the catalogue of characteristics in the representative part, to ease greatly the burden for the 90% of the population who had only to respond to the questions contained in the exhaustive enumerations. As far as the processing of the data covered by the 1970 population census is concerned, it may justly be claimed that there has been a considerable enlargement of evaluation possibilities due to the shifting of more differentiated questions to the sampling part. Just by looking at the topics covered in the representative part with regard to the sector "school education and vocational training", it can easily be seen what evaluation possibilities are becoming available by combining educational topics with other socio-demographic and socio-economic characteristics. With reference to the growing public and political discussion on the correlation between the educational system and the employment system, above all under the aspect of realizing more social equality of opportunities in these respects, the provision of reliable data for use by government, administration and science was at that time of very great importance. The evaluations of the results of the sample surveys were fully adequate in their degree of technical and regional detail to meet the demands made on them.

22. The experience made with the representative part of the 1970 population census must also be seen as positive under cost aspects. The shifting of the extended topics to the representative part not only led to a reduction of costs in the collection phase, but also to a lowering in coding expenditure. Due to the fact that particularly open questions, which require work as well as cost-intensive subsequent coding, were included in the representative part, the costs of coding could also be reduced.

23. Commensurate with this positive experience, the possibility of including a sample survey already in the collection phase was thoroughly looked into

Chart 2: Catalogue of Questions for the 1970 Population Census

Brief designation of census characteristics	Question put to		No. of question
	100% of population	10%	
Statistical characteristics of population			
Sex	x		1
Date of birth	x		2
Marital status	x		3
Position inside the household	x		4
Religious denomination:			
Short version	x		5
Detailed version		x	5
Nationality:			
Short version	x		6
Detailed version		x	6
Allocation to resident population	x		7
Residence on 1 Sept. 1939, arrival from Soviet Zone, expellee identity card		x	19,20,21
Birth statistics			
Year of marriage and previous marriage		x	37,38
For women:			
Birth years of all live-born legitimate children		x	39
Statistical characteristics of economic activity and employment			
Main source of livelihood	x		8
Participation in economic life and seeking employment	x		11
For economically active persons, pupils and students:			
Address of establishment/school	x		12
Means of transport used and time required	x		13,14
For economically active persons:			
Branch of business	x		15
Status in occupation	x		16
Weekly hours of work	x		17
Further activity	x		18
Activity performed (occupation), brief description		x	24
Operation of machines		x	25
Net earned income		x	26
Leading or supervisory activity		x	27
For self-employed persons:			
Data on persons employed in business		x	28,29
For proprietors of agriculturally-used areas:			
Size of total area		x	30
For non-active persons:			
Former economic activity and year of termination		x	22,23
Statistical characteristics of education			
Attendance at schools of general education and vocational training, universities	x		9
Termination of a			
school of general education	x		10
school of vocational training, university	x	x	10,33
For persons with completed education at a school of vocational training/university:			
Length of education/training, special orientation, year of termination		x	34,35,36
Length and type of practical vocational training		x	31,32

as part of the preparatory work for the census of population, occupation, housing and non-agricultural local units scheduled for 1983, with the result to conduct the 1983 census exclusively as an exhaustive enumeration. The decision arrived at due to the lack of an adequate sampling frame and also on account of the changed standards of performance as against the 1970 population census was the following:

— a suitable sampling frame such as the 1968 census of buildings and dwellings available for the 10%-sample of the 1970 population census, did not exist as far as the 1983 population census was concerned;

— the census programme had been twice before parliament for discussion. It had been introduced initially during the 8th Legislative Session (Autumn 1978) of the German Bundestag, but failed only over the question of the distribution of costs between the Federation and the Laender because in this respect the Mediation Committee could not come to an agreement. Both Bundestag and Bundesrat considered the census as indispensable and there was full accord among all participants with regard to the contents of the census. During the 9th Legislative Session (in early 1981), a new draft of a parliamentary bill was presented by the Federal Government, which for reasons of costs provided for cuts in the question programme (cancellation of the real estate survey, cuts in the question programme with regard to buildings, dwellings and non-agricultural local units). Within the scope of the different retrenchment models, the feasibility of using a sample survey was also discussed in great detail. After invocation of the Mediation Committee in order to deal with the proposal of a subsidy to be paid by the Federal Government against the costs to be borne by the Laender and communities, the new bill was given approval by the Bundestag and the Bundesrat. The law was promulgated on 25 March 1982. Over against the 1970 population census, the new law had cut the question programme for the 1983 population census by half. The inclusion of a representative part did no longer seem to be meaningful under those conditions, because only three of the 20 topics remaining in the 1983 question catalogue (practical vocational training; occupation pursued; special orientation) could have been covered by way of a sample survey. However, in view of a very high rate of unemployment and the influx of strong birth cohorts into the world of work, it seemed absolutely necessary — contrary to 1970 — to have a 100% coverage also with regard to questions concerning employment and professional activities. A sample covering only the three topics mentioned would not — as was shown already by the experience made with the 1956/57 housing statistics — tend to alleviate the burden imposed on the population, but rather necessitate considerable organizational efforts and costs.

24. In conclusion, it may be said that the 10%-sample employed as a supplementary part to the exhaustive enumeration within the scope of the 1970 population census, was quite suitable to satisfy the expectations which had been

set in them with respect to cost reductions and quality of the results. This may perhaps permit the general conclusion that the method of combining a total enumeration with a sampling part is feasible in large-scale censuses, but the decision whether this procedure can be applied in a purposeful way always depends — as was shown by the preparatory work for the 1983 population census — on the standards of performance set for the respective large-scale census and on the availability of an appropriate sampling frame.

c) The system of descriptive sample checks in official statistics of the Federal Republic of Germany

25. As another possibility of employing sample surveys in connection with a large-scale census, the following deals with sample checks of a descriptive nature. In addition to the total checks of an operative character which have the task of improving the accuracy of the results by detecting systematic errors in the course of the compilation of the statistics, the descriptive procedures performed on a sampling basis represent a second integrated *control system* within the scope of a large-scale census. It is the objective of the descriptive checks to provide information on the quality of the census results already during the processing phase, the completeness of coverage as well as the full and pertinent answering of the questions being of primary concern. The system of sample checks of a descriptive nature has up to now been employed by official statistics in the 1961 (10) and 1970 (11) population censuses and encompassed the following procedures:

- a) immediate checks;
- b) alphabetical checks (1961 population census), birthday checks (1970 population census);
- c) checks of characteristics.

26. The objective of *immediate checks* consists in verifying the complete and correct coverage of buildings, households and persons, as well as the correct allocation to the *resident population* (at the main place of residence) and to the population with *legal resident status*, persons having more than one place of residence being in general covered at each place of residence. The immediate checks as a follow-up survey based on a representative sample are performed directly after completion of the census-taking in the form of an interview procedure, which requires each respondent to reply again, with census day as the reference date, to certain questions included already in the census questionnaire. In the censuses of 1961 and 1970, a central item for the exact ascertainment of the total number of the total number of the population was the question as to whether the individual household member had any further accommodation at his/her disposal and, if this was the case, whether he/she

went to work or training/education from this further accommodation.

27. The household members are considered to be part of the resident population in that place from where they actually depart on their way to work or vocational training. The staff employed for the immediate checks have in a number of cases found wrong answers to this central question. Within the scope of immediate checks, they could however establish this incorrectness at one place only, without being in a position to check the answer for the other place. Both in 1961 and in 1970, the reliability of the answers to this question could be ascertained only by bringing together the data which had been entered for these persons with further accommodation in the different places covered. This verification was made possible by the performance of an alphabetical check (1961) and a birthday check (1970), respectively. Both of these control procedures were meant to determine whether a questionnaire has been filled at two different places by one and the same person. By means of these two sampling procedures, it should moreover be made possible to estimate for the population census the number of cases which had been covered twice but where it had not been indicated at either one of these places that there was a further residence. For this purpose, the questionnaires of the persons included in the sample were brought together for comparison of the relevant entries. The only difference between the alphabetic and the birthday checks is the method used for the selection of the sample. While the alphabetic check included in the sample all persons whose family name began with the letter "A", the sample for the birthday check covered all persons who were born on the 31st of either March, May or July. The advantage of the sampling by the birthday method is seen in the fact that the birthday, in contrast to the name, was in 1970 stored already on data carriers. This facilitated the selection of the sample as compared to the alphabetic check of 1961.

28. The procedures discussed regarding immediate checks on the one hand and alphabetic and/or birthday checks on the other with their differing methodological approaches and complementary aims, made it possible to estimate the total error for the relevant census as related to the resident population.. The results of the checks were combined in such a way that only those values, which theoretically exclude each other, were admitted for the computation. As far as the 1961 population census is concerned, it thus was possible to arrive at an under-enumeration of the resident population of 0.6%, while this estimate for the 1970 census came to 0.9%.

29. The *checks of characteristics* are the third procedure complementing the system of sample-type checks. Its results reveal the variability of answers by comparing the data given in reply to the same questions asked on the one hand in the population census and on the other in two microcensus enquiries conducted directly before and after the census itself. The checks are to reveal to what extent and in what direction deviations may occur with certain characteristics and should also indicate the degree of sensitivity manifested by

specific characteristics. The microcensus is offering itself as a basis for making comparisons on account of the fact that there exist close technical and organizational correlations as well as close connections as to subject-matter and content between the population census and the sample statistics of the microcensus. The technical/organizational link exists due to the fact that the population census provides the sampling frame for the microcensus. The link in point of subject-matter and content consists in the fact that the population and occupation census with its total coverage at long-term intervals provides structural data in a detailed subject-matter-related and regional breakdown, while the microcensus provides on a representative but annual basis numerous structural data in an always limited subject-matter and regional breakdown. The methodological particularities of the checks of characteristics resulting from the inclusion of three surveys with differing enquiry methods (interview method in the case of the microcensus) conducted at different times, and the thus possible deviations in the data, necessitated intensive processing checks in both 1961 and 1970.

30. In short the experience gained by official statistics in the Federal Republic of Germany in making use of the control system described for the two large-scale censuses of 1961 and 1970, may be summarized as follows:

— the experience with the performance of descriptive checks for exhaustive enumerations conducted in the past permits us to derive important information for the preparation, execution and evaluation of future censuses. New developments in the field of data processing, in particular data preparation, should, in conjunction with a further refinement of the statistical resources employed for the control procedures on a sampling basis, lead to still greater accuracy in the appraisal of the quality of census results;

— information with regard to the accuracy of large-scale censuses is of particular importance for appraising the accuracy of the current adjustment of vital events and migrations based on the results of the population censuses;

— the expenditure of time, personnel and costs required for the execution of large-scale censuses justifies to a particularly high degree the employment of a control system on a sampling basis as a complement to a system of total checks of an operative character. In the case of the population census originally scheduled for 1983, the share of costs for the descriptive checks would have amounted to only about 1% of the total costs calculated for the Federation and the Laender.

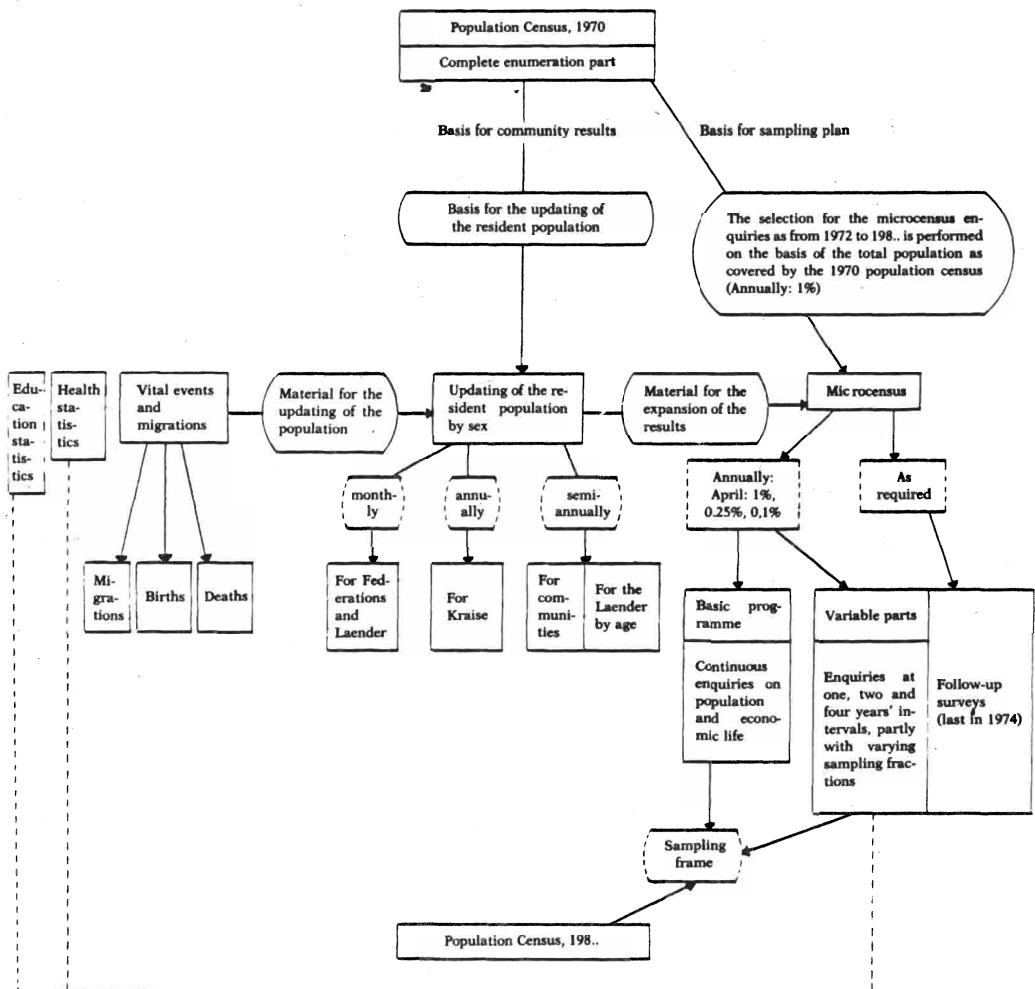
31. In conclusion it should be mentioned that the employment of sample checks in official statistics of the Federal Republic of Germany is not limited solely to the controlling of population censuses. Sample surveys are also performed in connection with other large-scale censuses in order to have with regard to the reliability of individual data, some idea of the degree of accuracy of the census results and of the extent of variability in the response to questions.

As an example should be mentioned the sample checks performed in connection with the 1968 census of buildings and dwellings where the most important census results were immediately upon completion of this census subjected to a 0.1%-sample check (12).

III. THE USE OF SAMPLE SURVEYS AS A FOLLOW-UP TO LARGE-SCALE CENSUSES

32. In section II the positive experience made with samples as a follow-up to a complete enumeration, has already been briefly dealt with, using as an

Chart 3: Structure of population statistics and sample enquiries between population censuses



example the 10%-sample survey conducted within the scope of the 1956/57 housing statistics. It was shown here what an important role sample surveys can play in lessening the burdens imposed on the respondents in a census, as well as with respect to the extension of the contents of complete enumerations within the scope of official statistics. The introduction of the microcensus in 1957 which, in addition to the already mentioned function in the preparation of large-scale censuses, also envisages as an objective, among other things, "the easing of pressure on the programme of the population census by taking over specific topics originally meant to be part of the population census, and the more detailed elaboration of data derived from the results of the population and occupation census by means of follow-up surveys" (13), is an important step forward as far as sample surveys within the scope of official statistics of the Federal Republic of Germany are concerned. Due to its annual periodicity, the microcensus helps to bridge the informational gap between the population censuses by performing a continuous updating of the census data. Chart 3 above illustrates the connective role played by the microcensus between two large-scale censuses.

33. It is not possible here to deal with all sample surveys performed within the scope of official statistics in the Federal Republic of Germany for the purpose of complementing a preceding census. All the same, we would like to present here just one such example, namely the statistical reports in trade and in the hotel and restaurant industry which, on account of the combination of total enumerations and subsequent representative surveys, may also be called a "reporting system".

34. This reporting system embraces the following survey parts:

as a complete enumeration

— the censuses of distribution scheduled to be conducted at 6 to 10 years' intervals

as representative surveys

— the monthly surveys

— the annual surveys

— the follow-up surveys to the annual surveys (14) (scheduled to be conducted at 5 to 7 years' intervals).

35. The exhaustive enumeration has been conceived within the framework of the reporting system as a basic census which is used as a sampling frame for the representative statistics. The results of the sample surveys in their turn can be raised to the universe derived from the census of distribution. The new conception of statistics in trade and in the hotel and restaurant industry introduced in the mid-seventies was the consequence of an in-depth structural change in this sphere, which had strongly transformed the traditional picture of

these sectors of economy. It had been possible to draw for this purpose upon the manifold experience of official statistics with the use of samples as a supplement to complete enumerations.

IV. CONCLUSION

36. The purpose of this contribution was to present the most significant experience gathered by official statistics in the Federal Republic of Germany with regard to the employment of sample surveys during the various phases of complete enumerations. The emphasis was on population statistics and in particular on the population and occupation censuses conducted up to this time. As far as the use of sample surveys before, during, and after the censuses is concerned, regardless of the objectives involved, it may as a final comment be stated that official statistics can fall back upon a large store of knowledge based on the experience gained through the systematic employment of sample surveys over the past three decades. This facilitates both the planning and execution of new statistics as well as the modification of already existing statistics that is called for every once and again.

37. The development and postponement of the census of population, occupation, housing and non-agricultural local units, originally scheduled for 1983, has shown that it will also in future be necessary to test intensively and further improve the existing sample surveys, and constantly to evaluate their possible performance capabilities in connection with complete enumerations; this further development of sampling procedures is gaining more and more in importance, in particular for reasons of data protection legislation. In the controversies about the 1983 population census, considerable weight was brought to bear by the argument to employ sample surveys in place of complete enumerations on the grounds that, as a "milder form of inquiry", they would involve only some of the population in the collection of personal data, thus limiting the burden connected with data provision to that specific group. Although the highest court in the land has conceded to official statistics that there does not exist at present any alternative to the execution of a population census as a complete enumeration, official statistics have nevertheless been called upon to examine continuously whether exhaustive enumerations could in future not entirely be dispensed with and whether sample surveys could instead be increasingly employed for that purpose (15). At the present time, it can neither conclusively be stated whether this will in general be feasible, nor whether this will actually be expedient in the long run.

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NOTE

(1) See Annex 1, which is to give an outline of the most important statistics compiled by means of sample surveys. Annex 2 shows the position of the microcensus and other selected sample surveys within the scope of official statistics (organizational links).

(2) See: Statistisches Bundesamt (Publisher): Stichproben in der amtlichen Statistik. Stuttgart/Mainz 1960. As standard works for the conception of official samples are considered: Hansen, M.H., Hurwitz, W.N. and Madow, W.G.: Sample Survey Methods and Theory. 2nd Ed., New York/London 1956. Deming, W.E.: Some Theory of Sampling. 4th Ed., New York 1961. Kellerer, H.D.: Theorie und Technik des Stichprobenverfahrens. 3rd Ed., Munich 1964.

(3) See: Statistisches Bundesamt (Publisher): Statistik der Bundesrepublik Deutschland, Vol. 31. Organisation und Technik des Volkszählungswerkes 1950. Stuttgart/Cologne 1956, p. 33.

(4) This opinion poll was performed by the "Institut zur Erforschung der öffentlichen Meinung" Munich. See: Die Volkszählung in der Volksmeinung. In: Bayern in Zahlen. Number 2, 1950.

(5) See: Statistisches Bundesamt (Publisher): Organisation und Technik des Zählungswerkes 1960/62. Stuttgart/Mainz 1968.

(6) See: "Gesetz zur Vorbereitung der Volkszählung 1970", Bundesgesetzblatt I, 1967, p. 506.

(7) Since the legislative procedure for this census was not continued on account of the difficult budget situation, it had finally not been possible to go through with the 1975 census of buildings and dwellings. A 10%-housing sample survey taken into consideration as a substitute solution could not be realized either.

(8) In supplementation to the 1%-sampling fraction, three inquiries each with a sampling fraction of 0.1% were conducted as part of the microcensus up to including 1974 in January, April

and July of each year. See: Herberger, L.: Die Statistiken der erwerbstätigen Personen. In: Allgemeines Statistisches Archiv, Special Number 11, 1977, p. 36 ff.

(9) The advantages of using sample surveys *after* a census will be further dealt with in Chapter 3 of this contribution.

(10) See: Herberger, L.: Verfahrenskontrollen zur Prüfung der Vollständigkeit und Genauigkeit bei Volks — und Berufs — zählungen. In: Allgemeines Statistisches Archiv. Vol. 54, 1970, p. 55 - 75.

(11) See: Statistisches Bundesamt, Subject-Matter Series 1: Population Census on 27 May 1970, Number 25: Methodische Hinweise und praktische Vorbereitung sowie Durchführung der Volkszählung 1970.

(12) See: Nourney, M.: Deskriptive Stichprobenkontrolle zur Gebäude - und Wohnungszählung 1968. In: Allgemeines Statistisches Archiv. Vol. 54, 1970.

(13) Herberger, L.: Die Statistiken der erwerbstätigen Personen. In: Allgemeines Statistisches Archiv. Special Number 11, 1977, p. 36.

(14) See: Herberger, L., Reeb, A.: Neues statistisches Berichts - system im Handel und Gastgewerbe. In: Wirtschaft und Statistik, Number 11, 1978, p. 681.

(15) See: Decision of the Federal Constitutional Court on the 1983 Population Census Law of 15 December 1983. 1 BvR 209/83, among others, p. 58 ff.

Annex 1

Principal Methodological Features of Sample Surveys

Subject Statistics	Bases of the statistics		Sampling procedure		Average sampling fraction
	statistical unit	tabulating unit	sampling unit 1)	number of sampling units	
Population and Employment					
Population Census 1970	household	person, household	enumeration list 2)	800,000	10% 2)
Microcensus					
1%-sample surveys	household	mostly: person	segment 3)	about 1,000,000	1%
0.5%-sample surveys	household	mostly: person	segment 4)	about 10,000 4)	0.5% 5)
0.25%-sample surveys	household	mostly: person	segment 4)	about 10,000 4)	0.25% 6)
0.1%-sample surveys	household	mostly: person	segment 4)	about 10,000 4)	0.1% 6)
Elections					
Statistics on the 1980 Bundestag Elections	persons entitled to vote/voter	person entitled to vote/ballot paper	election district	57,000	3.4% 7)
Statistics on the 1979 Elections to European Parliament					
Agriculture and Forestry					
Reports on Agriculture	agricultural holding	agricultural holding person	agricultural holding	900,000	about 11%
Sample Part of the Main Survey for the 1979 Census of Agriculture	agricultural holding	agricultural holding, person	agricultural holding	900,000	about 11%
Labour Statistics					
in agriculture	agricultural holding	person	agricultural holding	900,000	about 11%
in forestry	forestry holding	person	forestry holding	8,000	about 37%
Land Utilization Surveys					
Main survey	agricultural holding forestry holding	agricultural holding forestry holding	agricultural holding forestry holding	1,070,000	10%
Surveys of vegetable cultivation	agricultural holding	agricultural holding	community 8)	8,500	about 25%
Special Yield Inquiry 9) Sample cuts and sample liftings	sample plot	field	holding, field of type of crop, sample plot	about 700,000	about 0.0001% of area 6) 10)
Complete threshings	field	field	field of type of crop 11)	1,500 to 1900	0.03 of area 6) 10)
Intercensal Livestock Surveys					
in April and August	agricultural holding	agricultural holding	agricultural holding	950,000	5%

Subject Statistics	Bases of the statistics		Sampling procedure		Average sampling fraction
	statistical unit	tabulating unit	sampling unit 1)	number of sampling units	
in June	agricultural holding	agricultural holding	agricultural holding	700,000	5%
Sample Checking of the Livestock Censuses					
in December	agricultural holding	agricultural holding	community, agricultural holding	about 8,400 950,000	about 0.6% 6)
in April	agricultural holding	agricultural holding	community, agricultural holding	about 7,800 950,000	about 0.3% 6)
Production Industries					
Survey of the Cost Structure in Mining and Manufacturing	enterprise	enterprise	enterprise	38,000	39%
Survey of Materials and Goods received in Mining and Manufacturing	enterprise	enterprise	enterprise	38,000	53%
Survey of the Cost Structure in Construction	enterprise	enterprise	enterprise	17,000	23%
Survey of Materials and Goods received in Construction	enterprise	enterprise	enterprise	17,000	58%
Reports on Handicrafts	enterprise	enterprise	enterprise	316,000	about 11% 12)
Dwellings					
Housing Sample Survey, 1978	buildings, dwellings, households	buildings, dwellings, households	segment 13)	about 1,000,000	1%
Dwellings					
Supplementary Survey					
in wholesale trade, 1981	enterprise	enterprise	enterprise	43,000 14)	46%
in retail trade, 1980	enterprise	enterprise	enterprise	123,000 15)	20%
in the hotel and restaurant industry, 1981	enterprise	enterprise	enterprise	137,000 16)	6%
Wholesale Trade Statistics	enterprise	enterprise	enterprise 17)	20,000 17)	50%
Statistics on Agents and Brokers Business	enterprise	enterprise	enterprise	45,000 16)	22%
Retail Trade Statistics	enterprise	enterprise	enterprise	123,000 15)	20%
Statistics on the Hotel and Restaurant Industry	enterprise	enterprise	enterprise	137,000 16)	6%
Transport					
Statistics on Goods	lorry	lorry	lorry	947,000	9% 18)

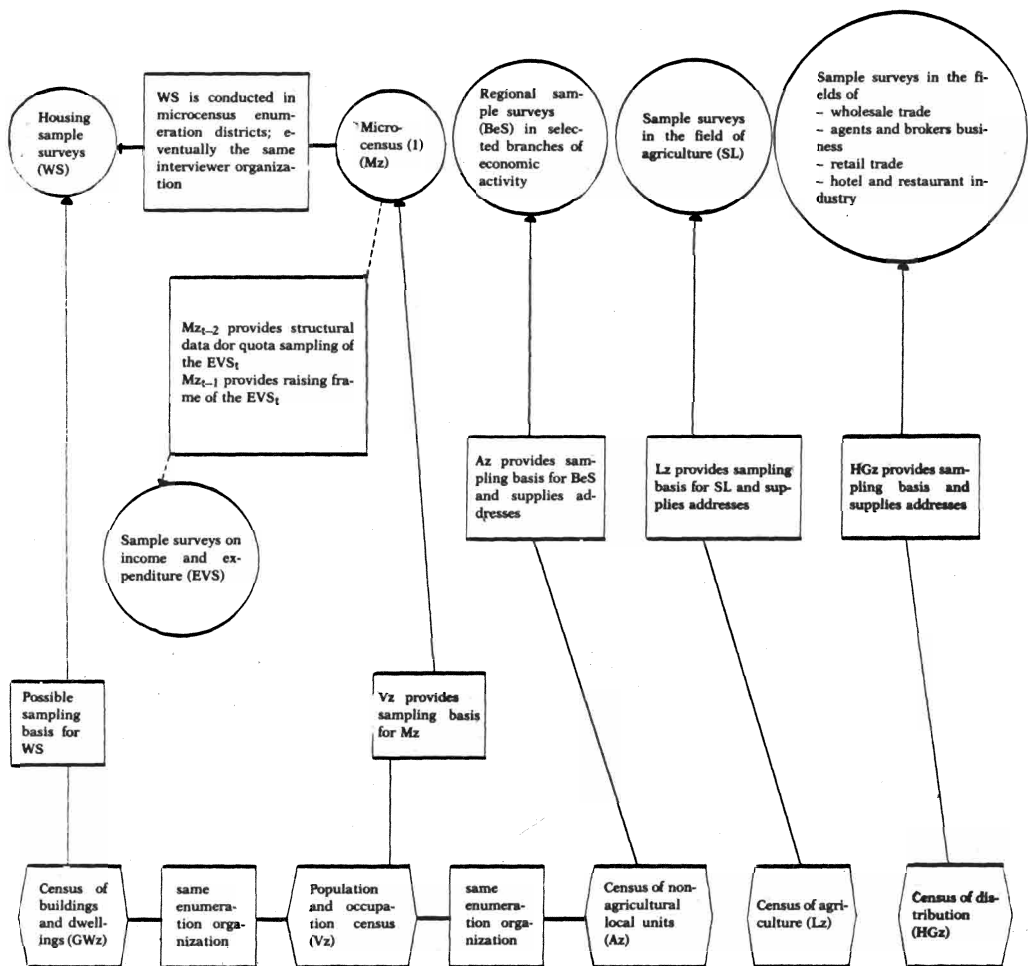
Subject Statistics	Bases of the statistics		Sampling procedure		Average sampling fraction
	statistical unit	tabulating unit	sampling unit 1)	number of sampling units	
Transport by Motor Vehicles, 1978		trip			
Social Security Schemes Supplementary Statistics on Public Assistance, Current Subsistence Aid, 1980	recipient of assistance	recipient of assistance	recipient of assistance	1,000,000	20%
Supplementary Statistics to the Annual Statistics of Public Assistance on Nursing Assistance, 1977	recipient of assistance	recipient of assistance	recipient of assistance	425,000	30%
Statistics on Housing Allowances, 1978	household	household	household	about 1,500,000	25%
Wages and Salaries Statistics on Earnings in agriculture	agricultural holding	agricultural holding	agricultural holding	43,500	4%
in industry and commerce	establishment (or local unit)	establishment	establishment (or local unit)	265,000	12.7%
in handicrafts	establishment	establishment	establishment	149,000	13.5%
Survey on Labour Costs, 1978					
in production industries	enterprise	enterprise and local unit	enterprise	116,000	13.3%
in trade and in the service sector 19)	enterprise	enterprise	enterprise	52,000	23.3%
Survey of Salary and Wage Structure, 1978					
in trade and industry	local unit	employee (case of activity)	local unit	126,000	14.1%
in the service sector 19)	enterprise	employee	employee enterprise	about 11,000,000 52,000	10% 6) 23.3%
Statistics on Pension Schemes of Enterprises	enterprise	enterprise	enterprise	about 2,000,000 110,000 20)	10% 6) 10.1%
Family Budget Surveys Sample Survey on Income and Expenditure, 1978	household	household	household 21)	240,000 21)	0.25%

(1) In the case of the multi-stage sampling procedure the sampling units to be considered are listed downwards in the order of the stages. - 2) Larger institutions covered on a total basis. Enumeration lists selected with 20% in the stratum with the largest number of households, covering half of them. - 3) Systematic subdivision of the ordered sample to prepare the rotation of segments. One quarter of the 1%-sample is exchanged every year. - 4) Selection 2nd phase from the 1%-sample survey of the microcensus. - 5) Every two years for purposes of the European Communities. - 6) Total sampling fraction. - 7) Election districts with less than 290 persons entitled to vote are not included in the sample; replaced by larger ones which, with regard to eligible voters and election behaviour, closely correspond to the districts replaced. For the eligibility to vote 3.7%. - 8) In some federal Laender also sample of holdings at a second

stage. - 9) For the Saar deviating sample design. - 10) Per type of crop. - 11) Selection 2nd phase from the field sample of sample cuts. - 12) Handicraft enterprises which report to the monthly report on mining and manufacturing, and being part of building industry proper or, through one of their establishments, participate in the monthly survey of finishing trades, are not included here. - 13) Same sampling plan as for the microcensus. - 14) With at least 1 mn DM turnover in 1978. - 15) With at least 250,000 DM turnover in 1978. - 16) With at least 50,000 DM turnover in 1978. - 17) Selection 2nd phase from the supplementary survey in wholesale trade. - 18) Equally distributed to 13 series over the year. 19) In the service sector (excl. the public service), the sample of the year 1974 was once again drawn upon. - 20) 105,000 enterprises from the 1970 Census of Non-Agricultural Local Units, and 5,000 enterprises providing retirement systems from the Survey on Personnel Expenses, 1972. - 21) Simple selection; partly from the 1977 Microcensus.

Annex 2

**Position of the Microcensus and Other Selected Sample Surveys within the Scope of Official Statistics
ORGANIZATIONAL INTERRELATIONS**



(1) 0.5%-sub-sample; labour force sample survey of the EC.

USE OF THE SAMPLING METHOD IN THE 1981 CENSUS OF POPULATION IN ITALY (a)

1. The census of Italy of 1981 made considerable use of the sampling method. Although there had been some opportunity of using samples in past censuses, in the last census a much wider use was made of them.

2. It is necessary to point out, however, that random samples were not always used. In certain instances, methodological strictness was voluntarily abandoned to make way for a smooth survey, and taking into consideration the special goal being pursued in the survey.

I. EXPERIMENTAL SURVEY

3. Within the framework of the preliminary operations, and with reference to 30 November 1980, an experimental survey was conducted with the aim:

— to assess the census «household questionnaire» and introduce in time likely changes in the formulation of the questions, wherever considered necessary to guarantee complete and consistent answers;

— to verify whether households would be disposed to fill in the questionnaires and to spread information, as much as possible, about future survey operations;

— to test the feasibility of using an optical reader, point out likely defects and take corrective action in order to avoid problems at the time of the census.

4. In each Province, the survey was taken in the chief Commune and another Commune chosen by the Provincial Office of Statistics. In each Commune, 150 households were involved; therefore, a total of 28,500 households participated in the survey.

5. We can affirm that the survey was a success since it allowed useful

(a) Report prepared by Mr A. Cortese - Central Institute of Statistics.

elements of information to be obtained for the organizational and executive preparation of the census, especially with reference to the format of the questionnaire. Among other things, it led to the decision not to use optical readers.

II. CONTROL SURVEYS

6. Although the questionnaires were subjected to a thorough checking at the Communes' offices, it was considered feasible — immediately following the census — to undertake specific surveys to obtain detailed indications of the validity of the information collected. Three distinct surveys, to be precise, were taken.

(a) Survey on the census - population registers comparison

7. On the occasion of the census of the population, the Communes should provide by law a thorough up-dating of the register of the resident population. The comparison between the two sources is useful to the census because it can identify demographic units that escaped the enumeration operation.

8. The essential aim of this survey is to obtain information on the state of up-dating of the Communes' registers and, consequently, on the utilization of such registers for the so-called «improvement» of the census. Within the framework of the control surveys, this therefore presents atypical characteristics. Less importance was given to the census data than to the population register, even given the importance which (in the present methodological formulation of the census) this device has for the checking carried out in the Communes.

9. The survey covered 99 Communes (the 95 chief Communes of the Provinces and the 4 non-chief Communes with over 100,000 inhabitants). The choice was suggested by experience, since it is especially the large Communes that encounter major difficulties in the census - population registers comparison. A total of about 43,000 households (equivalent to 0.7 per cent of the households involved in the census) in the sample Communes participated. Stiff regulations were not fixed for their selection. The Communes, therefore, operated in full autonomy, as they had been requested only to guarantee the maximum coverage of the Communal territory. From a practical point of view, after having selected the questionnaires, a much easier form was compiled containing, beside the information obtained by the census questionnaire, the corresponding information appearing on the household card of the Commune register.

10. As for the results, one may limit oneself to pointing out that the Communes do not always up-date the population registers with the necessary promptness. This points to the need of enlisting other channels to guarantee a satisfactory degree of coverage in the census.

(b) Survey on the degree of coverage

11. This is the first time that our Country has felt it necessary to examine closely the coverage of the population census. This is explained by the lesser reliability of the Commune registers, and that in the past they have always played an outstanding role in checking the census information. Therefore, this survey has had, in some ways, an experimental character. Precise indications have, moreover, come about.

12. As regards the manner of developing such an operation, it should be said that one acted on the basis of a sample of enumeration areas. In order to carry out the survey, use was made, more precisely, of a two-stage stratified sample: the areas of the first stage were the Communes with over 10,000 inhabitants (it is supposed that in these Communes the under-coverage of the census universe is more noticeable); the enumeration areas formed the units of the second stage. The Communes were stratified according to a geographical division (three areas) and the population size (six broad classes). The 8,000 Italian Communes were subdivided into 18 strata from which the sample Communes were selected: from the latter, a sample of enumeration areas was selected. In order to give some idea of the size of the operation, it is sufficient to point out that the survey involved more than 120,000 households.

13. Enumerators who proved themselves particularly efficient in the course of the census-taking, and who were selected for this reason, went through the sample areas and noted all the findings on an appropriate form.

14. The counting turned out to be somewhat complicated, since, for instance, consideration had to be given to eliminate from successive countings those households which had resided in the area at the time of the survey, but who moved away after the date of the census.

15. There were also difficulties in the interpretation of the results because it was not always possible to be fully certain about the complete reliability of the information collected in the survey. It is, however, possible to express a sufficiently favourable opinion on the degree of coverage of the census enumeration.

(c) Survey on the quality of the data collected

16. The topic of the quality of the information gathered in the census is

treated in a separate report (p. 239). The survey is mentioned here only to provide some information on the methodological aspects with particular regard to the sample used.

17. Special care was called for, as in the preceding case, in the field organization. Naturally, it was necessary to prepare an "*ad hoc*" form whose compilation was not entrusted to household heads. Instead, it was felt preferable to use interviews which were conducted by persons employed as enumerators at the time of the census. The delicate task entrusted to such personnel underlined the need to pay special attention to their training. It also appeared feasible to limit the individual work load in view of the reduced time available for completing this survey. Once again it is worth noting that the field operations were constantly checked by the ISTAT officials who closely followed the activities of the Communes' Boards which had been called upon to co-operate in this task.

18. The survey plan involved visiting again 9,800 households selected at random from the household universe involved in the census carried out in 3 Communes. This group of Communes, although not constituting a random sample, could be deemed sufficiently representative of various situations: the Communes were, in fact, selected on the basis of geographical area, population size and some information on the success of the census operations.

III. PREPARATION OF INPUT

19. Measures were undertaken in the basic data registration to guarantee the indispensable validity of the delicate operation.

20. Such measures were rendered necessary also because of the heterogeneity of the Boards which, according to the law, in certain cases had to fulfil such an operation on their own.

21. The controls were made at two distinct moments and were carried out during the storing of the information and later by considering the recorded information.

22. It should be stressed that this last checking was carried out on a sample basis. It consisted of a random selection of (n) enumeration areas within which (m) questionnaires were selected in sequence starting from a number chosen at random within the area itself.

23. By comparing the records of the sample with the corresponding household questionnaires, the number of "different" records was found and then the percentage of these on the total of the sampled records was calculated.

24. Such an operation allowed us to ascertain that the level of error attributable to the recording of the input is generally less than 5 per thousand.

IV. TABULATION OF DATA

25. Sampling was last used for tabulation purposes because of our desire to disseminate census information on a more timely basis. In seeking to anticipate the availability of certain detailed information on the major characteristics of the universes involved in the census, a sample of questionnaires was selected so as to provide the basis for some tables which were to be published in a separate volume. A systematic sample of households, one out of 50, equivalent to 2 per cent of the universe, was selected from the magnetic tapes containing the information inferred from the census questionnaires. Such a rate of sampling was chosen with due consideration to both the sample error and the processing times.

26. Since the questionnaires were recorded on provincial tapes and filed according to enumeration areas and Commune, it should be stressed that the said tapes were filed again, at the time of selection, according to the region (the results of the counting have been referred to such an administrative district). Such a procedure brought about an implicit stratification of the selected areas and increased the reliability of the sample estimates. As is known, a systematic sample can be assimilated to a simple random sample if the internal class correlation is nil, or rather, if the population units filed are independent from each other. In the case in question, one may suppose that such an independence exists or that, at most, there is a correlation of negligible entity between the filed households. According to this hypothesis, one should approximate the variance of the systematic sample evaluations to that relating to a simple random sample.

27. It would be interesting to go into further technical detail. However, this would require a much longer report than the present one. On the other hand, this report is only intended to give a general idea of the experiences gained.

NORWEGIAN EXPERIENCES IN THE USE OF SAMPLING IN DIFFERENT PHASES OF THE CENSUS (a)

I. INTRODUCTION

1. In this paper, we will present four examples of using sampling in the census. Three of the examples are pre-tests of the collection methods, the questionnaires and the information campaign. The fourth is an evaluation study.

2. In Norway we have good experiences in using sampling for these purposes. Different methods with different costs can be used, and may give useful information both in the planning and the evaluation.

3. Sampling has not been used as a supplement to the data collection from the population.

II. THE PRE-TEST 1978

4. The aim of Pre-test 1978 was to test and appraise the quality of the ways we planned to collect data and the ways we phrased the questions on the questionnaires. The 1980-census was the first census where Norway used "mail-out, mail-back", and it therefore was very important to us to discover problems in the questionnaires and in the procedures.

5. The sample was taken from the Central Register of Population. It consisted of 2027 families with 3779 persons 16 years or older. Each family received a housing form and a "mail-back" envelope, and each person a personal form. In addition they received an information pamphlet. About 65 per cent filled out the forms and mailed them back to us.

6. The questionnaire was mailed out at the end of September 1978, and were to be mailed back before 3 October. In the period 16 October to 10

(a) Report prepared by the Central Bureau of Statistics of Norway.

November, the families were visited by interviewers. Their questions were divided in two parts. The first part contained some of the same questions as in the two forms we had mailed out earlier, but this time we put them in a more precise and extended way than had been possible on the first forms.

7. The second part of questions on the interviewers' questionnaires, was about the census, the questionnaires and so on.

8. Data from both sources were put into the computer. Afterwards tables for each variable were produced, showing the results in the mailed questionnaires and in the interviewers' questionnaires in the same table.

9. From the conclusion in the report, we will mention that the quality of the answers on economic activity seemed to be better than in the 1970 - census, but the quality was still not satisfactory, even if we took the non-response into account. Also, for other questions on the questionnaires, the pre-test showed that we should try to find some better solutions.

10. Another fact from the Pre-test 1978 was that the way to register households with more than one family was not acceptable and had to be changed.

11. At last, we will mention that in the Pre-test 1978, we also had a test of the use of optical reading, a technique which in 1980 was to be used for the first time in large statistical investigations in Norway. The pre-test gave us useful results on that point, too.

III. THE PRE-TEST 1979

12. As mentioned under para. II, one of the results of the Pre-test 1978 was that the questionnaire did not work as well as we wanted on the questions concerning economic activity. The test also told us that housewives, students and pensioners very often omitted the small jobs (part-time jobs, week-end jobs and vacation jobs) they had in addition to their main activity. But the test could not tell us *what* was wrong with the questionnaire and *how* we could correct it, and it seemed to be difficult to construct interviews which could solve this problem and to educate interviewers to use them.

13. Therefore we decided that the staff who was planning the census had to do this investigation themselves. The staff numbered about 10 persons and was situated in the town Kongsvinger with about 17000 inhabitants, 90 km from Oslo. These facts put heavy restrictions on the number of persons in the sample, and the geographical extension of it. From the local population register we chose persons expected to belong to one of the groups to which we wanted to give special attention. To assure that we got information on special groups which were not well represented in Kongsvinger, as for instance students, some of our colleagues in Oslo visited a student hostel there.

14. About 10 September 1979 we mailed out the questionnaires with an

information pamphlet, but no return envelope. Instead we told them to fill in the forms and keep them until we would come and fetch them. About 17 September we started to interview.

15. The interview should be very free and not heavily structured. We asked for the forms, studied them a little and started a talk, through which we confirmed the information. We also asked for their opinion on the questionnaires and the information pamphlet, but mostly the talk was free and we tried to let *them* speak to *us* instead of asking them questions. Afterwards the interviewer summed up the experiences in a more structured way, and out of that we could make a report.

16. Of course this was a very rough way of making a survey, and "pure" statisticians may refuse such a method. It gave us very good information on the problems, and information which may have been difficult to get from an ordinary interview with interviewers who do not ordinarily work on the planning of the census. It was also a very useful education of the staff in the planning of questionnaires, data collection routines, and information attempts.

17. The results of the survey were transformed into new ways of putting some of the questions. But the experiences had also a great influence on the information booklet which we planned to distribute together with the questionnaires.

IV. THE PRE-TEST 1980

18. In March 1980, just before the information booklet was to be printed, two private marketing research firms carried out a very simple pre-test of it. The questionnaire also contained some questions on the public opinion of the census.

19. One of the firms asked people on streets in Oslo to answer some questions. The other one used the more traditional method, visiting a sample of people in their homes.

20. The methods were too crude to be really serious, but when both of them came to the same results, we took the information into account in the editing of the booklet and in planning the information campaign. One observation was that only a few people had negative feelings against the census, and that the campaign should make special efforts to mark the day of the census, and to remind the public to fill in the forms and to return them.

V. THE EVALUATION SURVEY 1980

21. The evaluation survey (ES) for the Population and Housing Census 1980 is a sample survey held in November-December 1980 shortly after the

Population and Housing Census took place (1 November).

22. Population censuses and other similar investigations are subject to random and systematic mistakes in the answers filled in on the questionnaires. In addition, there are always a number of people who do not answer individual questions. The main goals of the evaluation survey were to gain knowledge about the extent of the influence of these types of mistakes on some selected special features and to find out the extent of damage this causes to the statistics. We also wished to gain insight into the reasons for the mistakes in the answers and to investigate whether the mistakes were prominent in any definite answer categories or in any definite population group. Another goal of the evaluation survey was to produce corrected numbers for some of the special features investigated by the census.

23. A selection of about 6700 persons was made for the ES and these persons were visited by interviewers. The interviewers collected data about special features, and these data were compared to those collected from the personal questionnaires in the census itself.

24. In the ES, questions were asked about the special features using the same definitions used in the census, but in a more detailed form. In addition, the questions were posed by trained interviewers who were capable of clearing up misunderstandings. We can, therefore, presume that the answers resulting from the ES were of better quality than those resulting from the census itself. Our experiences in carrying out the ES show, however, that the data gathered by interviewers cannot be assumed to be 100 per cent correct.

25. As an example of the presentation of the results from the survey, we have included in the paper a table from the publication "Employment Statistics". The table shows the shares of each category of the census and the calculated shares according to the ES. In addition, they show the net deviations, meaning the differences between the shares in the census and the corresponding shares in the ES. The margins of error listed in the tables correspond to two calculated standard deviations to the estimated from the ES. The example below explains how some of these margins of error should be interpreted. Example: In Table A, which is based on the ES, figures show that 43.5 per cent of all persons 16 years of age or more, had worked 1300 hours or more in the period 1 November 1979 to 31 October 1980. The margin of error is estimated to be $\pm 0.8 = 44.3$ per cent will then, with 95 per cent probability, contain the share with "1300 hours or more" that would have resulted if we had carried out the ES as a total census. If the calculated deviation is greater than the corresponding calculated margin of error, it is reasonable to assume that the deviation is, in reality, greater than zero.

26. As Table A shows, the deviation between the census and the ES can not be interpreted as significant. Looking on the different categories of working hours, you will find significant deviations, but most of it comes from the category "Not-reported". A very useful result from Table A is the information

on how persons with "Not-reported" in the census seems to be distributed among the categories of working hours in the ES.

27. Some other tables from the ES were presented in the publication *Employment Statistics*, and similar tables will be included in other publications. In addition, we will make a more analytical presentation of the ES in a special publication.

28. The presentation of results of the ES in the statistical publications is a new method to bring these results to the users of the statistics. It is too early to say something about how useful this new method has been, but we have the feeling that we need to develop the method in a more popular way to serve most of our readers.

29. The actuality of the results of the ES has been much better than for the 1970-census, and this has been very useful both for us and for the more qualified users of the statistics. It has given more specific information on the quality of the results, and how to handle variables which have a considerable number of "Not-reported" cases associated with them.

Table A. Persons 16 years and over by economic activity, working hours and sex in the census and ES.
Per cent

	Total			Males			Females		
	In the census	In the ES	Devia- tion	In the census	In the ES	Devia- tion	In the census	In the ES	Devia- tion
Total	100.0	100.0	—	100.0	100.0	—	100.0	100.0	—
Not economically active or less than 100 hours	34.9	34.5	0.4	22.1	21.4	0.7	47.2	47.1	0.1
Uncertainty		±0.6	±0.6		±0.8	±0.8		±0.9	±0.9
Economically non-active		32.8			20.8			44.3	
Uncertainty		±0.7			±0.9			±1.0	
1 - 99 hours		1.7			0.6			2.7	
Uncertainty		±0.3			±0.3			±0.6	
Economically active 100 hours or more	65.1	65.5	-0.4	77.9	78.6	-0.7	52.8	52.9	-0.1
Uncertainty		±0.6	±0.6		±0.8	±0.8		±0.9	±0.9
100 - 499 hours	9.6	8.2	1.5	7.1	6.1	1.0	12.1	10.1	1.9
Uncertainty		±0.6	±0.6		±0.8	±0.8		±1.0	±1.0
500 - 999 hours	7.6	8.7	-1.0	4.7	4.6	0.1	10.5	12.6	-2.2
Uncertainty		±0.6	±0.6		±0.8	±0.8		±1.0	±1.0
1000 - 1299 hours	5.3	4.8	0.5	4.0	3.5	0.5	6.6	6.0	0.6
Uncertainty		±0.5	±0.5		±0.7	±0.7		±0.8	±0.8
1300 hours or more	38.7	43.0	-4.4	57.5	63.6	-6.1	20.5	23.3	-2.8
Uncertainty		±0.7	±0.7		±1.1	±1.1		±1.0	±1.0
Not reported working hours	3.9	0.8	3.0	4.6	0.9	3.8	3.2	0.8	2.3
Uncertainty		±0.2	±0.2		±0.3	±0.3		±0.3	±0.3

POLISH EXPERIENCES IN THE USE OF SAMPLING IN POPULATION CENSUSES IN 1950-1983 (a)

I. INTRODUCTION

1. In the post Second World War period population censuses in Poland were conducted in the years 1950, 1960, 1970 and 1978. Besides, in 1974 a micro-census was conducted by the sampling method and right now preparatory works for the 1984 micro-census are being conducted. As a rule the censuses are conducted in the first decade of December because of the lowest mobility of the population in this period and considerably good weather conditions.

2. A pilot census was conducted a year before the general census as a part of preparatory works to the census. The purpose of that census was to put to the test the organizational scheme of the future census, formulation of questions and instructions contained in the census questionnaires and their clarity. Test censuses were conducted by purposive sampling not by random sampling in selected census enumeration areas. Purposive sampling was easier for realization and it made possible to conduct the tests in the localities in which the greatest difficulties were expected because of specific conditions.

3. For example, a year before the 1978 census in the period from 7 to 13 December 1977 a pilot census which covered the area of 19 purposefully chosen basic administrative units comprising about 200,000 people was conducted. The aim of the pilot census was to check in practice the organizational scheme of the 1978 census in the new conditions of the two-stage administrative division of Poland (introduced in 1975) and to test the clarity of instructions and questions contained in the census questionnaires. Besides, the pilot census was to supply indispensable material for checking of all programme designs of data compilation. The test census like the planned general census comprised the population and their living conditions. In case of households possessing private agricultural holdings data on the share of household members in work on the holding were

(a) Report prepared by Professor Ryszard Zasepa of the Mathematical Commission of the C 50.

collected. Since there was a need to obtain detailed information on migration of the population and time taken travelling to work or school from a 10 per cent sample of dwellings four designs for the sample survey were tested. Many essential issues and questions emerged as a result of the analysis of data collected during the pilot census and comments and opinions expressed by enumerators involved in it made possible to introduce improvements which contributed to a more efficient conducting of the 1978 census. Thanks to this p.c. instructions concerning «biological» disability and the reasons for economic non-activity of the people in the working age were revised. Also questions about the share of household members in the work in agricultural holdings and the classification of the tenure status of households were modified as well as some other minor issues.

II. USE OF SAMPLING METHOD IN THE SHORT-TERM TABULATION OF THE CENSUS RESULTS

4. The 1950 population census was conducted in a difficult socio-economic situation caused by war damages, extermination of the population and high mobility. There were no data on the number of the population, the socio-demographic composition, housing conditions, the agricultural population and the characteristics of private agricultural holdings. In such a situation the population census was combined with the housing census and the census of agricultural holdings. Since rapid presentation of the results for the needs of economic central planning was necessary a decision was made to divide the collected data into the following two parts: (a) a sample for earlier processing and tabulation and (b) other materials which were to be processed later.

5. A census enumeration area or more precisely census materials collected for the area (in Poland there were more than 111,000 census enumeration areas) served as a sample unit. The sample was selected according to proportional stratified sampling design. Voivodships (major administrative units) divided into towns and rural areas constituted particular strata and poviats (minor administrative units) — about 390 in Poland — constituted substrata. In each stratum a simple random sample without replacement had been drawn. The sample comprised 10 per cent of census enumeration areas in towns and 5 per cent in rural areas. Implementation of the sampling procedures was not difficult. Ratio estimators were used for tabulation of data using provisional information on the number of the population by sex in each voivodship.

6. The results of the tabulation of data from the sample were compiled in 16 tables of which 6 tables concerned the population, 3 housing conditions and 7 agriculture. Representative results were worked out in a relatively short time. Data on private agriculture were tabulated half a year after the census and data on the population and housing conditions were presented in October 1951. The

data obtained by the sampling method for Poland as a whole and 19 voivodships divided into towns and rural areas were published in 1952. The full elaboration of the results including the printing process lasted up to 1956.

7. Precision of sample estimates constitutes a very important issue. The comparison between the results obtained from the sample and from complete enumeration showed that the sample for Poland as a whole provided quite precise estimates. For example, the number of the population by quinquennial age groups differed in general less than 1 per cent, data on the number of dwellings by number of rooms were biased from 0.13 per cent to 1.78 per cent. The exception constituted dwellings with four rooms and more, the number of which was estimated too high from the sample with the sampling error of 5.15 per cent. The error was caused by the fact that big dwellings are situated only in some areas and do not occur in other ones. This caused the increase of the standard error of the estimator. The number of private agricultural holdings was estimated too high and the error was 1.64 per cent. Understandably, the errors were higher for voivodships. As an illustration of this statement percentage errors of selected estimates for 5 voivodships (of which Łódź-city has the status of voivodship) are presented in Table 1. Figures in the table show that estimation errors may reach up to 20 per cent. It is possible that for smaller voivodships and for smaller age groups the estimation errors may in some cases be higher than 20 per cent.

8. In the 1960 population census the same procedures as in the previous census were applied, i.e. first the materials collected by sampling were processed in order to prepare short-term tabulations and next the other materials collected during the census. The experiences of the 1950 census showed that census enumeration areas did not constitute good sampling units for collecting data not only for the country as a whole but also for voivodships. Let us assume that on the area of voivodship there are M survey units grouped in N clusters constituting the sampling units of the size $\bar{M} = M/N$ and simple random sample selected without replacement includes n clusters. Thus, estimating the number of MP survey units possessing the attribute by estimator M_p , where p is a proportion of such units in the sample, we have an approximate formula for the variance estimator:

$$V(M_p) = \frac{\bar{M}(N-n)}{n} PQ [1 + \rho(\bar{M}-1)]$$

where ρ is the so-called intra-class correlation coefficient

$$P = \frac{1}{M(\bar{M}-1)PQ} \sum_{k=1}^N \sum_{l_1=l_2}^{\bar{M}} (Y_{kl_1} - P)(Y_{kl_2} - P)$$

$$Y_{kl_i} = 0 \text{ or } 1 \text{ for } i = 1, 2,$$

Table 1. Total population by sex and aged 20-24 according to data from the sample and final census data for Poland in selected voivodships - 1950

Specification	Evaluation from sample	Final census data	Percentage error	Evaluation from sample	Final census data	Percentage error
	Urban areas			Rural areas		
1	2	3	4	5	6	7
POLAND.						
Men						
Total	4 352 130	4 410 530	-1.3	7 159 127	7 135 484	0.3
20-24	373 318	370 910	0.6	519 596	519 596	-0.7
Women						
Total	5 150 631	5 194 724	-0.8	7 921 806	7 87 946	0.6
20-24	517 000	514 347	0.5	700 669	693 912	1.0
Łódź-city						
Men						
Total	271 362	274 335	-1.1			
20-24	22 874	23 050	-0.8			
Women						
Total	348 604	345 848	0.8			
20-24	38 848	38 942	-0.2			
Białystok						
Men						
Total	95 470	96 674	-1.2	347 967	352 220	-1.2
20-24	7 342	7 098	3.4	24 408	25 384	-3.8
Women						
Total	116 835	117 515	-0.6	389 951	388 406	0.4
20-24	10 790	10 689	0.9	35 892	34 499	4.0
Zielona Gora						
Men						
Total	101 598	98 304	3.4	170 223	171 417	-0.7
20-24	8 977	7 512	19.5	13 498	12 865	4.9
Women						
Total	105 767	109 620	-3.5	181 112	181 272	-0.1
20-24	12 905	13 242	-2.5	18 286	18 106	1.0
Krakow						
Men						
Total	291 420	298 446	-2.4	683 799	691 802	-1.2
20-24	25 701	28 086	-8.5	47 321	49 768	-4.9
Women						
Total	360 796	356 824	1.1	765 888	766 426	-0.1
20-24	36 723	34 566	6.2	63 541	64 663	-1.7
Poznań						
Men						
Total	393 687	391 488	0.6	582 546	587 532	-0.8
20-24	30 191	26 828	12.5	36 005	36 648	-1.8
Women						
Total	469 573	473 025	-0.7	654 765	653 144	0.2
20-24	40 851	39 897	2.4	51 743	51 089	1.3

In a census area $\bar{M} \approx 220$ persons and almost 50 dwellings and more than 40 private agricultural holdings. In general, if \bar{M} decreases the product $\bar{M}-1/x$ also decreases and the same is with variance estimator. That is why a decision was made to reduce the size of a sample unit by adopting a census questionnaire (comprising usually information on one household but sometimes on more households sharing a dwelling) as a sample unit.

9. Prior to sample selection the questionnaires concerning collective households (students' hostels, boarding schools, workers' hostels, monasteries, etc.) were excluded for separate treatment. Census forms pertaining to one poviat (minor administrative unit) were arranged according to the order of enumeration and numbered according to a two-digit classification from 01...99, 00. For each poviat 5 sets of two-digit figures were randomly chosen and corresponding questionnaires were drawn and arranged in 5 sets constituting particular 1 per cent subsamples. Thus this was stratified sampling where poviats constituted particular strata and drawing a sample of questionnaires was systematic. The total sample comprised around 5 per cent of the population.

10. Division of the sample into five 1 per cent subsamples made it possible to evaluate percentage standard error for any item in the table (as a rule the items concerned the number of population of specific attributes). Having 5 estimates $n'_i = 1, \dots, 5/$ of an item in the table from subsamples and the difference

$$W = \max n'_i - \min n'_i$$

an unbiased estimator of standard error is

$$u = \frac{W}{2,326} \sqrt{\frac{1}{g} - \frac{1}{k}} \quad \text{with } g = 5 \text{ and } k = 100$$

i.e. with the notation

$$n' = \frac{1}{5} (n'_1 + n'_2 + \dots + n'_5)$$

we have

$$100 \frac{u}{n} \cdot \% = 18.7 \frac{W}{n}$$

Percentage standard errors for all items in the tables concerning agriculture were evaluated according to this formula. Evaluations for the population tables led to similar conclusions. It appeared from the evaluations that for 80 per cent of items of the size 200,000 and over and for 70 per cent of items of 100,000-200,000 as well as for 55 per cent of items of 50,000-100,000 the percentage standard error was not higher than 1 per cent. For majority of items of the size of 5,000-50,000 the standard error was not higher than 2.5 per cent. For about 80 per cent of the items in tables of the size of 2,000-5,000 the standard error did not exceed 5 per cent.

11. The sampling tabulation supplied data for 26 tables of which 12 tables concerned the population, 6 tables concerned dwellings and buildings and 8 tables concerned private agricultural holdings. The tables on agricultural holdings were completed at the beginning of September 1961, i.e. 9 months after the census, and other tables at the beginning of 1962. Complete results of the census were published in the years 1964-1965.

12. In the next population censuses the preliminary tabulation of data obtained by sampling was neglected because there was considerable acceleration of the processing of complete census materials thanks to implementation of computers.

III. USE OF SAMPLING FOR BROADENING THE SCOPE OF CENSUS

13. The scope of population census is limited in itself and cannot comprise all important demographic information. In such a situation a good solution is to obtain additional information by the sampling methods. Such sample surveys were conducted in Poland during two last population censuses in 1970 and 1978.

14. In order to forecast the number of population by sex and age it would be desirable to know actual women's fertility. We intended to include this topic in the 1960 population census. However, the pilot census showed that the results may be heavily biased because some questions were regarded as ticklish, e.g. questions about illegitimate children or divorces or because of weak memory of older women. The idea to insert these questions into the census questionnaires was neglected and a decision was made to survey fertility by sampling during the 1970 census.

15. We were aware of the fact that in order to obtain true answers to the questions we should employ as census enumerators adequately trained female personnel of older age. That is why a selected number of census enumeration areas constituted a sample and the training was limited to a certain group of enumerators. A census enumeration area was adopted as a sample unit.

16. Preparation of the sampling procedures started from elimination of the areas in which the population lived in collective households. Next, in order to diminish differences between the sizes of particular census areas, big areas were

divided into smaller areas and small areas were attached to bigger ones. As a result about 136,000 new census areas were created each of which comprised the average 240 inhabitants. In each voivodship census areas — the number of which was divisible by 40 — were arranged by size starting from the biggest one. Each 40 consecutive areas constituted a stratum from which areas were chosen at random. In this way we obtained a 5 per cent sample of areas divided into subsamples which made it possible to evaluate the standard errors of estimates. In the enumeration areas selected for the sample women aged 15-70 were additionally enumerated if during the census or earlier they were married.

17. The results of the sample survey of women's fertility were presented in 18 tables for Poland as a whole and in 5 tables for particular voivodships divided into urban and rural areas. In order to determine the precision of those data, standard errors of particular items in 8 country tables (of which 5 voivodship tables) for the four selected voivodships were evaluated. Let \hat{x} denote the evaluation of an item of the table (as a rule it is a number of women of the specific attribute, e.g. the number of married women who gave birth to two children) and x_{h1} , x_{h2} denote the number of women of the selected category, correspondingly from the first and second subsamples of the h stratum $/h = 1, 2, \dots, L/$. An unbiased variance estimator V/\hat{x} is

$$\hat{V}(\hat{x}) = 380 \sum_{h=1}^L (x_{h1} - x_{h2})^2$$

The standard error expressed in per cent is evaluated according to the formula

$$100 \Delta \% = \frac{100 \sqrt{\hat{V}(\hat{x})}}{\hat{x}}$$

The results of the standard error estimates showed tight correlation between the size of the item in the table and the size of percentage standard error as can be seen from data in Table 2 which were based on 8,600 randomly drawn items of the tables concerning fertility. It should be emphasized that the estimator 100Δ is a sampling variable and the evaluation of standard error may also be biased with sampling error, so they will be either underestimated or overestimated.

18. Also during the 1978 population census the sampling method was used for broadening the scope of the census. This time the aim was to obtain additional information on migration of the population (changes of the place of residence) and time taken travelling to work or school, i.e. the so-called commuting. Compilation of those data for the whole population would be too expensive and could lead to the creation of too extensive census questionnaire.

That is why the survey was conducted on a 10 per cent sample. It was not possible to conduct the survey of migration shortly after the population census because of technical and organizational reasons (i.e. the necessity to employ again a big number of enumerators). In such a situation it was indispensable to collect simultaneously data for the census and for the sample survey.

Table 2. Percentage standard errors of the evaluations from the survey of fertility conducted during the 1960 census depending on the size of the evaluated item of the table

Size of the item in the table a - number of items b - percentage		Number (percentage) of items in tables						
		Total	in which percentage standard error amounted to					
			1%	1-2%	2-5%	5-10%	10-20%	20% and more
200,000 and more	a	600	315	260	5	—	—	—
	b	100	52.5	43.3	4.2	—	—	—
50,000 - 200,000	a	800	2	506	276	16	—	—
	b	100	0.2	63.3	34.5	2.0	—	—
10,000 - 50,000	a	1 500	—	3	127.6	206	15	—
	b	100	—	0.2	85.1	13.7	1.0	—
2,000 - 10,000	a	1 800	—	—	125	1 484	186	5
	b	100	—	—	6.9	82.5	10.3	0.3
500 - 2,000	a	1 600	—	—	—	40	1 465	95
	b	100	—	—	—	2.5	91.6	5.9
less than 500	a	2 300	—	—	—	—	123	2 177
	b	100	—	—	—	—	5.3	94.7

19. During the preparatory work for the 1978 census four sampling procedures suggested for application were carefully examined. A dwelling was adopted as a sample unit. After the analysis of evaluations of estimators' variances and testing the levels of difficulty of realization of surveyed sampling procedures during the pilot census a decision was made that the best solution is stratified sampling in which census enumeration areas constitute particular strata. In the strata dwellings were systematically chosen at random with the interval 0 and there were two 5 per cent subsamples.

20. The sampling procedures were the following: (a) during preparatory works for each census area a list of buildings and dwellings was made on a special questionnaire, (b) the dwellings were given consecutive numbers, (c) for each census area two figures $1_1 = 1_2$ from 1 to 20 were allocated, (d) dwellings

numbered $1_1, 1_1 + 20, \dots$ (the first subsample) and $1_2, 1_2 + 20, \dots$ (the second subsample) were additionally enumerated in the questionnaire of the migration survey, (e) in case of collective households persons were drawn in the same way (out of 20 persons enumerated in the questionnaire two persons were included in the sample).

21. In order to determine the precision of sample estimates computations for selected items of tables were done. It was found that, similar to the sample survey conducted during the previous census, there were correlations between the size of items and the size of percentage standard error. The accuracy of evaluations in the 1978 census was higher than in the 1970 census. For example, for the item of the size of 10,000 - 100,000 the percentage standard error was from 1 per cent to 3 per cent, for the item of 5,000 - 10,000 the error was from 3 per cent to 5 per cent and in case of small items, less than 500, the standard error exceeded 5 per cent.

22. Information on migration of the population obtained during the 1978 census from a 10 per cent sample was made available in 1981. The data were presented in 14 tables in a special publication printed in the same year.

SAMPLING IN THE 1981 CENSUSES IN THE UNITED KINGDOM (a)

1. Unlike censuses in a number of other countries, those carried out in the UK in 1981 did not employ any sampling techniques during the enumeration itself. Attempts to do this on previous occasions (for example in 1961) had shown many difficulties in ensuring that field samples were unbiased. Nevertheless sample methods were used for a variety of purposes in connection with the 1981 census operations.

I. CENSUS TESTS

2. Census tests were carried out in 1972, 1974, 1977 and 1979 (the first two in preparation for a mid-term census in 1976 which was later cancelled although some of the test results were relevant to the planning for the 1981 Census). These tests were carried out in purposive samples of areas — in which all households were included.

3. The number of households involved on each occasion was

1972 - 33,000 households

1974 - 100,000 households

1977 - 50,000 households

1979 - 65,000 households

In addition special tests of particular questions were carried out in 1973 and 1976. These used nationally representative samples of about 1,700 and 2,000 households respectively.

4. Sampling was used extensively in a series of additional tests carried out over the period 1976 to 1978 in England and Wales to find a question on race or

(a) Report prepared by the Office of Population Censuses and Surveys.

ethnic origin which would be workable and acceptable when included in a compulsory national census. The samples used on each occasion were as follows:

- 1975 - 450 households - purposive samples to include
- 1975 - 2,000 households - the main ethnic minority groups
- 1977 - 3,000 households - probability sample of the general population plus purposive samples of
 - 450 Asian households
 - 400 Turkish households
 - 400 W. Indian households
- 1978 - 1,500 households - selected to produce roughly equal numbers of W. Indian, Asian and indigenous white households

5. Following these tests further versions of the ethnic questions were tried out in conjunction with the full scale "dress rehearsal" of the 1981 Census in the London Borough of Haringey in April 1979. For this the entire population of Haringey was included but this was split into four interpenetrating samples to try out two versions of the census form (one longer than the other) and two versions of the ethnic questions.

6. Also a sample survey was conducted to obtain detailed public reactions to the ethnic questions. For this a sample of 2,600 households, out of the 65,000 or so Haringey households, was purposively selected to represent the main ethnic minority groups. This sample was first enumerated and then interviewed by trained interviewers. An additional sample of 2,000 was selected and matched according to the ethnic mix of the first sample: this second sample was enumerated by ordinary, temporarily employed, enumerators so that the effect of using trained interviewers on the test sample could be assessed.

II. POST ENUMERATION SURVEY

7. Following the 1981 Census enumeration in April 1981, a post enumeration survey (PES) was conducted in May and June 1981. The object was to assess the coverage of the census and the quality of response to the questions. For this five samples were drawn.

(a) Visual list sample. This comprised 1021 enumeration districts (ed's) (roughly one per cent of ed's in England and Wales) clustered into blocks of, on average, about four ed's. The ed's were selected with probability proportional to the estimated number of households in each block of ed's. For each sample block of ed's, trained survey interviewers listed all buildings and compared them with those listed by the census enumerators to identify any housing units which had been omitted from the census.

(b) Vacant/absent sample. For this, interviewers checked a sample of 1 in

4 of the addresses which enumerators had recorded as vacant/absent in the 1021 eds, to see whether they had been correctly classified, and especially to see whether they had contained persons on census night. The sample was selected systematically by the interviewers from the vacant/absent entries in the enumerators' record books. The resulting sample sizes were 2540 vacants and 1260 absents.

(c) Non residential sample. A sample of 840 premises in the 1021 eds which enumerators had listed as non residential were checked by PES interviewers to see if in fact any had been used for residential purposes on census night. Again the sample was selected by interviewers from the entries in the enumerators' record books.

(d) Quality check sample. Within each block of eds an average of 20 households who had returned a census form were interviewed by PES interviewers to assess the quality of information on the census forms. At the same time, for coverage check purposes, the number of people in the household on census night was checked to see if any had been omitted from the forms. Altogether 5170 households were included in the sample and 4705 (91 per cent) agreed to be interviewed.

(e) Multi household sample. Where a household in the quality check sample was at an address found by the PES interviewer to contain more than one household, a check was made to see whether all the households at the address had been recorded in the census. There were 283 addresses containing more than one household and PES interviewers identified 974 additional households within them.

8. The above description of the PES samples relates to England and Wales. Separate sample coverage checks were carried out in Scotland although the quality check (described at (d) above) covered England and Wales and Scotland. No PES was carried out in N. Ireland.

III. PROCESSING

9. Sampling methods were also used in the processing phase of the 1981 Census. For England and Wales and Scotland (but not in N. Ireland) six questions which required substantial coding were processed only on a 10 per cent sample basis.

The 10 per cent items were

- relationships to head of household
- name and business of employer (ie. industry classification)
- occupation
- address of place of work
- means of daily journey to work*

— higher qualifications

10. The sample was selected during processing from the 100 per cent records. The sample consisted of one household selected at random from each stratum of ten consecutively recorded households, and a similar sample of persons in communal establishments. The sample of *persons* therefore comprised all persons in the sample households plus the sample of individuals in communal establishments. Thus the sample drawn was geographically a highly stratified sample of households although the sample of people was clustered in households. The sampling errors associated with the sample valued for this type of selection are different from those which would have resulted from simple random sampling over the country as a whole. In order to estimate the effect of the sample design on the sampling errors, a replicate 10 per cent sample was selected in 100 eds within each county of England and Wales. First results indicate that at the national level the ratio between calculated standard errors and those that would obtain under simple random sampling lay between 0.8 and 1.2 for most of the groups examined.

11. Other work is proceeding to assess the quality of the 10 per cent sample and preliminary results suggest that the local authority level nearly 4 out of 5 of the grossed up 10 per cent counts of the resident population are very close (within one per cent) to the 100 per cent count and in only 11 districts (out of about 400) do the figures differ by more than 2 per cent.

IV. QUALITY CONTROL

12. Sampling was also used in the quality control procedures used in the coding and keying operations. For both operations each person's work was checked 100 per cent until a satisfactory standard was deemed to have been reached. At that point the level of checking was reduced to 10 per cent. The quality standards were set at $\frac{1}{2}$ — 1 per cent error rates (per individual) for coding and at 0.1 per cent error rates (per key depression) for keying. In all cases the samples to be checked comprised 10 per cent of eds and all the forms in a sampled ed were checked. The selections were made by the coding and keying supervisors using random numbers. In Scotland the checking work was organised somewhat differently. No 100 per cent checking was carried out: the rate began at 12 forms per ed for every ed but after a satisfactory standard was reached checking was carried out on every second ed. The checks in N. Ireland were similar to those for England and Wales.

* In fact this question was largely pre coded. It was processed on a 10 per cent basis because it was positioned on that part of the census form from which data were not being entered during the 100 per cent data capture phase.

**USAGE OF SAMPLING METHODS IN DIFFERENT PHASES
OF THE CENSUSES OF POPULATION AND/OR HOUSING CONDUCTED
IN ECE COUNTRIES IN OR AROUND 1980**

Note by the ECE Secretariat

1. The secretariat sent a questionnaire to ECE member countries in June 1983 in order to collect information from them on the extent to which they complied with the recommendations for the 1980 censuses of population and housing in the ECE region and to obtain their suggestions for areas to be concentrated on in preparing new recommendations for the 1990 round of censuses (1985-1994) in the region. The questionnaire also contained several questions related to census methods and procedures, one of which was:

Q6 In which of the following phases of the census did you use sampling methods? (a) tests of census procedures; (b) enumeration of topics in addition to those for which universal coverage is required; (c) post-enumeration field checks; (d) quality control of data processing; (e) advance tabulation of selected topics; (f) final processing and tabulation.

2. As of the end of February 1984, twenty-five countries had responded to the questionnaire. The information which they provided in response to the above question on sampling methods is presented in summary form in the Annex to this note, in order to provide the Seminar with an overview of the extent to which sampling methods have been used in different phases of the censuses of population and/or housing conducted in ECE countries in or around 1980.

ANNEX. Usage of sampling methods in different phases of the censuses of population and/or housing conducted in ECE countries in or around 1980 (a)

Country (b)	Tests of census procedures	Enumeration of topics in addition to those for which universal coverage is required	Post-enumeration field checks	Quality control of data processing	Advance tabulation of selected topics	Final processing and tabulation
Austria	(c)	—	—	X	—	—
Belgium	X	—	—	—	X	—
Bulgaria (d)	(c)	—	X	—	—	—
Byelorussian SSR	X	X	X	X	—	—
Canada	(c)	—	—	—	—	—
Czechoslovakia	(c)	—	X	X	—	—
Finland	X	—	—	X	—	—
German Democratic Republic	X	—	—	X	—	—
Germany, Federal Republic of (e)						
Greece	(c)	—	X	—	—	X
Hungary	(c)	—	X	X	X	X
Ireland	X	—	—	—	X	—
Luxembourg	(c)	—	—	—	—	—
Norway	X	—	—	X	—	—
Poland	X	X	X	X	—	—
Portugal	X	—	—	X	—	—
Romania	—	—	X	—	—	—
Spain	X	—	X	X	X	X
Sweden	—	—	—	(f)	—	—
Switzerland	(c)	—	—	—	—	—
Turkey	X	—	—	—	—	—
Ukrainian SSR	(c)	—	X	—	—	—
USSR	(c)	—	X	—	—	—
United Kingdom	X	—	X	X	—	X
United States	X	X	X	X	X	(g)

Notes to the Annex

(a) The entries shown in the table are based on information submitted by countries in response to Question 6 in the secretariat's questionnaire of June 1983 on censuses of population and housing.

(b) The table excludes entries for the following nine ECE member countries, which as of the end of February 1984 had not responded to the secretariat's questionnaire: Albania, Cyprus, Denmark, France, Iceland, Italy, Malta, Netherlands and Yugoslavia.

(c) A census test (or tests) was/were conducted prior to enumeration in these countries (response to Question 5 of the questionnaire), and in at least some of these tests sampling methods were used.

(d) Bulgaria indicated in its response to the questionnaire that its last census was taken at the end of 1975, and that its next census will be taken at the end of 1985.

(e) The Federal Republic of Germany indicated in its response to the questionnaire that its population and housing census which was scheduled to be taken on 7 April 1983 had been postponed.

(f) Except for evaluation studies, no use was made of sampling for quality control of data processing in Sweden's census.

(g) Although sampling generally was not used in the final processing and tabulation of data, a subsample of questionnaires was selected for coding place of work and migration data to introduce cost-reduction measures in sample coding operations.

STUDY TOPIC (iii)

Coverage and Content Errors.

Discussion leader: Prof. R. Zasepa (Poland).

Papers prepared by:

- France
- Canada
- Italy
- Switzerland
- United Kingdom
- United States

TEXT OF OPENING ADDRESS
AND SUMMARY OF DISCUSSION (a)

Ladies and Gentlemen,

It is very well known that during any statistical survey a large number of non-sampling errors may appear unless it is properly planned and executed. These errors, usually called coverage errors and content errors, have great impact on quality of survey data. At present, we shall discuss problems encountered in national population censuses in connection with the attempts to improve quality of census data. The national reports presented at this Seminar clearly indicate that generally census organizers made efforts in reducing both coverage and content errors to the greatest possible extent. To find out whether these efforts were effective it was required to measure extent of errors still occurring in the census. Errors evaluation provides extremely important information for planning a future census; it can also be useful for census data users.

Extent of census errors depends among others on preparatory work for the census. As may be seen from the national reports it was a common practice to test census questionnaires, instruction, enumeration procedures, field organization, training programme, etc. to assure collection of data of required quality. Almost in every country pre-enumeration tests were performed. Exchange of opinions regarding effectiveness of these tests and their influence on quality of different census operations may be very instructive.

In some countries census enumeration has been done on interview basis while in other countries (partly or fully) on self-enumeration basis. What influence have these techniques on coverage and content errors?

In order to prevent undercounts or double enumeration in some countries special procedures were applied to those population categories which had great chance to be omitted or doubly enumerated (persons being for a long time outside of their usual residence place, person in voyage, etc.). For instance, in

some countries check-in forms were issued to those persons who happened to be away of their residence place at the period of census enumeration; information included in these forms makes it possible to test whether the respondent was already enumerated or not. Other forms, so called census certificates, were issued to all those persons who were supposed to go somewhere (at least for one day) during the enumeration period, e.g. spending longer time in trains, ships, etc. Our discussion might indicate what was the extent of such procedures in other countries and how this improved the quality of census data.

National reports stress the use of statistical control techniques to assess and control the work of individual operators and operations. Because of importance of these techniques for improvement of the quality of data, exchange of experiences in this regard may be very valuable; especially this may refer to methods of search for mistakes and gaps in individual census questionnaires, methods of correcting errors, filling-in gaps, methods of coding and code checking, means of detecting figures misread by the optical reader.

One of the predominant sources of coverage and content errors is census enumeration. Therefore, most countries of the region performed a post-enumeration survey (PES). Comparing enumeration data with data of the PES, different kinds of individual errors could be caught. As good designing of the PES is not an easy task, it may be very valuable to exchange experiences in this field, e.g. required qualifications of the personnel engaged in survey enumeration, design and size of test sample, problems of matching, costs of survey as compared to total costs of the census, etc. National reports usually indicate magnitude of under-coverage, but very interesting for census executors and users of the data is information on content errors, too.

In a number of national evaluation studies of coverage and content errors included comparison of census data relating to specific categories of population with demographic data obtained from sources fully independent of the census concerned e.g. data of the multi-household sample, immigration records, vital statistics records of births. Selecting a sample of persons from these frames and undertaking a tracing operation to determine addresses of these persons at the time of the census could provide an additional test of under-coverage during the census enumeration.

As may be seen from the above, different procedures can be used to evaluate completeness and accuracy of the information collected in population and housing censuses. It may be very instructive to discuss these procedures, to emphasize their advantages and faults, and as a result of this discussion to have some tools for further improvement of future censuses.

Thank you for your attention.

TWO INSTANCES OF SAMPLE CHECKING OF THE CODING AND COLLECTION OF DATA FROM THE FRENCH CENSUS OF 1982 (a)

The data collected during the 1982 French census will be processed as follows: a fourth of the forms will be intended for heavy operation, while the remaining three fourth will be for light operation. The first batch is processed within the Institute whereas the second one is handed over to subcontractors. In both instances, the Institute deemed it necessary to implement a sample inspection of the combined codification-capture activity.

This document describes the methods selected respectively for light and heavy operations. Both are considered from five stand-points:

- the purpose of inspection;
- constraints to be allowed for;
- definition of a number of concepts;
- characteristics regarding:
 - sampling;
 - specific processing of sample units;
 - the selected decision rule;
- theoretical justifications of the solutions agreed upon.

Last of all, a number of partial and temporary results will be provided.

Appendix 1 contains the three main forms used for the collection of data.

1. ACCEPTANCE INSPECTIONS OF THE LOT ENTRUSTED TO SUBCONTRACTORS FOR LIGHT OPERATION OF THE CENSUS

1.1 Purpose

When a subcontractor forwards to the INSEE a magnetic tape containing a

(a) Report prepared by Mr J.L. Bellier of the French National Institute of Statistics and Economic Studies.

number of encoded units, what should be the procedure to first appraise their work and secondly, accept or refuse it?

The following considerations will strive to describe the method selected, taking into account the constraints which we had to allow for.

The work requested from subcontractors is described in *Appendix 1.1*.

1.2 Constraints

1.2.1 The smallest storage and handling unit for census documents is the "district".

1.2.1 The cost of inspections, as expressed in number of hours of labour, is an increasing function both of the number of forms to be checked and of the number of districts to be handled.

1.2.3 The INSEE's reaction time to a dispatch is limited. Therefore, inspection should be feasible within a given time limit.

1.2.4 The risk of the subcontractor should be less or equal to β for any $p < p_0$, whereas that of the client (INSEE) should be at most equal to β for any $p > p_1$.

1.3 Units considered for decision making, sampling, and error counting.

The decision unit is the subcontractor's lot in the form of the tape they dispatch to the Institute.

The sampling unit is the census district (which is the smallest geographical collection area).

The error or divergence count unit is the recording. A recording is not valid if it contains at least one error.

1.4 The selected method

It develops in three stages:

1.4.1 Sampling

A random sample of districts is drawn with various probabilities of belonging to the sample. These probabilities are defined in such a way that they reduce the variance of the error ratio estimator under two types of constraints, namely: a constraint related to the costs of inspection, and a constraint related to the increase of all inclusion probabilities.

With each drawing unit is associated a pair of realisations (U_1, U_2) for a uniform variable on (0,1).

The drawing unit is included in the sample if, and only if U_1 is inferior to a previously defined constant and if U_2 is inferior to a quantity proportional to the square root of the number of recordings contained in the drawing unit considered (see Appendix 1.2)

1.4.2 Specific processing of sample units

These sample districts shall be processed at the INSEE; encoding and capture identical to the work requested from subcontractors.

1.4.3 The decision rule

Then the INSEE's work and that of the subcontractor are compared in two stages on the basis of sample districts. In a first stage, the comparison is carried out with computerized means and it generates divergencies, if any. If the ratio of these divergences is inferior to a threshold (A) determined by contract and valid regardless of the subcontractor, the considered lot is accepted by the INSEE. If the aforementioned ratio is greater than or equal to the threshold, the divergences are printed out on listings for manual analysis.

This analysis will be the second stage of comparison. It will consist in identifying among all the divergencies those which may be ascribed to the independent worker and subsequently, deemed as errors of the independent worker. If the percentage of these errors is less than (A), the lot shall be accepted; otherwise, it shall be rejected.

In the last case, the subcontractor will have to start his work over again and this second work will also be submitted to similar inspection.

1.5 Theoretical justification

The number of drawing units per worker-lot is such (several hundred or even several thousands) that the \hat{p} estimator of the number of errors, once centered and standardised converges in distribution towards the standardized centered normal law (one of the two convergence conditions required and sufficient as set out by Liapounof is thus checked). The hypothesis test can thus be carried out:

$$H_0 : p < p_0 \quad \text{against} \quad H_1 : p > p_1$$

$$\text{where under } H_0 : \hat{p} \sim N(p_0, \sqrt{V(\hat{p})}) \quad \text{under } H_0$$

$$\text{where under } H_1 : \hat{p} \sim N(p_1, \sqrt{V(\hat{p})}) \quad \text{under } H_1.$$

2. SAMPLE INSPECTION OF THE COLIBRI II CENSUS FORM COMBINED CODIFICATION (ON-LINE CODIFICATION OF FORMS FOR THE CENSUS OF PERSONS) - HEAVY OPERATION

2.1 Purpose

The purpose is threefold:

- to provide a possibility of assessing the quality of the production on the basis of sample observation;
- to identify, for further analysis, the headings of the questionnaire and/or the answering modalities causing problems in working out the encoding.
- to improve the training of agents.

2.2 Constraints

- The first two constraints mentioned in 1-2 can also be taken into account for this work.
- The time constraint is first related to the necessity of rapidly and continuously identifying difficult headings and training agents;
- Secondly the time limit is related to the reduced storage capacity for current operations.
- A last constraint may be added to the three above mentioned constraints, concerning the itemization of headings, or even of encoding modalities, linked with the objectives sought for.

2.3 Units for decision making, sampling and error counting

- The decision unit is the operator-week, which comprises all the districts completed by a given operator within a week.
- The drawing unit is the district.
- The counting unit is the occurrence of an error on a heading or a modality.

2.4 The method selected for

2.4.1 Sampling

Within a given week, each operator processes a number (M) of districts,

which contain the documents to be encoded. Among these (M) districts, the system picks up at random a certain number (M) so that: $E(m): \tau \cdot M$.

The drawing process is the following: for any district, a random number is drawn, comprised between 0 and 1 and evenly distributed. The number drawn (U) is compared with the sampling ratio (desired). The district belongs to the sample if and only if $U < \tau$. This process makes it possible to gradually constitute the sample without having to wait for the end of the week.

2.4.2 *Specific processing of sample districts*

The districts belonging to the sample will be submitted to checking and arbitration.

2.4.2.1 Checking

The documents of these districts are redigitized (V_1) independent of the first combined codification (\emptyset). *The divergencies* between the two codifications \emptyset and V_1 are pointed out to the supervisor. The latter may then confirm or modify his codification. This confirmation or modification is called V_n . Deviations between \emptyset and V_n are called *disagreements*.

2.4.2.2 Arbitration

Divergences will be printed out on hard copy so they may be analysed by executive staff. This analysis, called arbitration, makes it possible to arbitrate between codifications \emptyset and V_1 . If arbitration proves that \emptyset was wrong, an error is ascribed to the operator.

2.4.3 *The decision rule*

2.4.3.1 Context

The headings or modalities on which the checking and arbitration bear are in the order of one thousand three hundred. For each one of the one thousand three hundred headings or modalities (j), the data processing system accounts the number of occurrences of codification of operator (i): (N_{ij}). Likewise, for any heading or modality (j), there is a P_j which is a mean error ratio of encoding.

2.4.3.2 Hypotheses

It is assumed that the headings or modalities are independent in probability regarding the errors which they may entail.

Assume (X_{ij}) the number of errors produced on the heading or modality (j), it is assumed that (X_{ij}) follows a Poisson distribution with parameter $m_{ij} =$

$N_{ij} \cdot P_j$. The sum total of the (X_{ij}) on (j) , marked (X_i) therefore follows a Poisson distribution $P(m_i)$ with $m_i = \sum_j N_{ij} \cdot P_j$. when (i) is equivalent in "quality" with the standard represented by vector of the P_j 's.

2.4.3.3 The decision rule

It is inspired from the Wald method.

2.4.3.4 Definition of acceptance and rejection thresholds

When parameter (m_i) is defined, " S_{1i} " and " S_{2i} " are computed so that:

$$\text{Probability } (X < S_{1i}) = 80\%$$

$$\text{Probability } (X < S_{2i}) = 99\%$$

where (X) follows a Poisson distribution with parameter (m_i) .

2.3.4.5 Decisions

(X_i) is compared with thresholds " S_{1i} " and " S_{2i} ";

If $X_i < S_{1i}$ job (i) is accepted

if $X_i < S_{2i}$ work (i) is rejected

If $S_{1i} < X_i > S_{2i}$ the current sample is added up to that of previous week. Then two new thresholds are defined and compared with the errors observed on both samples.

If a new irresolution (i.e. $S_{1i} \leq X_i < S_{2i}$), is observed, the current sample is added up with those of the two previous weeks. This aggregation process is limited to four weeks. Indeed, after three aggregations, the lot is accepted if the number of errors observed is inferior to the new limit " S_{1i} "; otherwise it is rejected. The resulting diagnostic only bears on the quality of the work of the current week, whether an aggregation has been carried out or not.

2.5 Theoretical Justification

The sampling mode used secures us the probability independence of observations-sample. Therefore, it can be inferred that the law of probability of errors within a sample, once sampling has been completed, is a Poisson distribution.

3. SOME PARTIAL RESULTS AND DATA

3.1 Light operation

There are one hundred and forty lots distributed among five subcontractors.

The size of these lots ranges from sixty thousand to four hundred and eighty five thousand recordings with an average size of three hundred thousand.

The number of samples is obviously equal to the number of lots. The global size of the sample drawn from a lot varies between one thousand four hundred and fifty-five to ten thousand eight hundred and forty-four recordings. The average size is five thousand two hundred and six recordings.

Only one lot was refused out of the eleven lots that were submitted to the inspection described in (1).

The table below gives the percentages of divergence identified by data processing means and of the errors ascribed to subcontractors after manual analysis.

Table I. Divergence Ratio and Error Ratio

Divergence ratio	Error ratio
16.8	2.54
16.6	4.00
14.7	3.36
18.7	3.66
17.6	3.42
15.1	3.1
16.1	3.86
16.7	3.52
13.9	3.66
18.2	4.02
36.5	12.00

The deviation between the two types of ratios is due to the following factors:

- different possible interpretation of the basic data;
- codification errors due to Institute;
- capture errors due to the Institute;
- different interpretations of the instructions.

The acceptance threshold (A) is set to $4\% + \epsilon$. This ratio is within the order of magnitude of the errors observed during the heavy operation for same headings.

3.2 Heavy operation

This operation develops in two stages: first a 1/20 operation followed by a 1/5 operation.

The number of operators is within the order of four hundred and thirty. These agents are distributed among the eighteen Regional Offices according to the volume of documents to be encoded.

3.2.1 *Sampling fraction and acceptance probability*

The first six weeks of enumeration for each agent are checked exhaustively. The sampling codification such as described in paragraph 2 only occurs afterwards, with a 24% ratio for a 1/20 operation, and a 5% ratio for the 1/5 operation.

Note the modification in the S_{1i} acceptance threshold definition, which corresponds to a probability of 0.90 instead of 0.80. In Appendix 3, one may read three tables providing the acceptance and rejection probabilities, and the average number of weeks required for decision making. These elements apply for an average operator as much from the standpoint of work quality as from the standpoint of structure of the data to be encoded.

The results indicated in the appendix are confirmed by the follow-up. Indeed we observe an acceptance percentage in the order of 95% of the operator-weeks.

3.2.2 *Evolution in time of the components of the error ratio vector for France as a whole*

This vector was fractioned into seven aspects:

- the headings;
- the one character modalities;
- status;
- type of activity (TA);
- the former department and place of residence (DRA-CRA);
- the economic activity (AE);
- the job.

Table II hereby gives the time evolutions of error ratios associated to the seven entries.

Given the mode of updating (Appendix 3-2), of the error ratio vector on the one hand, and the frequency of codification occurrences on the other hand, one should consider that the estimates of the first five entries on t . and t' are independent in probability and that each one is obtained from a sample of ten thousand recordings. It may thus be inferred that the evolutions observed on (A) and (D) are significant whereas those relating to (B), (C) and (E) are not.

For entries (F) and (G) independence of the estimates is not checked. The gradual drop observed on each one of these two entries is not only significant

but also slowed down by the inertia resulting from the updating process of the corresponding components of the error ratio vector.

Table II. Time Evolution of the Error Ratios (%)

	1983										
	28-2	1-4	29-4	27-5	17-6	4-7	1-8	29-8	3-10	2-11	21-11
A) Headings	0.66	0.38	0.31	0.32	0.40	0.40	0.27	0.21	0.22	0.21	0.21
B) One character modalities	1.42	1.32	1.29	1.25	1.33	1.34	1.34	1.32	1.34	1.38	1.30
C) Status	2.64	2.75	3.15	3.31	2.93	3.09	3.09	3.19	3.04	2.89	2.86
D) Type of activity	0.53	0.46	0.43	0.35	0.35	0.35	0.34	0.30	0.28	0.23	0.22
E) Dra-Cra (*)	1.44	1.06	1.33	1.41	1.39	1.37	1.64	1.55	1.69	1.54	1.35
F) Economic activity (AE)	4.99	4.69	4.47	4.31	4.26	4.21	4.18	4.12	4.00	3.86	3.80
G) Job	5.99	5.70	5.60	5.37	5.30	5.24	5.18	5.09	4.96	4.82	4.76

Note: The fact that a question belongs to a given entry is mentioned on the forms in Appendix 1.

(D) TA is an activity indicator of the person registered. It contains 8 possible modalities. It is encoded on the basis of data identified in several areas of the individual form.

(*) DRA = previous department of residence / CRA = previous municipality of residence.

CONCLUSION

The two applications described above only mean to bring a solution to the problems raised by the encoding capture stage, with a given collecting mode.

It goes without saying that an approach taking into account all the stages of the process from collection to codification, would be much more efficient regarding the global quality of the work considered.

The analysis of errors shows to what extent the care given to collection is fundamental. It also reveals the difficulty in obtaining homogeneity between processings. The uniqueness of instructions does not prevent us against diverging interpretations from a site of encoding to another one.

APPENDIX 1

LIGHT OPERATION WORK REQUESTED FROM SUBCONTRACTORS

Data to be captured - District folder									
NAME			ORIGIN				ACQUISITION FILE		
In plain language	Symbol	Line	Presence	Character	Modalities	Comments	Type of recording	Pos	Length
Department number	D	2	Mandatory	Numeric	01 to 19, 21 to 95	Exception 2A and 2B for Corsica	1 2	2 2	2 2
Municipality number	C	2	Mandatory	Numeric	001 to 909	—	1 2	4 4	3 3
Census municipality number (or block)	IL	4	Mandatory	Alphabetic	—	—	1 2	7 7	4 4
Block fraction	FIL	4	Optional	Alphabetic	A to Z	concerns only some districts	1 2	11 11	1 1
Municipality-block	CIL	4	Optional	Numeric	—	See list of municipa- lities concerned	1 2	12 12	3 3
Total number of dwelling house sheets	NFL	3	Mandatory	Numeric	001 to 999	—	1	22	3

Data to be captured - Dwelling sheet - "A" lots									
NAME			ORIGIN				ACQUISITION FILE		
In plain language	Symbol	Justification	Presence	Character	Modalities	Comment	Type of recording	Pos	Length
Sequence number of the building	IMM	top right hand side, page 1	Mandatory	Numeric	001 to 009	—	2	17	3
Dwelling number	IOG	top right hand side, page 1	Mandatory	Numeric	01 to 99	—	2	20	2
Dwelling category	CAT	bottom, page 1	Mandatory	Numeric	1 to 7	1 to 5 main place of residence 6 vacant dwelling 7 secondary home	2	22	1

Data to be captured - Individual form number 2 - "A" lots

NAME		ORIGIN				ACQUISITION FILE			
In plain language	Symbol	Question	Reply	Reply mode	Character of the code to be captured	Modalities	Type of recording	Pos	Length
Sex	S	3	mandatory	box ticked off	numeric	1,2	2	26	1
Position in household	SF	4	mandatory	box ticked off	numeric	1 to 2	2	27	1
Day of birth	JN	5	mandatory	hand written	numeric	01 to 31	2	28	2
Month of birth	MN	5	mandatory	hand written	numeric	01 to 12	2	30	2
Year of birth	AN	5	mandatory	hand written	numeric	872 to 982	2	32	3
Nationality	N	6	mandatory	box ticked off or possibly hand written	numeric	1 to 3	2	35	1
Previous residence indicator	IRA	7	optional (84%)	box ticked off	numeric	1 to 3	2	36	1
Department of previous residence	DRA	7	optional (33%)	hand written	numeric	01 to 19, 2A, 2B, 21 to 95, 97 to 99	2	37	2
Children schooling	SCO	8	optional (21%)	box ticked off	numeric	0,1	2	39	1
Student or trainee	ET	9	optional (78%)	box ticked off	numeric	1 to 3	2	40	1
Type of activity	TA	9,12 to 16	optional (78%)	box ticked off and hand written	numeric	1, 3 to 5	2	41	1

APPENDIX 2

DRAWING OF SAMPLES FOR LIGHT OPERATION

Since the number of recordings (N_α) for each district (α) is known beforehand, the probability of district inclusion (α) in the sample is provided by the expression:

$$\Pi_\alpha = K\lambda_\alpha$$

where $KE] 0,1$ [and $\lambda_\alpha = \text{Min}$

$$N \cdot \frac{N_\alpha^{1/2}}{\sum N_\alpha^{3/2}}, 1$$

For each lot, K is defined so that the ratio

$$\frac{4 V(\hat{p})}{P} =$$

= may be inferior to P^2 for any error percentage (P) greater than P_{Po} .

The expression of variance $V(\hat{p})$ is obtained by:

$$V(\hat{p}) = \frac{1}{N^2} \sum_{\alpha} \frac{Y_{\alpha}^2}{K \lambda_{\alpha}} (1 - K \lambda_{\alpha}) \quad (N = \sum_{\alpha} N_{\alpha})$$

Since the number of errors Y_{α} is unknown, we took the expected value of its square, assuming that $P_{\alpha} = P$.

$$E(Y_{\alpha}^2) = N_{\alpha}^2 P^2 + N_{\alpha} P Q$$

APPENDIX 3

HEAVY OPERATION

1. Acceptance and rejection probabilities allowing for the aggregation process

$$\lambda = 5.25 K$$

$$\lambda = 2.K.$$

K is the number of calendar weeks involved in the aggregation.

2. The updating mode for the components of the error ratio vector for France as a whole

The error ratio vector for France as a whole is updated daily. For each one of its components, the following is available:

— the number of enumeration occurrences (O_{jt});

— the number of errors observed (E_{jt});

for a given time implicity determined by constraint $O_{jt} < 10,000$.

Two possibilities may be considered when updating component j:

1) $O_{jt} < 10,000$ and ΔO_{jt} such that $O_{jt} + \Delta O_{jt} < 10,000$ then $O_{j,t+1} = O_{jt} + \Delta O_{jt}$

$$E_{j,t+1} = E_{jt} + \Delta E_{jt}$$

one shall add up occurrences on the one hand and errors on the other hand.

2) $O_{jt} < 10,000$ and O_{jt} such that $(O_{jt} + \Delta O_{jt} > 10,000)$

$$\text{then } O_{j,t+1} = \frac{1}{2} (O_{jt} + \Delta O_{jt})$$

$$\text{and } E_{j,t+1} = \frac{1}{2} (E_{jt} + \Delta E_{jt})$$

Note: $O_{jt} < 10,000 \Delta(j,t)$

MEASURING THE QUALITY OF DATA IN THE 1981 CENSUS OF POPULATION AND HOUSING OF CANADA (a)

I. INTRODUCTION

1. The Census of Canada, given its size and significance to the work of Statistics Canada, and to data users, presents special problems and responsibilities to ensure that the data can be properly analysed and interpreted. This, of course, requires that the user be provided with the basic definitions of variables and relevant terminology. These, however, frequently will not be sufficient.

2. The interpretation or use of the data is not bound to a given Census. For example, changes in population characteristics and distributions from earlier Censuses are of immediate interest. Such comparisons are meaningful only to the degree that the Census data are historically comparable. The comparisons may be affected by changes in questions, concepts or procedures.

3. The use of the data may also be affected by error. The inevitability of some non-response, and of coverage, response, processing and other errors in the data, is commonly accepted. The geographic size of Canada and the mobility, and varied social and cultural characteristics of its population, present potential for error which requires special consideration — a consideration which must be viewed in the light of increasing use of data for smaller geographic areas and for sub-groups of the population.

4. To encourage the most effective use of the data, the output of the Census should include information on the concepts and methods which historically underlie the data and information on data quality.

5. The purpose of this paper is to describe the evaluation programme undertaken for the 1981 Census of Canada. The objective of this programme was to provide users with the fundamental information on comparability and quality.

(a) Report prepared by Mr R. Burgess - Statistics Canada.

II. 1981 CENSUS EVALUATION STRATEGY

6. The evaluation of the 1981 Census data was planned and carried out in a manner consistent with the practices of previous Censuses, while at the same time extending and reformulating these practices to achieve better the objective of providing better service to the user. To this end planning was done using five basic guiding principles:

i) counts and data must be analysed and reported on, from the perspective of quality and historical comparability, prior to release;

ii) anomalies and conceptual or significant procedural changes should be identified at the time of release and documented as part of the disseminated data;

iii) where feasible and practical, estimates of error for potentially significant sources of error should be produced;

iv) estimates of error produced must be meaningful to the user and provide him/her with guidance on the potential impact of error on the use of specific data;

and v) an assessment of the quality of the data and of the impact of the methodology and procedures of the Census on the quality and comparability of the data must be documented, published and disseminated as part of the regular Census publication programme.

7. For the first two guidelines there was a timeliness problem to overcome. An evaluation of the data based upon statistical studies which produce estimates of error is a time consuming process. To withhold dissemination of the Census data until such measures were available would not have been acceptable to users and would have seriously depreciated the relevance and credibility of the data as a current indicator of the characteristics and distributions of the population.

8. For the third and fourth guidelines there were strict limitations on the extent of evaluation that could be conducted from the perspective of cost, timeliness and feasibility. There were similar constraints on the level of geographic detail and population sub-groupings for which consideration for evaluation could reasonably be given.

9. To overcome or to mitigate these constraints two approaches to the evaluation were undertaken — the one termed certification, the other data quality measurement. The certification approach was directed towards meeting the first two guidelines, i.e., towards establishing, prior to release and dissemination of data, a basic knowledge of the quality of the data, and of the impact of procedural or conceptual changes on historical comparability. As a consequence of providing at least an initial view of the data quality, the certification process identified specific problem data areas where less timely but more detailed and

more rigorous evaluation could be conducted under the data quality measurement process.

10. Data quality measurement was directed towards meeting the third and fourth guidelines, i.e., towards providing basic measures of data quality, and providing quantitative data on the impact of Census operations on the data. This included identifying sub-populations with significant error or potential error and providing measures of this error, and conducting detailed evaluations of problem areas identified during the certification process.

11. The last guideline was met by including in the formal Census products and services programme, publications devoted to documentation and discussion of the quality of the data.

III. CERTIFICATION

1. The objective of the certification process was to identify data quality problems which required rectification of the data before dissemination, notification to users at the time of dissemination, further evaluation and/or some combination of these. This was achieved by way of a macro assessment, for major geographic levels, of universe counts (i.e., counts of persons, households, families, etc.) or proportions and of univariate and multivariate distributions, and of measures derived from these distributions. Such assessments were facilitated primarily by making comparisons with alternative sources of data and with data from previous Censuses, either through direct comparison of distributions or through the use of projections especially prepared for this purpose.

(a) Scope of Certification

13. Given that there were more than one hundred universes and variables to be certified and that data for these would be available for many different levels of geographic detail, the timeliness requirements dictated that only major aggregations of the data be checked. For most variables certification was carried out at the Canada and province level and only sub-provincially if higher level checks indicated a potential data quality problem, if by the nature of the variable provincial checks were not meaningful (e.g., Place of Work), if the variable was considered to be of special importance or if there was a legal requirement for sub-provincial certification. In the latter category were included the population counts (verified to the Census Tract level - 3,000 to 10,000 persons) and the Mother Tongue variable verified to the Federal Electoral District (an area represented by a member of Parliament).

14. Univariate distributions for all variables available to users through

published tables or by special request were certified. Multivariate distributions for variables frequently associated, or for which there was some predictable correlation, were also certified.

(b) Method of Certification

15. Certification was carried out by groups of subject matter experts, each group dealing with one or more of sixteen sets of related universes and/or variables. Prior to the availability of the Census data to these groups, alternative sources of data and a strategy for verification and acceptance or rejection were established.

16. A variety of alternative data sources were used. Sources other than earlier Censuses included data from Statistic Canada surveys, administrative or survey data from federal, provincial and municipal government departments and agencies, and data from a variety of publications of a specialized or technical nature.

17. Typically, as an alternative source, the 1971 and 1976 Censuses were used. In the case of housing and household variables, data back to the 1961 Census were used. For family data reference was in some cases made back to the 1941 Census.

18. Two general verification strategies were used. The one was a comparison between the 1981 Census data and that of the alternative source. Tolerance levels were pre-set for the degree of acceptable deviation of distributions from comparable distributions for alternative sources of data. These tolerance levels were set with consideration for comparability of concepts and effective dates, and the limitations of the universe, methodology, data quality, etc., of the alternative source. As an example, the verification of age/sex/marital status variables used independent demographic population estimates as one alternative source. The tolerance levels for the Census data were set at $\pm 5\%$ of the comparable population estimate for all cells of size 100,000 or more; and $\pm 10\%$ for cells in the range of sizes 10,000 to 100,000. Smaller cells were examined on an ad hoc basis.

19. When a cell or other measure exceeded tolerance it was necessary for a rationale to be provided to explain the deviation. In some cases such an explanation was readily found in other Census data distributions (e.g., because of unexpectedly high inter-provincial migration certain age-sex cells within a particular province were larger than projected). In other cases subsequent investigations showed the deviations to be due to an error in the Census data; in others due to an error in the data from the alternative source.

20. The second verification strategy was applied when there was no previous Census precedent to project from, or if projection from a previous Census was not entirely meaningful, and if external alternative sources were not

adequately comparable or were not available. For such variables it was necessary to provide a basic rationale for the distributions. This interpretative verification was based upon logical criteria being placed on the data. For example, for one first time Census question, related to dwelling ownership, one particular response would not be expected to be common except for certain dwelling types in urban areas. Significant occurrence of this response in other areas, or for other dwelling types, would have indicated a probable error.

21. The data comparison verification strategy accounted for more than 80% of the certification. The interpretative technique was used for the remainder.

22. As part of the certification process, for all variables comparisons were made between distributions for edited imputed data and for unedited unimputed data. Thus to a limited extent some separate assessment of Census processing and procedures was made.

IV. DATA QUALITY MEASUREMENT

23. The data quality measurement process was an examination of the error and/or change introduced by five sources of potential error in the Census — coverage, response, processing (other than edit and imputation), edit and imputation, and sampling and weighting. These components of examination were intended to encompass all aspects of data collection and processing of the Census data.

24. For each of these sources, studies were undertaken to provide either estimates of error or to describe quantitatively the impact of operations or processes on the data. A decision on what studies to conduct, among the viable options, was based upon an assessment of the significance to the users of Census data of the potential error being examined and of the cost effectiveness of the option.

(a) Nature of Operations

25. The measures of data quality were produced by way of four general types of study:

i) *Enumeration checks*: enumeration checks were statistical studies, on a sample basis, of some particular aspect of Census enumeration and involved some degree of re-enumeration. Such checks were carried out primarily as part of coverage studies.

ii) *Parallel operations*: parallel operations were studies which were performed independently and, using a sample of Census data, in parallel with a Census operation. A comparison of the Census output with that of the sample

operation permitted estimation of the error introduced. This type of study was carried out to evaluate processing.

iii) *Alternative data source comparisons*: comparisons with alternative data sources involved micro-matches, on a sample basis, of Census records with those of an alternative source. This type of study was carried out to evaluate response and edit and imputation.

iv) *Analysis of Census data*: analysis of the Census data involved some form of calculation using finalized and/or intermediate (united) Census data. Such studies were carried out to produce response rates and estimates of sampling error and to evaluate edit and imputation.

(b) Coverage Component

26. The most fundamental purpose of the Census is to provide counts of the population for various geographic levels. Errors in coverage, therefore, have special significance and a comparatively large proportion of evaluation resources was applied to estimate of these errors.

27. A coverage error occurs whenever a person, a household or dwelling is missed completely (undercoverage), counted more than once (overcoverage), or whenever a unit not in a Census universe is counted (overcoverage). Generally overcoverage is expected to be fairly rare in relation to undercoverage and is more difficult to evaluate. The coverage component of the data quality measurement programme therefore was directed primarily, but not exclusively, to estimation of undercoverage error.

28. An assessment of four elements of coverage error was made:

i) population and private household undercoverage, which were evaluated by the Reverse Record Check;

ii) population undercoverage of persons temporarily absent from their usual place of residence, which was evaluated by the Temporary Resident study;

iii) population and household undercoverage of persons whose usual place of residence was misclassified as unoccupied, which were evaluated by the Vacancy Check;

and iv) dwelling overcoverage due to structures not in the housing stock (because they were under construction or renovation, seasonal dwellings, etc.) being misclassified as unoccupied.

(i) The Reverse Record Check

29. The Reverse Record Check (RRC) has been conducted as part of the Census of Canada since 1966. The specific objectives of the RRC were i) to

provide estimates of population undercoverage at the province level; and ii) to provide estimates of private household and population undercoverage for various sub-groups of the population and housing universes.

30. There were two key elements of the RRC methodology: i) the construction of an independent list of all persons who, it was believed, should have been enumerated in the census; and ii) the tracing/follow-up operations which were undertaken to identify intercensal deaths and emigrants on the constructed list, and to ensure that the Census day usual place of residence for persons who should have been enumerated was known.

31. Conceptually these two elements permitted matching to the Census to determine whether or not the persons who should have been were enumerated. The construction of the list and subsequent tracing, follow-up and matching were carried out for a sample of persons.

32. The independent list had four components or frames:

- i) all persons enumerated in the previous (1976) Census;
- ii) all intercensal births - obtained from vital statistics records;
- iii) all intercensal immigrants - obtained from immigration records;

and iv) all persons missed in the previous (1976) Census - obtained from the 1976 RRC.

33. A sample of persons was selected from all frames except for the fourth, as this was already represented by the sample of cases from the 1976 RRC which were classified as missed in the 1976 Census. A total sample of approximately 36,500 persons was selected.

34. After sample selection extensive operations were conducted to trace and to follow-up on the selected persons. For most selected persons their available address was searched in the Census documents. If they were not found enumerated then contact was attempted, or alternative addresses obtained, through telephone interviews and through searches of city directories and of various government administrative records. If a selected person was contacted but not found enumerated in the Census, then a follow-up interview was conducted to obtain information on possible alternative addresses and certain Census data for him/her and the household. This information was used to confirm that the selected person was missed in the Census, and if he/she was, as input to estimates of undercoverage.

35. The sample cases were classified, as a result of these operations, into one of five basic results: i) enumerated in the Census, ii) missed in the Census, iii) deceased before Census day, iv) emigrated before Census day or living abroad on Census day, and v) selected person not traced. The "not traced" category was in effect "non-response" and represented those cases sent to a tracing operation but not located. Among all selected persons 3.4% were classified to this category. These cases were removed from subsequent estimation by way of weight adjustment procedures.

(ii) The Temporary Resident Study

36. The Census of Canada is "de jure" and not "de facto". Thus persons temporarily absent from their usual place of residence are still to be enumerated at their usual place of residence. All persons in Canada on Census day who were in the Census universe (i.e., were not foreign residents) and who were staying temporarily at some residence (e.g., hotel, hospital, or jail) were enumerated there on a special Census form called a Form 3.

37. After collection, a % sample of completed Forms 3 (approximately 10,000) was selected and tracing undertaken to identify among the regular Census questionnaires the usual place of residence of the selected person. This was facilitated by address information requested on the Form 3. It was then determined, using data collected on name, age, sex and marital status, whether the selected person had been enumerated at his/her usual place of residence.

38. Estimates of the number of persons missed by age, sex and marital status groups for broad geographic areas within provinces were produced. These estimates were used to adjust or to "correct" the Census population counts for this particular incidence of undercoverage. This adjustment was effected through a weight adjustment process using randomly selected donor records with given characteristics (age, sex, marital status) within given geographic areas. By this process the weight of the donor record was incremented by one to thus represent both itself and the missed person. Nearly 118,000 persons were added to the initial population counts through this methodology. This was approximately 0.5% of the final population count and 3% of all persons enumerated on a Form 3 at a place of temporary residence.

39. It was because persons enumerated as temporary residents represented an easily identifiable group known to be subject to a high rate of undercoverage that this study and subsequent adjustment were undertaken.

(iii) The Vacancy Check

40. Dwellings enumerated as unoccupied formed another group within the Census which was known to be subject to a relatively high rate of coverage error. There were in this case two aspects of coverage error to be examined. First, dwellings enumerated as unoccupied may have been in fact occupied on Census day. This would represent undercoverage of persons, households and occupied dwellings, and overcoverage for unoccupied dwellings. Such misclassification may have resulted because the household moved close to Census day or was absent for some period of time (e.g., on vacation, or staying at a summer residence). Second, structures enumerated as unoccupied dwellings may not have been suitable for year round occupancy on Census day and thus should not have been classified as dwellings. This would represent overcoverage for unoccupied dwellings and for total dwelling stock.

41. In order to estimate these elements of coverage error a sample re-enumeration of dwellings or structures enumerated as unoccupied was undertaken soon after completion of the Census collection operation. The work of approximately 150 enumerators involving approximately 14,000 "unoccupieds", was selected for this study.

42. The re-enumeration was carried out through intensive interviewing of current occupants (if the dwelling was currently occupied), building superintendents, and neighbours. From the results of the interviews it was established whether the structure was actually occupied on Census day. In the event that the structure was occupied, it was established, through searching of addresses provided, whether the occupants were enumerated elsewhere. The number of persons in the household and the dwelling type (e.g., apartment) were also determined.

43. In the event that the structure was unoccupied on Census day it was established whether the structure was a dwelling. To be a dwelling a structure had to be suitable for year round occupancy as of Census day. This meant that it had to include basic facilities. For example, a house under construction or renovation, and an unheated summer cottage would not be considered dwellings and should not have been enumerated.

44. Two primary sets of estimates of coverage error were the results of the study. First, estimates of the number of households missed by household size, by dwelling type, by urban-rural areas within provinces were produced. (The estimate of missed households represented also a corresponding amount of overcoverage of unoccupied dwellings). These estimates were used to adjust or to "correct" the Census population, occupied dwelling (household) and unoccupied dwelling counts for this particular incidence of under and overcoverage. The adjustment of population and occupied dwelling counts was effected through a weight adjustment process similar, in general terms, to that used for the temporary resident adjustment. In this case donor records were household records selected on the basis of household size and dwelling type within given geographic areas. A corresponding number of unoccupied dwellings was deleted from the data base. Approximately 44,500 households and 8,000 persons were added to the initial population and household counts through this methodology. This was approximately 0.3% of the final population count and represented a 10% misclassification rate for structures enumerated as unoccupied.

45. Second, various estimates of the number of structures misclassified as dwellings were produced. Those were not used for adjustment but were used in a Census data publication to caution the user on overcoverage in total dwelling stock counts and in unoccupied dwelling counts. On an after adjustment basis the overcoverage rate for unoccupied dwellings was estimated to be nearly 20%. Approximately one half of this was due to the erroneous enumeration of dwellings under construction or renovation.

(iv) Net Undercoverage Error

46. The results of the RRC matching to the Census reflected only the completeness of the Census counts prior to the adjustments for temporary residents and misclassified unoccupied dwellings. The RRC estimates thus had to be adjusted to account for these statistical additions to the data base. This yielded a net % rate of population undercoverage for the 1981 Census, a level comparable to that of the three previous Censuses.

(c) Response Component

47. Three general studies were conducted to evaluate response quality — a response rate study, a content study based upon the RRC sample, and various problem area investigations.

(i) Response Rate Study

48. Response rates at the Canada level for each variable were produced. These response rates were only general indicators of the level of quality but provided a measure of the extent to which the Census data were based upon responses from respondents and to some extent of the amount of imputation required.

49. For a sample of Census records, more extensive univariate and multivariate response rates were calculated. These were produced to identify groups of the population with high rates of non-response. High rates for particular groups gave indication of the potential for bias in data representing such groups. Correspondingly, for the majority of groups, low rates of non-response gave indication of low potential for non-response bias.

(ii) Reverse Record Check Content

50. The RRC content study used all selected person records which were classified in the RRC as "enumerated" in 1981. For these records comparisons between the responses for the person in the 1981 Census and those from the 1976 Census (or from administrative records for persons not enumerated in the 1976 Census) were made. Comparisons were made for those variables which should be stable over time (e.g., date of birth, sex, mother tongue) and for those for which change could only be in one direction (e.g., highest level of schooling attained). The primary measures produced were estimates of relative bias and gross difference rates.

(iii) Problem Area Analysis

51. Studies were conducted as a result of problems being identified during the certification process. Results were typically an explicit identification of the problem but without necessarily being able to provide estimates of the precise degree of error.

(d) Processing Component

52. Two studies were conducted to evaluate the processes of coding, data capture and manual editing.

(i) Coding Bias Study

53. Coding was necessary to transform various write-in entries (e.g., industry, occupation) into numeric codes which could then be captured. A study of the bias introduced by coders was conducted.

54. The estimation of coding bias was facilitated by comparing coding results by "expert" coders on a record by record basis for individual variable, under the assumption that the expert was correct. The reliability of the results would be limited to some unknown extent by this assumption, by the fact that only a sample of person records could be used in the study, and by the infrequency of occurrence of write-ins for some variables and of individual codes.

(ii) Data Capture Evaluation

55. The Census data were captured by a key entry process. This method of capture methodology had not been used in the previous Census, thus it was important to show that this process was not a significant source of error.

56. For this study a sample of Census questionnaires amounting to data for approximately 33,000 persons was recaptured independently of the main flow of Census data. The re-keyed data were then processed through the remainder of the capture system which included basic manual consistency and head count edits. Changes to the data for the sample, as a result of this processing, were made by experts.

57. Once re-processed the sample data records were matched to the corresponding records captured as part of the main Census process. Any discrepancies between the two versions of the data were outputted for review by the expert staff. Discrepancies due to an error in the main Census process were flagged. Estimates of processing error were then produced, by variable, using the flags and indicators of error.

(e) Edit and Imputation Component

58. Three general studies were conducted to evaluate the impact of edit and imputation on the Census data. These studies paralleled those undertaken as part of response evaluation.

(i) Data Relationships

59. The Data Relationships study provided quantitative measures of the extent of imputation — both for edit failures and for non-response. While such measures were not direct estimates of error they provided a strong indication of the quality of the data. Since an edit and imputation process is directed to detectable error (including non-response) given any fixed set of processing procedures the smaller the proportion of change or of imputation the more reliable the data should be. To some extent this must, of course, lead to some assessment of the actual rules of the process.

60. Estimates of the rate of imputation were produced for each variable according to each final value. Similar estimates on a multivariate basis using combinations of imputed and unimputed values were produced. These were used to identify groups of the population for which a relatively high rate of imputation occurred and to determine the propensity for imputing particular values. This in part constituted an assessment of the edit and imputation rules applied.

61. Some direction to this process was given by the certification activity which identified particular areas for which edit and imputation had a significant impact on the data and by the results of the work on response rates.

(ii) Reverse Record Check Match

62. Once the matching process for the RRC Content study had been done it was possible to use these same matched records to assess the impact of edit and imputation. Essentially this was identical to the RRC Content methodology except instead of matching initial Census responses, the RRC responses (either from the previous Census or administrative records, or those collected as part of the RRC process) were matched to imputed values where imputation occurred.

63. Separate estimates were produced for imputation required to resolve edit conflicts and that required for non-response. Estimates produced for the edit conflict cases were assessed in conjunction with corresponding RRC Content results.

(iii) Problem Area Analysis

64. The process for investigation of specific problems in edit and imputa-

tion was similar to that for suspected response problems. Typically the problem was identified during the certification or through another study and resulted in a detailed examination of the specific edit and imputation procedure in conjunction with circumstances of response and collection.

(f) Sampling and Weighting Component

65. While basic data for the 1981 Census were to be collected for 100% of the population, an extensive amount of data was to be collected only from a 1 in 5 random sample of households. There was thus a need to evaluate the impact of sampling, and the consequent weighting process, on the quality of data. Three primary studies were conducted for this evaluation.

(i) Sampling Bias Check

66. The requirements of the sample design for the Census, and for corresponding sample selection procedures to be followed by the enumerator, should have ensured that an unbiased sample was selected. The Sampling Bias Check was conducted to evaluate the extent to which sample selection was implemented according to the intended design.

67. This evaluation was made by comparing for all Enumeration Areas (an EA was a geographic area which was the collection assignment for one enumerator) the distribution of household characteristics of sampled households with those for all households in the EA (using data collected for all households). Statistical tests were applied to these comparisons in order to determine if differences, among all EAs in given geographic areas, deviated significantly from what could be expected for a simple random sample of households.

(ii) Sample/Population Consistency Check

68. The Census weighting procedure was carried out for groups of contiguous EAs called Weighting Areas (WAs). A WA typically would have had a population count in the range of 3000 - 7000 persons. The weighting methodology made use of the various population and housing data collected for all households by employing a raking ratio estimation procedure. This procedure was what might be considered a two dimensional ratio estimation procedure with each dimension being implemented alternately and iteratively. For characteristics used in this adjustment process, estimates based upon the sample data, at the WA level or higher, would closely approximate the corresponding counts that would be obtained from the corresponding complete or 100% population of persons or households. For data collected on a 100% basis, therefore, this procedure should

have yielded considerable consistency between tabulations based upon the 100% data and identical tabulations based upon sample data.

69. The Sample/Population Consistency Check was conducted to evaluate the extent of this consistency and in particular to determine whether consistency at the WA level had been achieved at the expense of consistency at sub-weighting area levels. This evaluation was made by comparing, for various geographic levels down to the EA level, the 100% counts for a variety of 100% variables to the corresponding sample data estimates. As in the Sampling Bias study, statistical tests were applied to these comparisons.

(iii) Sampling Error

70. The evaluation of error introduced by sampling in the Census was a fundamental undertaking. For most Census variables, estimates of variance (incorporating sampling variance and some components of response and processing variance) were produced. The estimates were based upon a ten percent sample of WAs, and using a Taylor Series expansion estimator which incorporated the effect of the estimation procedure. Separate sets of estimates were produced by province.

V. PUBLICATION OF DATA QUALITY INFORMATION

71. There were several ways in which information on the quality of data were (or are to be) disseminated. All data disseminated as part of the planned Census products programme were accompanied by standardized textual material on the quality of data. This included a discussion of the potential sources of error and cautioned the user to be aware that the data are subject to error, particularly in the case of smaller cell values. In some cases Canada level estimates of error were included (e.g., the estimated rates of population and private household undercoverage and response rates).

72. The textual material to accompany data collected on a sample basis included a discussion of the potential error due to sampling and a table of sampling errors (by cell size) with a statement on use of these measures. If, in addition, the data being disseminated included average income cells, then the data tables also included corresponding estimates of standard error of the average income estimates.

73. This information was, of course, in addition to the various types of notes discussed earlier, and the basic definitions of variables and terminology. The material of this nature, however, varied according to the data included in the particular tabulation package.

74. For data disseminated as a result of a request by a user, basic textual material, including cautionary notes, was sent with the requested tabulations.

In addition, at the time of request, the quality of the data requested and matters of comparability, definition, etc., were discussed thoroughly with the user.

75. Any textual material sent with Census data tabulations and any other relevant publications referred the user to two publications devoted to documentation and discussion of the quality of the Census data. These two publications represent the most comprehensive form in which the quality of the data, its historical comparability, and the impact of '81 Census methodology on the quality and comparability are discussed. One publication deals with the data collected from the total population; the other deals with the data collected from the sample of households.

76. These publications briefly describe those aspects of the Census methodology which impact on the quality and comparability of the data and present the results of the data quality measurement process by source of error. The largest portion of these documents is, however, a universe by universe and variable by variable assessment of the Census data. This assessment is based upon an analysis of certification results, re-considered in light of the results of the data quality measurement process.

VI. EFFECTIVENESS OF THE EVALUATION PROGRAMME

Planning and developmental work for the evaluation of the 1986 Census are going on at this time. One basis for this work is an assessment of the effectiveness of the 1981 programme.

(a) Certification

78. For 1981 the certification process attempted to evaluate the historical continuity and current consistency of the Census data. It was directed towards detecting significant bias in the Census data. Such bias would be detected providing certain conditions were met:

i) there was not a consistent historical bias or bias in common with alternative sources;

ii) concepts, methodologies, etc. of alternative sources were well understood;

iii) projections used for comparisons were well formulated and valid;

iv) tolerance limits reasonably represented non-bias deviations from the alternative source;

and v) the bias was relatively large so as not to be obscured by variances associated with the Census data and the data of the alternative source.

79. Assurances that such conditions were met for any given variable either had to be provided by reasonable evidence from the certification process itself that the data for the particular variable did contain a significant bias, or by the results of the data quality measurement studies. The certification approach was effective for variables which historically have been well studied, and for variables which are stable over time or for which change is relatively easy to predict (e.g., age, sex and housing variables). In general, the data quality measurement results for these types of variables supported the certification conclusions. There were two important cases for which the certification results were not supported. These were determined to be cases for which there was a historical bias (response or enumerator) in the Census data which invalidated the certification comparisons.

80. The approach was less effective for cultural and other variables which may have been subject to significant response errors, but which were difficult to evaluate. Generally, for such variables there was a lack of sound or comparable alternative data sources, or change over time was difficult to predict. There was often a lack of meaningful data quality measurement of response error for such variables. For these cases, the conclusions of certification may remain subject to some debate.

81. The certification process, therefore, did leave some potential for data to be released and to contain important, but unknown (and unsuspected) error. This potential, however, had been substantially diminished by the certification. At the same time, the analytical work which was part of certification, provided, prior to release, a knowledge of what phenomena (real or otherwise) the Census data were describing. This directly enhanced the effectiveness of communication with users.

(b) Data Quality Measurement

82. For most, if not all, aspects of the Census which were evaluated the data quality measurement studies provided meaningful and useful results. The limitations of this part of the programme were related to its breadth, or detail of application. Three limitations are worth noting. First, there are potentially important sources of error for which there are no estimates. For example, for many variables there are no estimates of response bias, and there are no estimates of population overcoverage or of the impact of illegal aliens on the quality of counts.

83. Second, estimates of error are not generally applicable for small area data. While estimates (e.g., sampling error) may be used for any cell size, the actual error may be greatly affected by localized circumstances. In part this is a problem of the sampling error associated with the estimates of data quality.

84. Third, and to some extent indistinguishable from the second, there are few estimates or measures of total or aggregate error. This will not necessarily be a serious problem for large cells values, if all major potential sources of error can be evaluated (regardless of the level of error). It will become an increasingly serious problem as cell sizes decrease, and in particular for small area data.

VII. CONCLUSION

85. The evaluation programme for the 1981 Census included important improvements on similar programmes for earlier Censuses. There was some increase in the scope and detail of evaluation. The most significant improvements were, however, in the application of a formal certification process, and in the scope, nature and packaging of information for users.

86. It would be obvious to conclude that the limitations of the 1981 evaluation programme should be addressed for the 1986 Census. It must be remembered, however, that improving data quality evaluation is an evolutionary process functioning within an environment of revolutionary changes in data usage and manipulation. It is unlikely that the limitations of the 1981 programme can be overcome in the near future, while demand for data will increase. It is therefore essential that there be a continuing concern for data quality in the design of Census questionnaires, methodology and operations. The quality of the Census data will thus be maximized even where this quality cannot be measured precisely.

QUALITY OF CENSUS DATA IN ITALY (a)

1. Evidently, the quality of the results of a survey depends on a series of factors. Generally, it could be asserted that it reflects in one way or another the attention with which the survey plan was first devised and how the phases of the operation that this implied were brought to an end. However, there is no doubt that the efficiency of the organizational structure represents precisely the major guarantee.

2. There are several expedients that can be adopted "a priori" to guarantee high quality standards in a survey. The census has, within this framework, seriously engaged the ISTAT Department which had the responsibility of bringing it into being. The importance of the survey, which from an economical point of view entailed the investment of substantial financial resources, accorded absolute priority to such a purpose.

3. Features with positive effects on data quality were:

a) the restraint within acceptable limits of the number of questions included in the questionnaire, especially avoiding difficult worded questions or ones that could provoke negative reactions by the households;

b) the insertion in the questionnaire of detailed directions to facilitate the task of the respondents;

c) the insistence with which, through the mass-media, the criteria to follow for the completion of the questionnaire were further illustrated;

d) the particular format of the questionnaire which, in most cases, provides the possibility of answering the single questions by checking a box;

e) the careful planning of the various levels of control of the questionnaires by the peripheral Bodies responsible for the enumeration;

f) the checking during the preparation phase of the input;

g) the processing of the tables with information which was exclusively used to highlight possible defects in the registered material;

(a) Report prepared by Mr A. Cortese - Central Institute of Statistics.

h) the controls of a more traditional type aimed at analysing both the individual information as well as the macrodata.

4. All this complicated activity, logically, has not lessened the need to evaluate "a posteriori", or rather, collaterally, the quality of the results achieved. It was a matter, on the one hand, of the opportunity to collect elements to evaluate the validity of the selected methodological formulation and, on the other, to underline the errors which might have been brought out by the procedures adopted (errors of the respondents as a result of an imprecise interpretation of the directions, which do not give rise to inconsistencies, are not easily picked, for instance, even if one resorts to sophisticated procedures of control).

5. Such a need has been met by carrying out a sample survey to which reference has been made already in our report on the use of the sampling method (CES/SEM. 17/R.16).

6. The survey aimed at: (a) identifying the characteristics more prone to "error" and to quantify such "error"; (b) knowing, in relation to the characteristics examined, the distribution of the error on various items of such characteristics.

7. In the strict sense, one cannot speak of a real "error" as much as of the "diversities" found in two successive observations of the same reality, as an objective support for such a reality does not exist.

8. Moreover, one has to consider the time the survey was being carried out. The results have, therefore, to be considered as an approximation of the "errors"; more precisely they are to be considered as "errors" of the checking carried out by the City Census Board.

9. The information was obtained by means of a household questionnaire which is subdivided into individual sections, one for each household member; two columns have been set for each person, one to be completed by an interviewer assigned by the Commune, the other with information deduced from the census questionnaire by the competent office of the Commune in the sample.

10. The survey covered the following characteristics:

- sex;
- age;
- marital status;
- educational status;
- employment status (active and non-active persons);
- occupation;
- occupational status (wage earners and salaried employees, employers and self-employed persons, unpaid family workers);
- sector of economic activity.

11. In the above, 8,095 households for a total of 27,070 persons were involved.

12. The errors found are of three types:

a) record level: the record is not "coupled" with the other, that is, the column referring to the information collected by the survey or that with the census information, is blank (lacking individualization of a component);

b) at a single characteristic level: a code that is not provided by the registration plan;

c) at a multiple characteristic level: logical inconsistency between the values given for two or more characteristics.

13. Desiring to limit the discussion, it would be asserted — with reference to the errors of the second type — that a clear-cut distinction emerged between the variables: on the one hand the characteristics sex, age and marital status for which the level of diversity maintained itself below the 2 per cent level, and on the other hand, the remaining variables for which the level turns out to be much higher, especially in the case of the question regarding the educational level.

14. Omitting to discuss the differences found between the various geographical areas and those found between small and large Communes, some concise indications on the results of the comparison carried out on a national scale on each single characteristic can be given as follows:

Sex: the identical answers (to the survey and to the census) are 99.45 per cent;

Age: the consistent answers were in the realm of 98 per cent;

Marital status: the situation is similar to that of sex;

Education: the equal codes have represented 86.9 per cent of the compatible codes;

Employment status: (active and non-active persons): in this case the percentage stood at 89 per cent; it is worth noting that the flow percentage between the different modalities has marked significant peaks in two cases:

<i>census</i>	<i>survey</i>	<i>per centage</i>
blank	student	2.75
retired from work	housewife	1.47

Occupation: Although it is a "difficult" question, a high percentage (94 per cent) was reached;

Occupational status: in 88.9 per cent of the cases, equal answers were given;

Sector of economic activity: the percentage of coinciding answers was 95 per cent.

15. In conclusion, it is interesting to point out, along general lines, that the persons for whom no diversity has been attested, represent 54.5 per cent of the persons interviewed.

LE RECENSEMENT FEDERAL DE LA POPULATION 1980: LA FAÇON DONT ON A ESSAYE DE COMBLER LES LACUNES ET DE CORRIGER LES ERREURS DES BULLETINS INDIVIDUELS (a)

Les deux premiers chapitres expliquent de quelle manière on a complété les questionnaires présentant des lacunes et dans quelle mesure on a réussi à corriger les formulaires contenant des fautes, lors du Recensement fédéral de la population de 1980. Le chapitre suivant est consacré au contrôle du codage, et pour finir, il est question des travaux faits pour détecter les substitutions (chiffres mal lus par le lecteur optique). Le bulletin individuel est reproduit en annexe.

I. LES QUESTIONNAIRES PRÉSENTANT DES LACUNES

Il faut faire une distinction entre les questions pour lesquelles on a prévu la rubrique "aucune indication" au dépouillement et celles dont la réponse est indispensable.

1. *Année de naissance (réponse obligatoire)*

Il fallait indiquer l'année de naissance trois fois en tout, à savoir sur l'enveloppe pour ménages privés ou sur la liste pour ménages collectifs, sur la case correspondant à l'année de naissance et enfin à la ligne complémentaire réservée à cette donnée (ajoutée pour permettre le contrôle). De ce fait, la date de naissance n'a été omise que par 0,2 pour mille de la population. On a obtenu la date de naissance des personnes en question au contrôle des habitants.

2. *Sexe (réponse obligatoire)*

Quelque 2 pour mille des questionnaires ne contenaient aucune indication quant au sexe. On a réussi à ajouter la réponse manquante grâce aux prénoms ou

(a) Report prepared by the Swiss Federal Statistical Office.

à la situation dans le ménage, parfois aussi grâce à la terminaison masculine ou féminine de la profession.

3. *Etat civil (réponse obligatoire)*

Dans le cas des personnes de moins de 21 ans qui n'avaient pas marqué d'une croix la case «conjoint (marié)» en définissant leur situation dans le ménage, on a indiqué automatiquement «célibataire». Dans les autres cas, on a essayé d'ajouter l'état civil à la main en se fondant sur les renseignements relatifs à l'âge et à la situation dans le ménage. Parfois, on l'a déduit de la réponse à la question «Si veuf/veuve, depuis quelle année?».

4. *Situation dans le ménage*

Les questionnaires de tout le ménage ont généralement permis d'établir les informations qui manquaient. Les noms de famille ont été fort utiles, à cet effet, de même que l'indication de la profession dans certains cas (p.ex. dans celui des travailleurs vivant dans le ménage de leur patron). Quand il n'y avait pas moyen de trouver la réponse on a classé la personne en question sous «autre situation».

5. *Langue maternelle (réponse obligatoire)*

La réponse à cette question manquait dans deux pour-cent environ des questionnaires (principalement ceux d'enfants en bas âge). En étudiant les formulaires des personnes vivant dans le même ménage, on a réussi à établir la langue maternelle dans la plupart des cas (langue de la mère ou du chef de ménage, en l'absence de la mère).

Chaque fois qu'il était impossible de définir la langue maternelle, on a choisi la langue de la région. Dans certains cas (pour les étrangers surtout), on s'est fondé sur la nationalité. Comme on s'est borné à prévoir 13 numéros codiques pour la langue maternelle, on a eu moins de peine à classer les personnes qui n'avaient pas indiqué la leur.

6. *Religion*

Il faut faire une distinction entre les personnes qui ont indiqué clairement qu'elles n'avaient pas de religion (en marquant d'une croix la case «aucune») et celles qui n'ont pas répondu à la question. Ces dernières ont été classées dans la rubrique «aucune indication», qu'on a admise au dépouillement. Un trait dans la case réservée aux inscriptions manuelles est synonyme de «aucune».

7. *Lieu de naissance (réponse obligatoire)*

2,4 pour-cent de la population n'ont fourni aucune indication utilisable quant à leur lieu de naissance. On a appliqué les règles suivantes:

— dans le cas des personnes de moins de 20 ans qui n'avaient indiqué aucun domicile antérieur, on a inscrit automatiquement le nom de la commune qu'elles habitent également dans la rubrique «lieu de naissance»;

— dans le cas des étrangers qui ne faisaient pas partie de la première catégorie, on a noté automatiquement «né à l'étranger»;

— dans le cas des Suisses qui ne faisaient pas partie de la première catégorie, on a essayé d'abord de déterminer laquelle des quatre possibilités convenait en fonction de la situation familiale (ainsi, en ce qui concerne les petits enfants dont les parents habitaient déjà au même endroit cinq ans auparavant, lieu de naissance = commune de résidence). Puis, s'il n'était pas possible de procéder de la sorte, on a ajouté une des possibilités (1 = commune de recensement, 2 = autre commune du canton, 3 = autre canton) en alternant.

8. *Lieu d'origine (réponse obligatoire)*

2% à peine de la population (surtout des étrangers) n'ont pas répondu à cette question. On a comblé la lacune de la manière suivante: en examinant les questionnaires des autres personnes vivant dans le même ménage, on a généralement réussi à établir le lieu d'origine des Suisses. Il faut relever le fait que les femmes (aussi les étrangères) acquièrent automatiquement le droit de cité du mari si celui-ci est Suisse. Dans le cas des ménages qui ne constituent pas une famille, on a consulté le Répertoire des noms de famille suisses. Enfin, on a réparti les personnes dont on n'avait réussi à établir le lieu d'origine d'aucune manière entre les communes du canton de résidence qui possèdent un très grand nombre de ressortissants (à ne pas confondre avec le norme d'habitants).

9. *Commune de travail (réponse obligatoire)*

On a rajouté à la main les informations manquantes qu'on avait réussi à établir en se fondant sur le nom et l'adresse de l'employeur, et dans certains cas sur le moyen de transport utilisé. Les réponses telles que «en voyage», «en route» ont été codées en fonction de la relation d'équivalence «commune de travail = commune de résidence». On ne considère donc pas les représentants comme des navetteurs. En ce qui concerne les cas qu'on n'a pas pu classer (environ 2 pour-cent des personnes actives et écoliers), on a indiqué la commune de résidence également à la rubrique réservée à la commune de travail.

10. *Durée du trajet jusqu'au lieu de travail, nombre de parcours par jour et moyens de transport utilisés*

Un nombre relativement important de personnes (à peu près 20 pour-cent) n'ont pas répondu à ces questions relatives à leurs déplacements. On a donc dû ajouter, dans les trois cas, la possibilité «aucune indication» lors du dépouillement.

11. *Degrés d'enseignement atteints*

Vu la proportion de personnes qui n'ont pas répondu à cette question (5% de Suisses, 11% d'étrangers), on a prévu une rubrique «degré d'enseignement inconnu».

12. *Profession apprise*

Le nombre des personnes qui n'ont pas indiqué la profession apprise est relativement important aussi. De ce fait, on a tenu compte, lors du dépouillement, que des questionnaires fournissant les renseignements requis. On a complété automatiquement les questionnaires des personnes dont le métier implique forcément des études universitaires, après avoir vérifié qu'elles exerçaient bien la profession indiquée (ainsi, l'ordinateur a ajouté à cette question, les études de médecine chaque fois qu'il s'agissait d'une personne pratiquant la médecine).

Il fallait indiquer également les certificats finals obtenus. C'est une simple question de contrôle, posée pour vérifier si la personne en question avait terminé son apprentissage ou ses études. Il en est de même de la question relative à la durée des études.

13. *Activités actuelles: Les réponses manquantes ont été ajoutées lors des contrôles effectués par ordinateur, par exemple*

— la réponse 1 (occupé(e) à plein temps) pour les activités économiques 010 à 950 et une durée du travail hebdomadaire de 40 heures au moins, ou une durée non indiquée, dans la profession principale;

— la réponse 2 (occupé(e) à temps partiel) pour les activités économiques 010 à 950 et une durée du travail hebdomadaire située entre 6 heures et moins de 40, dans la profession principale;

— la réponse 3 (actuellement sans travail, en quête d'un emploi stable) chez les personnes qui ont indiqué l'activité économique 990 (les chômeurs) et qui n'ont pas marqué d'une croix la réponse 4 (actuellement sans travail, emploi futur garanti);

— la réponse 5 (travaux ménagers dans le propre ménage) dans le cas des femmes qui ont noté un certain nombre d'heures de travail dans leur ménage;

— la réponse 6 (rentier) pour les hommes de 65 ans au moins et pour les femmes de 62 ou plus qui ne vivent pas avec un mari;

— la réponse 8 (autres sources de revenus) pour tout membre d'un ménage privé qui n'est ni occupé ni chômeur ni rentier, à condition qu'il s'agisse du chef de ménage ou d'une personne qui ne fait pas partie d'un noyau familial, ainsi que pour tout membre d'un ménage collectif qui n'est ni occupé ni chômeur ni rentier.

On a attribué à chaque personne active occupée un numéro codique pour la profession principale, pour l'échelon hiérarchique, pour la branche et pour le type d'entreprise.

14. *La question relative à la durée du travail hebdomadaire*

Elle a été posée entre autres pour permettre le contrôle. La durée indiquée devait correspondre aux réponses concernant les activités actuelles (point 13). On n'a pas classé les personnes travaillant moins de 6 heures parmi la population active occupée; en effet, la majorité des personnes dont l'horaire de travail hebdomadaire est aussi réduit ne mentionne pas cette activité professionnelle dans le questionnaire. Pour le dépouillement, on a prévu la possibilité «aucune indication».

15. *Profession principale*

Pour les indications relatives à l'activité professionnelle qui sont insuffisantes, on a prévu le numéro codique 961.

16. *Situation dans la profession principale*

Si les indications relatives à la profession et à la formation sont utilisables, elles permettent de déterminer l'échelon hiérarchique. Si on a classé la profession principale sous le numéro 961, on a le choix entre les possibilités 4 (employé subalterne) et 6 (ouvrier semi-qualifié ou manoeuvre).

17. *Branche économique*

Pour le classement des branches économiques, on peut se servir des numéros 950 (activité indéfinissable) et 990 (chômeurs). Les deux rubriques sont enregistrées à part, sans être rattachées à un secteur économique distinct. Sur ce point, les résultats définitifs et provisoires divergeront.

18. *Type d'entreprise*

Les indications relatives à l'employeur permettent de définir le type d'entreprise (économie privée, établissements ou services administratifs de la Confédération, des cantons, des communes, d'organisations internationales, d'un service public étranger). S'il n'y a aucun renseignement, on choisit le numéro 1 (économie privée).

19. *Question s'adressant aux personnes de condition indépendante*

On se sert du REE (Registre des entreprises et établissements) pour ajouter les réponses qui manquent.

20. *Questions s'adressant aux rentiers et retraités*

Lors du dépouillement, on ne tient compte que des questionnaires fournissant des renseignements utilisables sur la profession exercée avant la retraite. Si l'échelon hiérarchique manque, on peut l'ajouter en fonction de la profession, en optant pour la situation la plus usuelle. En cas d'indications manquantes ou incomplètes, on n'utilise pas le numéro de code 961 (employé, travailleur sans spécification) dont on se servirait pour une personne active occupée.

21. *Questions s'adressant aux femmes mariées*

Très souvent, ces questions sont restées sans réponse. Seuls les questionnaires remplis de manière impeccable ont fait l'objet du dépouillement.

II. LES QUESTIONNAIRES CONTENANT DES INDICATIONS FAUSSES

Les fautes ne peuvent être détectées sans risque d'erreur que dans de rares cas. Seules quelques caractéristiques permettent un tel contrôle.

22. *Date de naissance*

Le fait que la date de naissance devait être indiquée trois fois a grandement facilité la correction des dates fausses; il a surtout empêché que 1980 (l'année du recensement) figure à la place de l'année de naissance.

23. *Sexe*

Il arrive régulièrement que des gens se trompent de case en répondant aux questions pour lesquelles deux réponses seulement sont prévues. On ne peut comparer toutes les croix avec les prénoms; cela exigerait un travail disproportionné. Au moment de la lecture, il y a donc une erreur quant au sexe dans un questionnaire sur mille.

Pendant la première phase (données démographiques), les contrôles de plausibilité permettent de corriger un petit nombre de formulaires. En revanche, les erreurs qui ne sont découvertes qu'au cours de la seconde phase (dépouillement des réponses relatives à la profession) ne peuvent plus être corrigées; de ce fait, on est parfois obligé de changer la profession indiquée. (Exemples: un jardinier d'enfants «homme» est classé parmi les éducateurs; un conducteur de locomotives «femme» est considéré comme employée de gare). Mais la plupart des erreurs relatives au sexe ne sont pas détectées.

24. *Situation dans le ménage*

Conformément aux recommandations de l'ONU, on a remplacé le terme

d'“épouse” du chef de ménage par celui de “conjoint (marié ou non marié)” afin de pouvoir recenser aussi les unions consensuelles. Mais on a découvert que seul un très petit nombre des personnes unies de cette façon avait coché la case en question. La plupart de celles qui vivaient, selon toute vraisemblance, avec un conjoint sans être mariées ont noté “colocataire” à la ligne supplémentaire. Pendant l'élaboration des résultats, on essaiera donc de déterminer approximativement le nombre d'unions consensuelles (présumées) en se fondant sur l'état civil, l'âge et le sexe quand on est en présence de la combinaison chef de ménage/colocataire.

25. *Lieu de naissance*

Des erreurs se produisent principalement dans deux cas:

— certains indiquent comme lieu de naissance la commune dans laquelle se trouve l'hôpital, à la place du domicile des parents (de la mère) au moment de l'accouchement (la question est accompagnée d'une explication qui aurait dû permettre de réduire le nombre d'erreurs à un minimum);

— les navetteurs hebdomadaires, qui doivent remplir deux questionnaires, se réfèrent souvent, dans les réponses des deux formulaires, à la commune où ils ont déposé leurs papiers, et non au domicile économique selon la définition donnée pour le recensement de la population; cette remarque s'applique aussi aux réponses relatives au lieu d'origine et au domicile d'il y a cinq ans.

On est rarement en mesure de détecter les erreurs, en ce qui concerne le lieu de naissance.

26. *Lieu de travail, de l'école*

Les réponses qui concernent le lieu de travail sont fausses relativement souvent. Cela tient à ce que la localité qui figure dans l'adresse de nombreuses firmes fait penser à une commune politique qui n'est pas celle du siège social de l'entreprise. Mais il se peut aussi que la localité indiquée fasse partie de deux ou plusieurs communes politiques. Pour corriger les fautes de ce genre, on a établi une liste d'entreprises dont l'adresse postale ne correspond pas clairement à la commune politique en question. Le responsable a été chargé de vérifier, au cours d'une opération à part, si toutes les personnes travaillant dans ces entreprises avaient indiqué le lieu de travail correctement.

27. *Moyen de transport utilisé*

La question relative au moyen de transport utilisé pour la majeure partie du trajet jusqu'au lieu de travail a été mal comprise dans de très nombreux cas. Logiquement, il aurait fallu répéter le nom d'un moyen de transport cité dans la

réponse à question "Quel(s) moyen(s) de transport utilisez-vous habituellement(...)? Mais bien des personnes avaient indiqué un moyen de transport différent, probablement celui qu'elles utilisaient le plus souvent pour leurs déplacements privés. Avant le contrôle de plausibilité déjà, on a renoncé à l'exploitation de la question relative au moyen de transport utilisé pour la majeure partie du trajet, aucune correction judicieuse n'étant possible.

28. *Degrés d'enseignement atteints*

Assez souvent, des personnes qui avaient fait leurs études dans une école technique ou une académie de musique non universitaire ont coché la case "université, haute école"; de ce fait, le dernier degré d'enseignement atteint ne correspondait pas à la profession apprise. Les contrôles de plausibilité ont permis de rectifier ces indications erronées.

29. *Etudes terminées*

Lors du codage, il ne fallait tenir compte que des études terminées. On renonçait au codage dès que des indications complémentaires montraient que les études n'avaient pas été terminées ou que le nombre d'années d'étude était insuffisant.

30. *Questions s'adressant aux femmes mariées*

Parmi les réponses données à ces questions, un nombre relativement élevé ne pouvaient être justes, vu le contexte (année de naissance de l'épouse, date du mariage, dates de naissance des enfants). Ces questionnaires-là, de même que ceux qui présentaient des lacunes, n'ont pas été pris en considération lors de l'exploitation.

III. L'ÉLIMINATION DES ERREURS DE CODAGE

31. En ce qui concerne les données démographiques, il n'y a que peu de numéros codiques à mettre, en raison du système choisi (réponses imprimées plus case OVID). De ce fait, le taux d'erreurs est minime. Au début des travaux, le codeur et le contrôleur examinent les questionnaires afin de détecter aussitôt les fautes systématiques. Par la suite, les contrôles s'espacent peu à peu; pour finir, on vérifie à peu près 10% des formulaires.

32. Le codage des questions relatives à la profession pose de nombreux problèmes. Ceux qui s'en chargent doivent s'initier, dans des cours de 10 jours, au domaine complexe de l'activité professionnelle, puis appliquer leurs connaissances en faisant des exercices de codage. En dépit de cette préparation, ils font encore au moins 5% d'erreurs en moyenne au début du codage proprement dit.

Pour éliminer ces fautes le plus vite possible, on contrôle tous les formulaires de recensement pendant la période d'initiation des codeurs (environ les deux premiers mois après leur formation). Ensuite, on relâche le contrôle peu à peu; finalement, on se borne à vérifier un échantillon de 10% environ. Evidemment, les auxiliaires moins bien qualifiés doivent faire l'objet d'un contrôle plus serré (voir intégral, dans certains cas) pendant cette opération.

33. Le contrôle mécanique des données permet de détecter une partie des erreurs de codage. La rectification se fait tantôt à la machine, tantôt à la main.

34. Pour le traitement des données, la section spécialisée constitue, en vue de ce contrôle, un dossier de base contenant d'une part les examens à faire du point de vue de la plausibilité et vraisemblabilité des données et d'autre part les tableaux statistiques à confectionner. Dans les questions relatives à la plausibilité, il faut préciser les numéros de code qui peuvent apparaître pour chaque caractéristique, les combinaisons d'éléments douteuses ou impossibles; il faut indiquer aussi ce qui doit se passer lorsque la série de données concernant une personne est incomplète ou présente des contradictions. Pour être prémunie contre toute surprise désagréable, la section spécialisée doit avoir la possibilité de revoir des cas déjà corrigés par la machine et, le cas échéant, de modifier les corrections. Toutes les modifications mécaniques sont automatiquement comptées, et l'ordinateur dresse une liste des erreurs et des données invraisemblables relevées. Les erreurs signalées dans la liste doivent être rectifiées à la main; à cet effet, le contrôleur note le numéro de code exact sur une liste d'ordinateur. Ensuite, des opératrices sur multiclavier enregistrent la rectification sur des bandes magnétiques qu'on rattache au fichier principal pour que les corrections soient faites à l'endroit qui convient.

35. La liste des professions individuelles et la nomenclature des activités économiques, qui utilisent des nombres de trois chiffres, présentent de nombreuses interruptions. Dans le cas des métiers, on n'a utilisé que la moitié des chiffres de 1 à 999, et dans celui des branches économiques un sixième seulement. De ce fait, les erreurs produisent souvent des numéros de code inexistant; on réussit à éliminer en particulier une grande partie des fautes dues à des interversions de chiffres (673 à la place de 637).

36. Les invraisemblances doivent toujours faire l'objet d'une vérification. Elles ont été particulièrement nombreuses dans le domaine des professions. On a, en effet, accordé une attention spéciale aux métiers courants exercés normalement par des hommes (p.ex. meunier, boucher, scieur, serrurier en bâtiment, etc.) ou presque exclusivement par des femmes (p.ex. modiste, couturière en fourrures, nurse, dame de buffet, etc.). Dans le cas de ces professions, il fallait contrôler à la fois le métier et le sexe. On a découvert alors que soit le sexe soit le numéro de code de la profession était faux dans un certain nombre des cas signalés; on a donc fait une correction (toutefois, le sexe ne pouvait plus être modifié). Mais on a découvert également, en examinant les formulaires originaux, que les femmes commençaient à exercer des métiers

jadis réservés aux hommes, et vice versa.

37. Dans le cadre des contrôles de plausibilité, on a aussi comparé, dans un très grand nombre de cas, la formation, la profession apprise et la profession exercée. De cette façon, on a réussi à corriger une faute relativement fréquente, l'attribution d'études résultant d'une erreur de codage.

IV. LES FAUTES DUES AU LECTEUR OPTIQUE

38. Les données des bulletins individuels ont été saisies au moyen d'un lecteur optique. Une partie des numéros de code ayant été écrits à la main, dans les questionnaires, il était probable que certains ne seraient pas reconnus, ou mal interprétés, par le lecteur optique. Cet organe a enregistré immédiatement une image vidéo de chaque signe inidentifiable; par la suite, les responsables ont complété la saisie devant leurs écrans.

39. Les chiffres mal interprétés, eux, posaient certains problèmes, les erreurs n'étant pas évidentes. Il s'agissait de chiffres écrits à la main que le lecteur avait « mal lus » soit parce qu'ils s'écartaient de la forme standard (ils étaient trop petits, par exemple), soit parce que le trait était trop fin (tracé par un crayon qui venait d'être taillé, par exemple). Ainsi, l'appareil n'a souvent pas tenu compte des zéros trop petits (exemple: 703 → 73, 73 étant égal à 073). Les substitutions nées lors de la saisie des numéros de code désignant la profession et la branche économique exigeaient une attention particulière.

40. Dans le questionnaire d'une personne active occupée, il fallait inscrire, en règle générale, cinq numéros de code, soit 11 chiffres en tout (profession apprise, profession exercée et branche économique, 3x3, puis échelon hiérarchique et type d'entreprise, 2x1). Or, un chiffre sur 200 a été mal lu. Parmi les questionnaires des personnes actives occupées, un sur vingt contenait donc une erreur de codage due à des causes purement techniques. Avec les fautes faites par le codeur lui-même (3% en moyenne), on aurait ainsi obtenu un taux d'erreurs de 8% si on n'avait pas pris des contre-mesures. Il fallait évidemment remédier aux imperfections du lecteur optique (et aux maladresses des codeurs). Les contrôles de plausibilité mécaniques ont permis de détecter immédiatement un tiers environ des substitutions: les erreurs de lecture ont produit très souvent des numéros de code qui n'existent pas, dans la liste des professions ou dans la nomenclature des activités économiques. Afin de rectifier le plus grand nombre possible des substitutions qui n'avaient pas été détectées lors de cette première opération, un listing complet du contenu des questionnaires a été dressé de chaque secteur de recensement (un secteur comprenant en moyenne 150 questionnaires dont 75 de personnes actives occupées) où le contrôle de plausibilité avait mis à jour plus d'une substitution; c'était le cas dans dix pour-cent environ des secteurs. On a comparé ces listes avec les numéros codiques figurant dans les questionnaires originaux. Dans certains cas ex-

trêmes, près de la moitié des chiffres lus par le lecteur optique ne correspondaient pas à ceux du document original. Dans les secteurs en question, 2% des chiffres en moyenne avaient été mal lus. De ce fait, les numéros de code relatifs à la profession et à l'activité économique, qui comprennent beaucoup de chiffres (11), contenaient 22% d'erreurs de lecture pour 100 personnes actives occupées; ces fautes ont pu être corrigées. Si on avait demandé des listes également dans les secteurs présentant une seule substitution, cela aurait occasionné trop de travail et de frais. Le matériel qui n'a pas fait l'objet d'une telle comparaison, c.-à-d., celui des secteurs où on avait détecté une seule substitution, ou bien aucune, contenait encore une à deux erreurs de lecture détectées en moyenne. Il comprend donc, en ce qui concerne les personnes actives occupées, environ 2% de fautes de codage supplémentaires.

**THE 1980 FEDERAL POPULATION CENSUS:
WAYS OF FILLING IN GAPS AND CORRECTING ERRORS
IN INDIVIDUAL FORMS (a)**

Summary

1. The first two chapters of the report explain how questionnaires containing gaps were completed and forms with mistakes were corrected during the 1980 Federal population census. The third chapter deals with code checking and the last chapter discusses means of detecting substitutions (figures misread by the optical reader). An individual form is reproduced in the annex to the full text of the report.

2. In view of their importance, the last two chapters of the report are reproduced below.

A. ELIMINATION OF CODING ERRORS

3. Because of the system used (printed answers, plus OVID box), there are few code numbers for demographic statistics. The error rate is thus quite low. At the outset, the coder and the checker examine the questionnaires to detect the most common errors. Checks are then made less frequently. Ultimately, only 10 per cent of the forms are checked.

4. The coding of questions relating to occupations involves a number of problems. Those responsible have to familiarize themselves, during 10-day courses, with the complex field of occupational activities and then practise what they have learned by doing coding exercises. Despite such preparation, their error rate is at least 5 per cent on average at the beginning of the coding process. In order to eliminate such errors as rapidly as possible, all census forms are checked during the coders' period of initiation (which last about two months

(a) Report prepared by the Swiss Federal Statistical Office.

following training). Checks are then made less frequently; ultimately, only a sample of about 10 per cent of the forms is checked. The least qualified coders obviously have to be checked more carefully (if not fully) during this operation.

5. Some coding errors may be detected by mechanical data checks. Correlations are made by machine or by hand.

6. For data processing and checking purposes, the specialized unit prepares a master file containing data plausibility checks and the statistical tables to be drawn up. The plausibility questions specify the code numbers that may be used for each characteristic, as well as doubtful or impossible combinations; they also indicate what happens when individual data are incomplete or contradictory. To avoid any disagreeable surprises, the specialized unit must be able to look at cases that have already been corrected by the machine and, where necessary, change the corrections. Any mechanical amendments are automatically recorded and the computer draws up a list of errors and implausible data. The errors on the list must be corrected by hand; to this end, the checker notes the right code number on a computer list. Key punch operators then record the changes on magnetic tapes that are added to the master file so that corrections may be made in the proper place.

7. There are many gaps in the list of individual occupations and the classification of economic activities, which use three-digit numbers. Only half of the number from 1 to 999 have been used for occupations and only one sixth for economic sectors. Non-existent code numbers are thus frequently given by mistake. It is possible to eliminate many errors caused by the transposition of figures (673 instead of 637).

8. Implausibilities, which always have to be checked, are particularly common in the case of occupations. Special attention has been paid to occupations that are usually engaged in by men (e.g. miller, butcher, sawyer, locksmith) or nearly exclusively by women (e.g. milliner, fur maker, nurse). Both occupation and sex were checked in such cases. It was discovered that, in some instances, either the sex or the code number of the occupation was wrong and required correction (the sex could, however, not be changed). An examination of the original forms nevertheless showed that women were beginning to carry on occupations formerly engaged in only by men and vice versa.

9. As part of plausibility checks, a comparison was made in a very large number of cases between training, the occupation learned and the occupation engaged in. It was thus possible to correct a relatively frequent error, namely, the attribution of studies as a result of a coding error.

B. ERROR BY THE OPTICAL READER

10. Data in individual census forms were processed by an optical reader. Since part of the code numbers on the questionnaires has been written in by

hand, it was likely that some of them would not be recognized or would be misinterpreted by the optical reader, which produced a video image of each unidentifiable sign. The persons responsible then completed the data processing operation on their screens.

11. Misinterpreted figures gave rise to problems because the errors were not obvious: figures which had been written in by hand were misread by the reader either because they were not standard (i.e. too small) or because they were too faint (i.e. written with a pencil that had just been sharpened). The optical reader often did not take account of zeros that were too small (for example, 703 might become 73, with 73 equalling 073). Particular attention had to be paid to substitutions made during the processing of code numbers for occupations and economic sectors.

12. In most cases, the questionnaire for gainfully employed persons required five code numbers with a total of 11 digits (occupation learned, occupation engaged in and economic sector, 3x3; hierarchical position and type of enterprise, 2x1). One figure in 200 was misread. One in every 20 questionnaires on gainfully employed persons thus contained a coding error that could be attributed to purely technical causes. Together with the errors made by the coders (3 per cent on average), there would have been an 8 per cent error rate if countermeasures had not been taken. It was obviously necessary to remedy the optical reader's shortcomings and to correct the coders' mistakes. About one third of the substitutions were immediately detected by mechanical plausibility checks: reading errors often produced non-existent code numbers in the list of occupations and the classification of economic sectors. In order to correct the largest possible number of substitutions that had gone undetected during the first operation, a full list of the contents of the questionnaires was drawn up in each census sector (a sector comprises an average of 1500 questionnaires covering 75 gainfully employed persons) in which plausibility checks revealed more than one substitution. This was the case in about 17 per cent of the sectors. These lists were compared with the code numbers in the original questionnaires. In some extreme cases, nearly half the figures read by the optical reader did not correspond to those in the original document. In the sectors in question, an average of 2 per cent of the figures had been misread. Accordingly, the code numbers for occupations and economic activities, which comprised 11 figures, contained a 22 per cent error rate for every 100 gainfully employed persons. These errors were corrected. Too much time and expense would have been involved if lists for sectors with only one substitution had also been requested. Material for which such a comparison was not made, i.e. for sectors where one or no substitution was detected, still contained one or two reading errors on average. There is thus an additional 2 per cent coding error rate in material on gainfully employed persons.

CHECKS OF THE COVERAGE OF THE 1981 CENSUS IN THE UNITED KINGDOM (a)

1. The coverage of the 1981 Census was assessed in two main ways. The main method was the voluntary post enumeration survey (PES). (See CES/SEM. 17/R.19 for a broad description of the sampling arrangements). The PES method primarily relies on repeating the census process for small samples but using more detailed and thorough methods and using highly trained staff whose brief is in effect to seek out errors. This means that although the PES will itself be subject to error, its quality is expected to be appreciably better than that of the census. The main coverage results of the 1981 PES for England and Wales were published in August 1982 and are shown in Tables 1 and 2 on the next page.

2. The main findings were that the net undercount of persons present on census night was about 214,000 persons which was less than ½ per cent. But for Inner London, the proportion was around 2½ per cent.

3. In Scotland double counting of visitors was more of a problem and this resulted in an estimated net overcount in the population present on census night of up to 0.16 per cent. But the number of households with persons present on census night is likely to have been understated by about a quarter of one per cent.

4. However there are inherent difficulties in checking the coverage of a census using re-enumeration methods. Because of the cost and thoroughness of the approach the samples have to be small and the sampling errors are therefore large – especially at the sub national level. Also, in spite of the thoroughness of the methods, it is very likely that some of the persons missed in the census will also have been missed in the PES – for similar reasons. In other words re-enumeration surveys will tend to understate the error in the census. Therefore in addition to the PES it was decided to carry out checks against other independent sources for some groups of the population.

(a) Report prepared by the Office of Population Census and Surveys.

Table 1. Under-enumeration (as measured by the PES) by Cause

	Persons		
	Best estimate of under-enumeration	19 chances in 20 that under-enumeration will be inside the range	
	Per cent	(000s)	(000s)
Households misclassified as absent by enumerator	0.17	81	61 - 101
Household spaces misclassified as vacant by enumerator	0.09	41	27 - 55
Property missed	0.05	25	14 - 36
Persons missed in enumerated household	0.27	128	85 - 171
Gross under-enumeration*	0.62	296	243 - 349
Persons double-counted	0.17	83	47 - 119
Net under-enumeration	0.45	214	151 - 277

* Includes causes not shown separately in the table.

Table 2. Net Under-enumeration by Area (as measured by the PES)

	Persons		
	Best estimate of net under-enumeration	19 chances in 20 that net under-enumeration will be inside the range	
	Per cent	(000s)	(000s)
England and Wales	0.45	214	151 - 277
Inner London	2.46	58	39 - 77
Outer London	1.01	42	20 - 64
Other metropolitan areas	0.24	27	2 - 52
Non-metropolitan areas	0.29	87	39 - 135

5. One such check compared the number of children aged 0-9 in the census with data on registered births and deaths and making allowances for assumed emigration and immigration. The check could not be precise because of unknown errors in the migration assumptions. The results are still being evaluated.

6. Another check compared infants aged 0-1 with birth records and this showed the census figure for that age group to be about 2 per cent lower although it is possible that part of this error may be due to errors in the ages shown on census forms.

7. A third check compared census counts for children of school age with school rolls. This suggested a census undercount of around ½ per cent although there were imprecisions due for example to the different time period to which the two sources related.

8. Other checks compared the census count of children (all ages) with State benefit records and the census count of people of retirement age against records of the numbers receiving state retirement pensions.

9. The general conclusion drawn from all these checks is that the level of underenumeration in the 1981 Census in England and Wales may have been somewhat higher than the $\frac{1}{2}$ per cent found by the PES. However because of the considerable imprecisions surrounding the checks against administrative sources, it is very difficult to estimate the actual figure. For the purposes of mid-year population estimates the total underenumeration was put at 240,000 persons which made some allowance for the likely undercount of children in addition to the evidence from the re-enumeration.

10. The main message for the future that seems to emerge from the checks on coverage is that methods of enumerating inner city areas, and especially Inner London, should be improved if possible. This is much easier said than done but broad possibilities that are likely to be considered include using better quality field staff, closer supervision and tighter control of what they do and making it easier for householders who are rarely at home or nervous about opening their door to strangers to comply with the census. These measures might involve using double or treble workloads for enumerators thus providing better financial incentives to attract better people who would work more or less full time during the enumeration period, longer delivery and collection periods, checks of delivery records against some kind of control list such as postal address lists, seeking the help of local authorities to check the lists of addresses (which might also help to counter any claims by the local authorities of underenumeration in their area), greater use of postal returns where contact is not made at delivery, and special checks during the enumeration phase of a sample of vacant premises and absent households in each area.

COVERAGE AND CONTENT ERRORS IN THE 1980 US DECENNIAL CENSUS (a)

I. INTRODUCTION

1. The eminent nineteenth century French statistician, Alexandre Moreau de Jonnes, observed, "The United States presents in its history a phenomenon which has no parallel. It is that of a people who instituted the statistics of their country on the very day when they formed their government".

2. De Jonnes' observation underscores the fact the U.S. Constitution calls for a census of population every 10 years as a means of determining the number of representatives each state may send to Congress. The United States conducted its first census in 1790 and its twentieth, and most recent, in 1980.

3. This constitutional mandate remains the primary reason for conducting the census, but Americans use census data for many other important purposes:

- 1) Drawing congressional and state and local legislative district boundaries.
- 2) Allocating Federal and state funds under various grants-in-aid and revenue-sharing programs.
- 3) Formulating public policy at all governmental levels.
- 4) Making decisions in the private sector.
- 5) Conducting academic and analytical studies of demographic trends.

4. Because of the important uses of the data, completeness and quality have been of concern to census officials and data users since the first census. After the 1790 enumeration, President George Washington expressed disappointment that the population count did not exceed 4 million persons (it was 3,929,214). He base his belief not on fact but on his hunch, which was probably correct, that some persons were reluctant to be counted.

(a) Report prepared by Mr Peter A. Bounpane, the United States Bureau of the Census.

5. The development of probability sampling methods and the improvement in administrative record systems (such as birth and death registrations) in the middle decades of this century have made it possible for the Census Bureau to provide more scientific measures of the accuracy of census data. At the same time there has been a growing interest in the quality of the counts, particularly as Federal programs that use census data to allocate funds have grown.

6. Since 1950, each census has included an evaluation and research program to measure coverage error and content error in the census. In addition, the programs have also contained experimental and research projects designed to measure specific kinds of error or to test alternative census-taking methods. The purpose of these evaluation has been to attempt to evaluate error for the purpose of planning future censuses and to provide general levels of error so that users can be made aware of its sources and magnitude. In recent years, some persons have urged the Census Bureau to adjust the census counts based on the measured undercount, but as will be described in detail below, the census coverage measures are not yet valid enough to be used for this purpose.

7. Before discussing the coverage and content evaluation programs for the 1980 census, we should first look at how the census was taken.

II. BASIC 1980 CENSUS PROCEDURES

8. The procedures for taking the 1980 census were the result of many years of tests, evaluations, and census experience. The Census Bureau consulted with a broad array of individuals and organizations in planning the census and conducted extensive testing during the 1970's to measure the effectiveness of new techniques. We used a number of different procedures, some of them overlapping, to attempt to identify every housing unit and every person.

9. In 1980, we used the mail-out/mail-back method for 95 per cent of the population. The aim of this approach was to complete as much of the census as possible by mail and then to follow up each housing unit for which no questionnaire was returned.

10. There were separate procedures for counting persons who did not live in housing units, such as students in college dormitories and military personnel living in barracks.

11. Mail census procedures were not suitable in sparsely populated areas of the country. Here, mail carriers delivered unaddressed questionnaires to each housing unit. We asked householders to fill them out in advance, but enumerators travelled door-to-door to pick them up.

12. For areas covered by the mail-out/mail-back procedure, the Census Bureau developed an address list and mailed a questionnaire to each housing unit on the list shortly before Census Day (April 1, 1980). The address list served

as a control on which addresses returned questionnaires, and which did not. More than 80 per cent of householders filled out the questionnaires and mailed them back to the census district offices. Failure to return a questionnaire did not mean a person was not counted. A large work force (270,000 people) personally visited nonresponding housing units beginning about 2 weeks after mailout.

13. Because of the importance of the address control list in a mail-out/mail-back census, the Census Bureau used a combination of procedures to construct the most complete address list possible. We either purchased original lists from private companies or, where these were not available, compiled lists from scratch in the field.

14. We realized there would be inadequacies in both the purchased and listed addresses, so we put the addresses through a number of updates and checks by the U.S. Postal Service and census workers.

III. 1980 CENSUS COVERAGE IMPROVEMENT

15. The coverage estimates for the 1970 census indicated that about 2.2 per cent of the total population had been missed. Though this level of undercoverage was significant, it might not have been of as much concern if coverage errors had occurred randomly and had been distributed equally by geographic area. The evaluations revealed, however, that there was a disproportionate undercount for population subgroups. While 1.5 per cent of the White population were missed, about 7.6 per cent of Blacks were missed. The evaluations also showed that the undercount was higher in some regions of the country than in others.

16. The Census Bureau's coverage-improvement goals in the 1980 census were (1) to attain a relatively low overall undercoverage rate and (2) to reduce the coverage differential between population subgroups.

17. The Census Bureau took two main approaches to attempt to achieve these goals. First, since public cooperation is essential to a successful census, the Bureau made many special efforts to encourage support for the census. Some of these promotional efforts were designed specifically to reach minority racial and ethnic populations, to help reduce the coverage differential between these groups and the rest of the population.

18. The Bureau formed three census advisory committees – one each for Blacks, Hispanics, and Asian and Pacific Islands – and conducted regional meetings to obtain advice from the many tribal groups of American Indians. Our representatives participated in approximately 50 meetings of national minority organizations. In addition to these national programs, we hired full-time specialists to contact local leaders and organizations that could encourage their constituencies to cooperate with the census.

19. General publicity for the 1980 census was provided primarily by a public service advertising campaign. Independent evaluations indicate that

the public service announcements were worth about \$38 million in "air" time. This dollar figure, which covered the period January to June 1980, was greater than the paid advertising media expenditures in an average 6 months for all but two of the United States' largest commercial concerns – McDonalds and Ford.

20. A formal evaluation of the publicity campaign showed that the public service announcements were very successful in increasing awareness of the census. In addition, the campaign significantly increased knowledge about the census among lower-income Black and Hispanic households and had a positive effect on the mail response behaviors of these same households.

21. In addition to the general public service campaign, the Census Bureau directed a series of major publicity activities at the minority media. For example, our promotion office obtained testimonials from prominent minority leaders and celebrities, developed special television and radio spots designed to reach minority audiences, and printed special literature for distribution to minority populations. We also encouraged local communities to set up complete count committees to help generate local support for the census. More than 4,000 out of 39,000 jurisdictions formed such committees.

22. The second approach to coverage improvement for the 1980 census was to improve census-taking procedures to reduce the possibility of people being missed. The Bureau augmented and refined its address list compilation procedures, applied special procedures to count the transient population, provided assistance in answering questionnaires (including foreign language aids), and hired indigenous enumerators wherever possible.

23. The Census Bureau gave local officials an opportunity to review and comment on preliminary census counts for their areas. By involving local officials, the Bureau profited from their knowledge of local conditions. District office staff made corrections for errors documented by local officials before closing the offices.

24. Another coverage improvement effort was based on our previous experience that showed that the enumerators' misclassification of occupied housing units as vacant could be a coverage problem. Enumerators identified vacant units when they went to addresses for which no questionnaires were returned by mail. For the 1980 census, every vacant unit was to be visited by a second independent enumerator who was to verify the occupancy status of the unit. This recheck procedure also included units deleted as nonexistent by the initial follow-up enumerator.

25. As a further attempt to improve the coverage for minority populations, we matched names and addresses from administrative sources such as drivers' license lists to the census records. We performed this check only in areas with significant minority populations. Bureau employees tried to contact each person on the independent lists who was not recorded in the census to see if that person should have been enumerated.

IV. EVALUATION OF COVERAGE IN THE 1980 CENSUS

26. What were the results of these coverage-improvement programs? Did they help the Census Bureau attain its goals of a relatively low overall undercoverage rate and a reduction of the coverage differential between population subgroups?

27. The Bureau has two main programs for estimating the coverage of the population in the 1980 census--demographic analysis and the Post-Enumeration Program. Although neither of these programs has as yet produced firm figures, preliminary estimates show improvement in coverage over the 1970 census, particularly for the Black population. Even so, the preliminary estimates show that the coverage of Blacks and Hispanics is still poorer than the coverage of Whites, but the estimates are not sufficiently accurate to provide exact information on the size of the coverage differential or to show the exact change in the coverage differential since the 1970 census.

28. Demographic analysis involves the development of an estimate of the population from data sources essentially independent of the census. The estimated population is then compared to the census count to estimate coverage in the census. The sources used in demographic analysis include birth, death, and Medicare records, immigration statistics, and emigration statistics.

29. The particular procedure used to estimate the coverage for various demographic subgroups depends on the nature of the available data. For the population under 45 years of age in 1980, we base the estimates primarily on births corrected for underregistration, deaths, immigration, and emigration. We could not use birth data for persons older than 45 in 1980 because the year 1935 is considered the beginning of satisfactory birth registration in the United States. For the population over age 65, data on Medicare enrollments provide the basis for coverage estimates. The Medicare program, which provides medical care for nearly all elderly Americans, was established in the 1960's. For ages 45-64, coverage estimates are based on extensions of the estimated resident population aged 35-54 in 1970; the latter estimate were derived from analysis of previous censuses, use of recent death statistics, official life tables, and expected sex ratios, and application of stable population theory.

30. The data used in demographic analysis are corrected for various types of errors and, thus, are assumed to be more accurate than the census data being evaluated. The accuracy of the results obviously depends on the quality of the demographic data as corrected and the design of the estimating method.

31. Demographic analysis aims at providing national estimates of net census error for age, sex, and race groups. The technique does not allow the development of estimates for states or substate areas because there is no good information on state-to-state migration. Demographic analysis also does not allow estimates of the coverage of Hispanics, because many of the administrative records used do not record whether a person is Hispanic.

32. A significant limitation in the demographic analysis estimates is that there is no accepted, valid estimate of undocumented aliens in the country. Without such an estimate, it is not possible to develop an independent estimate of the *total* population living in the United States at census time. The estimated population figures developed so far represent estimates of the total number of persons legally in the United States.

33. Demographic analysis estimates of coverage for the 1970 or earlier censuses did not account for undocumented aliens either, but the problem is more severe now because of the influx of undocumented aliens into the United States in the 1970's. Thus, the estimates from demographic analysis for the 1980 census understate the number of persons missed in the census by however many undocumented aliens were in the population on April 1, 1980.

34. This is not to say that undocumented aliens were not counted in the census. The census attempted to count all residents of the United States, including legal aliens and undocumented aliens. In fact, Bureau research indicates that the 1980 census counted about 2 million undocumented aliens.

35. The preliminary estimates from demographic analysis show an *overcount* of 0.4 per cent for the total population in 1980. The Bureau does not believe that such an overcount occurred. This anomaly is due to the lack of an estimate of the number of undocumented aliens in the population.

36. For Blacks, demographic analysis shows an *undercount* of 4.5 per cent in 1980. Although the figures are preliminary, the Bureau believes they show an improvement over the 1970 census when there was an undercount of 7.6 per cent for Blacks. The estimate of the coverage of Blacks is probably affected only slightly by the absence of an estimate of the number of undocumented aliens, since the majority of undocumented aliens are White.

37. For Whites and Others, the preliminary estimates show an *overcount* of 1.1 per cent in 1980. As with the estimate for the total population, the Bureau does not believe there was an *overcount* of this magnitude for the Whites and Others category.

38. The problem of estimating the number of undocumented aliens in the population is still a matter of research at the Bureau. Bureau analysts are undertaking further work to develop more meaningful estimates from demographic analysis. It is virtually impossible to know the total number of undocumented aliens in the United States. In an effort to develop a different measure, the Bureau estimated the number of undocumented aliens counted in the census. By subtracting the estimated 2 million undocumented aliens included in the census count, the census count for legal residents can be compared with the independent estimates for legal residents. This exercise still shows a small *overcount* of 0.2 per cent for legally resident Whites and Others, an *undercount* of only 0.5 per cent for the total legally resident population, and an *undercount* of 5.3 per cent for legally resident Blacks. Once again, it must be emphasized that these estimates are uncertain. The Bureau believes that more

research is needed before any definitive statement can be made.

39. The second program for estimating coverage in the 1980 census is the Post-Enumeration Program or PEP. The Census Bureau designed the PEP to provide information about coverage not available from demographic analysis: information on the gross omissions and gross overenumerations in the census, estimates of the net undercount of Hispanics, estimates of the undercount at subnational levels, and coverage data for socio-economic subgroups of the population.

40. The PEP is an experimental program. Its primary goals are to attempt to evaluate census coverage for the purpose of planning future censuses and to provide general levels of coverage errors so that users can be made aware of the sources and magnitude of the errors. With respect to these goals, the PEP largely has been successful. The PEP does not provide coverage estimates precise enough for use in adjusting the counts.

41. The PEP obtained estimates of gross omissions by matching the persons in the April and August 1980 Current Population Survey (CPS) to the census to determine if the CPS individuals were in fact counted in the census. (The CPS is a monthly survey to collect current labor force information as well as other socioeconomic data.) Erroneous omissions in the census occur when an entire household is missed or when someone in an enumerated household is not entered on the census questionnaire either because of a misunderstanding about who should be enumerated or through unwillingness to be enumerated.

42. We obtained estimates of gross overcount by reinterviewing a sample of persons counted in the census to look for such errors as counting someone twice, in the wrong location, or ineligible to be counted under census rules, such as infants born after April 1, 1980 or persons who died before that date.

43. We derived net coverage rates by combining the estimates of gross undercount and gross overcount.

44. A major problem in the PEP was that the difficulty of matching cases from the CPS to the census led to a significant number of unresolved cases for which the enumeration status could not be determined. This problem was not unexpected and is inevitable, to some extent, in any matching study. Unresolved cases occur when incorrect or incomplete data are collected in either the census or the sample survey being matched. What makes the problem significant here is that the percent of unresolved cases is larger than the undercount that is being estimated.

45. We could make differing assumptions about which of the unresolved cases should be considered matches and which nonmatches. Because of these various assumptions, the Bureau originally produced 29 sets of PEP estimates. We discarded several of the estimates because we believed they were extreme, leaving 12 sets. The true estimates of coverage and our final "best estimates" may be outside these ranges.

46. The preliminary estimates of coverage in the 1980 census based on the

PEP range from an *overcount* of 1.0 per cent for the total population to an *undercount* of 2.0 per cent. For the Black population, from an *undercount* of 0.7 per cent to an *undercount* of 7.2 per cent. For the non-Black Hispanic population, from an *overcount* of 0.2 per cent to an *undercount* of 7.6 per cent. And for Others, from an *overcount* of 1.4 per cent to an *undercount* of 1.1 per cent. (See Annex 1 for a graph illustrating these figures).

47. Despite the limitations in the coverage estimates from both demographic analysis and the PEP, the Bureau believes the evaluations have been quite useful. For instance, the estimates show that the coverage of Blacks and Hispanics is poorer than the coverage of Whites, and the coverage of males is less complete than the coverage of females.

48. These coverage evaluation studies do not yet provide the Bureau with accurate enough information to adjust the 1980 census data for the undercount, as some people have suggested. In fact, several states and cities have taken the Census Bureau to court claiming that the counts would be more accurate if adjusted. As described above, the methods used to evaluate the census coverage are not sufficiently accurate to provide anything more than a general idea of the degree of coverage in the 1980 census. Even if an accurate measure of undercount at the national level were available, there is currently no acceptable method for distributing the national level undercount to subnational levels, and it is at these levels that adjustment becomes important for apportioning political representation or distributing funds. Because of the errors in the estimates, and the relatively low level of the undercount, an adjustment could add more error to the counts than it removes, especially at the subnational level.

49. One of the new coverage measurement techniques the Bureau is investigating is called forward tracing, which is a type of reverse record check. In our experimental forward trace study, we have created an independent sample of persons representing the entire U.S. population by drawing a sample of persons from the 1980 census records and supplementing this with missed persons as identified from the 1980 PEP, persons born since April 1, 1980, and immigrants since April 1, 1980. In a full-scale program, this sample of persons would be matched to the 1990 census to see if they were counted. Our experimental program will continue until late this year, when we will simulate the 1990 census by sending questionnaires to addresses where we believe the sample people are living.

50. This study differs from the record check conducted at the Census Bureau in connection with the 1960 census in that it employs forward tracing instead of retrospective tracing. Tracing sample persons (e.g., those from 1980 Census) to their addresses in the later census (1990) is a major problem in reverse record checks. If we did not start tracing sample persons until 1990, knowing only their 1980 address and not where they may have moved to in the interval (retrospective tracing), then we can anticipate greater tracing problems

than if we begin now to track and follow the sample persons. The forward tracing study is looking at various tracing strategies. At the end of the project, the Bureau should be able to assess its ability to implement and carry out a reverse record check and we can determine whether we want to utilize a reverse record check as part of the 1990 coverage evaluation program.

51. The Bureau will continue to examine the use of different undercount measurement and adjustment techniques to determine whether we can develop a valid procedure for adjustment of the census counts. The issue of adjustment will be a major concern in planning the 1990 census. The Bureau is creating a new organizational unit to coordinate, monitor, and analyse its undercount-related activities. It is also holding conferences with interested data users and will be working on this issue with the National Academy of Sciences' Committee on National Statistics, a panel of technical experts.

52. We have discussed only the technical aspects of the adjustment issue here. The question is really far broader, as it has legal, political, and public-perception facets, as well. The Bureau will also consider these in making a final decision on adjustment.

53. Regardless of whether we decide to adjust the 1990 census counts, we want to have both an accurate census and accurate measures of coverage in the census. Ideally, coverage in the 1990 census would be so good as to render academic the issue of whether to adjust the counts. While such an ideal census is unlikely to occur, we are working hard to improve coverage in the next census, and our efforts are discussed below under "1990 Census".

V. CONTROL AND MEASUREMENT OF CONTENT ERROR IN THE 1990 CENSUS

54. In addition to the coverage evaluation studies, the Census Bureau also conducts studies of the quality of the data it collects. Census data are collected on either a short form or a long form. In 1980, the short form contained 7 population and 12 housing questions that were asked for all people and all housing units. The long form, which contained the same 19 questions that were on the short form plus an additional 26 population and 20 housing questions, was asked only of a sample of the population. Generally, one household in six was in the sample, except in governmental jurisdictions with 2,500 people or fewer. Here, one household in two was in the sample.

55. Content evaluations focus on errors arising from misreporting of personal characteristics on the census questionnaire (as opposed to errors due to sampling, which will not be discussed in this paper). Response errors may be introduced by the person being counted or by the enumerator and may occur in either the data collection or processing phases of the census. The errors may be due to questionnaire design, the interviewing approach, the working or format of the question, or respondent behavior.

56. In a study conducted as part of the 1950 census, the Census Bureau learned that the misapplication of instructions by individual enumerators in their assigned areas could significantly affect census statistics, especially for small areas. As a result of this finding, the Bureau has conducted each of the three most recent censuses (and plans to conduct the 1990 census) on the basis of self-enumeration. We mail questionnaires to housing units in advance of Census Day to give householders an opportunity to think through their answers and consult other household members or household records, rather than having to answer an enumerator on the spot. Enumerators who must follow-up on nonresponding households are given detailed instructions designed to maximize self-enumeration by the respondent and to prevent the enumerator from filling by observation such sensitive questions as those on race or age.

57. Self-enumeration is just one of the many ways the Census Bureau attempts to control content error in the census. Coverage errors can introduce biases into the data, and this problem and the efforts the Bureau took to improve coverage in the 1980 census were discussed above. (Of course, content errors can also affect the coverage estimates for subgroups of the population.)

58. To reduce the possibility that the respondent might offer incorrect or incomplete information, the Bureau phrased questions as clearly as possible based on precensus tests and included a set of detailed instructions for completing each question with the questionnaire. The major content test prior to the 1980 census was a national split-panel test conducted in 1976, which compared alternate wordings to a number of questionnaire items, including disability, school enrollment and educational attainment, place of birth, language, race, and ethnic origin.

59. To assure public cooperation, we emphasized in our publicity campaign the importance of specific census questions and how the data would be used in program planning after the census. We were also concerned about respondent burden and were determined not to ask any more questions in 1980 than in 1970.

60. When respondents mailed back their questionnaires after Census Day, staff in our temporary district offices edited them for completeness and consistency. We followed up on questionnaires which failed this edit by telephone, if possible, or by personal visit. We also carefully monitored the work of enumerators. (Annex 2 shows failed-edit rates.)

61. If any characteristics for a person were still missing when the questionnaires reached our central processing offices, our computers supplied answers by a process called "allocation". Allocations were needed most often when an entry for a given item was lacking or when the information reported for a person on that item was inconsistent with other information for the person. The general procedure for filling blanks or changing unacceptable entries was to assign an entry for a person that was consistent with entries for other persons with similar characteristics. (Annex 3 shows allocation rates for selected population and housing items.)

62. Despite these efforts, the Bureau realized there would be content errors in the 1980 census. To measure the extent of these errors, we have initiated a number of reinterview and matching studies. Most of these studies are in their preliminary stages and final results have not been released yet.

63. The Content Reinterview Study involved reinterviews of a sample of about 14,000 households conducted 8-10 months after Census Day. Two types of reinterview methods were used. In the first, which was designed to measure response variance, we used the same interview procedures under the same general conditions as in the census itself. In the second, used to measure response bias, we attempted to obtain more accurate data than was possible in the census. We used experienced and better trained interviewers, chose the most knowledgeable respondents to provide the data, and used detailed questioning sequences to probe areas where the questions or instructions may have been ambiguous or inadequate. An "index of inconsistency" is used to measure gross error and a "net difference rate" to show net error. Error rates for both edited and unedited data are produced. This study will evaluate the reporting accuracy of selected 1980 census data items and will provide information that will aid in reducing the errors in future censuses.

64. The preliminary results of the Content Reinterview Survey shed some light on potential problems with a few of the questions we asked in 1980. A few examples are given below.

65. Question 11 asked "In what State or foreign country was this person born?" Respondents were instructed to provide the State where the mother was living at the time of birth. Previous studies had shown that respondents frequently answered incorrectly by giving the State where the hospital was located. The Bureau had altered the question wording and provided detailed instructions to reduce misreporting. The Content Reinterview Study shows that there may still be some misreporting where jurisdictions merge, for example for the District of Columbia and its suburbs in Maryland and Virginia.

66. Question H10 asked owners of one-family houses, "Is the house on a property of 10 or more acres?" Based on the Content Reinterview Survey, we estimate that the number of "Yes" answers to this question is overstated in the census by at least one-fourth.

67. Although the study found that for most of the questions examined there were low to moderate levels of inconsistency between the census and the reinterview, the Bureau is concerned about problems such as those described above and will examine them further prior to the 1990 census.

68. We will also match persons enumerated in the March and April 1980 Current Population Surveys (CPS) to the census to measure the consistency of their responses. High levels of consistency are not expected because of the differences in question wording and data collection procedures between the CPS and the census. The information gathered in this study, however, could be used to suggest changes in the 1990 census questionnaire.

69. The census questions on the cost of gas and electricity used in living quarters were the subject of another study. The Census Bureau asks questions on the cost of utilities and fuels in addition to mortgage and rent payments to get a picture of the complete housing costs for a household. Experience in the 1970 census and in the tests for the 1980 census showed that respondents tended to report considerably higher costs for gas and electricity than they actually paid. The census question asks for average monthly costs for the previous year. In this study, the Bureau tested the suggestion that errors in reporting of utility costs could be reduced if utility companies provided their customers with the average monthly cost of their gas and electricity for the 12 months prior to the census.

70. The utility cost study was conducted in eight U.S. cities. We compared the answers of households that were notified of their costs by their utility companies and those households that were not notified to data on actual costs supplied by the utility companies. The results of this study show there was significant improvement in the reporting of average monthly costs for both electricity and gas when the customers were previously given this information by their utility companies.

71. In addition to reinterview, matching, and record-check studies, we can also get indications of data quality by comparing census counts to aggregate counts from other data sources. For instance, a comparison of 1980 census ancestry data with data from a similar ancestry question asked in the CPS shows some inconsistency in ancestry reporting between the census and CPS. We are now undertaking research to provide more definitive information on the quality of the 1980 census ancestry data.

72. The 1980 census asked persons whether they had experienced any weeks of unemployment in 1979. Results of the question showed 21.7 million persons with one or more weeks of unemployment in 1979. This figure is 3.2 million higher than the comparable figure of 18.5 million persons based on the CPS. We have not yet conducted a formal analysis of the census data, but we think that they do overstate the number of unemployed persons in 1979. We suspect that many census respondents erroneously listed weeks in which they searched for new jobs while they kept working at their current jobs. Such persons should not be counted among those experiencing unemployment, but there was no way to screen them out of the census count. The CPS could do more screening because it used four questions to identify unemployment, whereas the 1980 census used one.

73. We have also noticed anomalies between some housing data from the 1980 census and similar data from the American Housing Survey (AHS). One discrepancy is that the AHS shows a larger percentage of owner-occupied units in 1980 than the census does, 65.6 per cent compared to 64.4 per cent. We have conducted a pretest to determine the feasibility of an AHS/Census match with field reconciliation of selected items. Data are presently being analyzed, and this analysis may lead to further matching studies for the 1990 census.

VI. PLANS FOR THE 1990 CENSUS

74. While the Census Bureau has been evaluating and will continue to evaluate the coverage and quality of the data in the 1980 census, we have also been busy looking for ways to make improvements for the 1990 census.

75. A perfect census — one that counts every person — is probably impossible, but the Census Bureau will work to continue to improve coverage of the population. We particularly want to find ways to close the gap between the undercount rates for different groups of the population. We will expand our outreach efforts to minorities by repeating those that were successful in 1980 and supplementing them with new efforts. We will determine which of our coverage improvement operations are cost-effective and should be repeated, and which are not, and we will look at potential new measures for augmenting census coverage.

76. With regard to the latter, we are planning to test alternatives to the basic mail-out/mail-back technique used in 1980. One of these alternatives is to have census enumerators update the mailing list and leave questionnaires at housing units at the same time, rather than have mail carriers deliver the questionnaires. The rationale for considering this approach is that it might solve some of the problems we experienced in the 1980 census with the delivery of questionnaires. Furthermore, early contact with the respondents by census personnel might increase the mail response rate and eliminate confusion over questionnaire items. On the other hand, this approach would significantly increase the costs and work force demands on the Bureau.

77. The second alternative, which could be implemented with either the mail-out/mail-back or list/leave census, would be to conduct the census in two stages. In the first stage, we would mail or deliver a short-form questionnaire containing a few basic questions to every housing unit. We would distribute the long-form questionnaire in the second stage. This approach might allow us to obtain a quicker count of the people and their essential characteristics, such as age, race, and sex. Unfortunately, public cooperation and coverage of individuals in the second stage may be decreased by the two-stage process and the cost of contacting many households twice could be prohibitive.

78. Both of these alternatives offer promise for improvement, but both also have the potential for being more expensive than the basic mail-out/mail-back method and have other potential problems as well. Our test censuses, the first of which will be conducted in April 1985, will give us the information we need to determine whether either of the alternatives should be implemented in the 1990 census.

79. We will also work to maintain the high quality of our data. When we have completed our content evaluations, we will have a better idea of which census questions, if any, are causing problems and will need to be reformatted or reworded. We will test alternate question wordings and questionnaire

formats before the 1990 census, as we did before the 1980 census.

80. While maintaining the quality of our data is a major goal for the 1990 census, so is making that data available to the public in a timely fashion. By law, the Census Bureau must provide state population totals and the number of seats each state is entitled to in the House of Representatives to the President within 9 months after April 1, 1990. We must provide population data to the states for use in drawing congressional and other legislative district boundaries within 1 year after that date. We met these legal deadlines for the 1980 census and a major goal for the 1990 census is to be sure we meet these deadlines again.

81. We also want to get our other data products — the computer tapes and printed reports containing detailed data for small areas — out to data users earlier than we did for the 1980 census. Budget problems at a key point in processing the 1980 census forced us to slow down our operations, thus delaying the release of some products.

82. Increasing the automation of census operations may be our best hope for controlling census quality and costs and speeding the release of data. The 1980 census relied heavily on a large work force of temporary workers to conduct manual operations. Some 270,000 temporary employees were working at the peak of operations. Because of low unemployment in most areas and the nature of census jobs, hiring such a large work force proved difficult, as it had in prior censuses. Our expectation is that through automation, many of the operations that were conducted manually in 1980 can be accomplished with fewer people, more quickly, and more accurately in 1990.

83. We are implementing an automated geographic information system that will combine census maps, addresses, and geographical names and codes into one data base. In 1980, each of these three components of our geographic system was prepared in separate clerical operations, leading to errors and inconsistencies. Automation should reduce the errors and inconsistencies that we experienced in 1980.

84. We are also investigating the possibility of automating many of the clerical functions performed in field offices in 1980. For example, we are planning to automate the check-in of returned questionnaires and to match them to an automated address control file. Thus, we could automate the control of the follow-up enumeration of those households that did not return questionnaires, the edit of questionnaires, the development of counts for use in local review, and the production of status information on each of the key activities. We are also investigating the possibility of automating the coding of responses to the questions on industry and occupation, which heretofore have been coded in costly and time-consuming manual operations.

85. As we look to increasing automation in the census, we must take care to ensure that the confidentiality of the data we collect is maintained both in fact and in appearance. Only by maintaining the confidentiality of the census process can we ensure a high level of public trust and cooperation. The Census

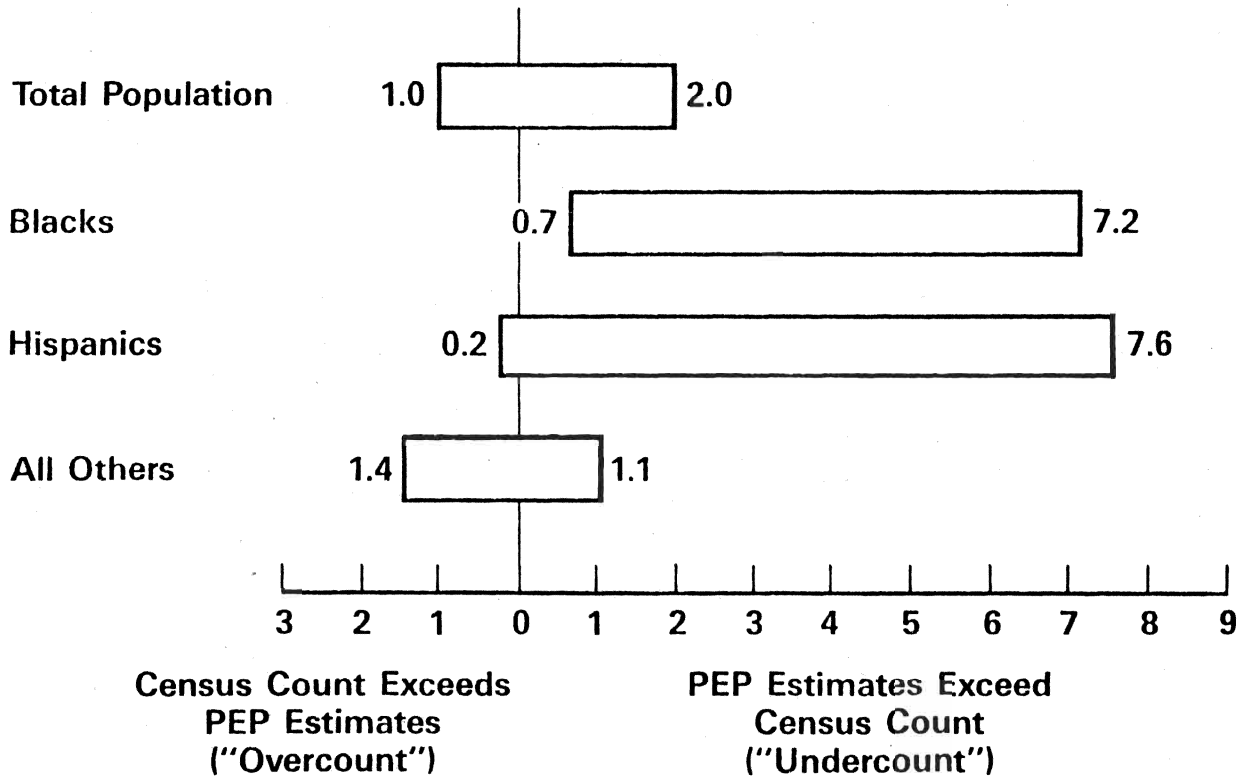
Bureau is proud of its record of protecting confidentiality and is constantly looking for ways to maintain and improve that protection. But the onset of 1984, with its Orwellian overtones, and the menacing implications of technology, require that we increase our efforts to convince individuals that they cannot be harmed by answering the census; that the information they provide is strictly confidential by law.

86. In planning the 1990 census, in addition to examining and evaluating our experiences in the 1980 census, we will seek new ideas and advice through two major channels: consultation with data users and tests of census procedures.

87. We will consult with data users in Federal agencies, state and local governments, private organizations, and the general public. In April 1984 we held the first of more than 50 local public meetings that will be convened over an eighteen month period. We have held special conferences on such issues as the meaning of enumeration, data for redistricting, minority participation in planning the census, and automation, and we will hold other conferences on various topics. The Congress, which is a prime user of our data, will review our plans periodically through its oversight and appropriations committees.

88. The second major channel for approaching 1990 census planning will be our series of formal pretests and dress rehearsals in which we will test alternative census-taking procedures. For 1984 we will conduct a test of several methods for compiling our address lists, and in 1985, as mentioned above, we will conduct the first major pretest for the 1990 census. (Scheduled tests are listed in Annex 4).

1980 Census: Selected Preliminary Coverage Estimates Post-Enumeration Program (PEP)



Annex 1

Annex 2.

Type of Questionnaire	Total Questionnaires Edited (1)	Total Questionnaires Failed Edit	% of Edited Questionnaires that Failed
Long-Form	12,138,122	4,395,468	36.2
Short-Form	53,314,137	7,106,338	13.3

(1) The total edited in centralized district offices includes all mail returns and any non-response cases received from enumerators by the close of Follow-up 1. In decentralized district offices, the total edited includes only mail returns. A sample of the enumerator filled non-response cases underwent a minimum information check while still in the field. No data as to the impact of this review is available.

Annex 3

Table C-1. Percent of Allocation: 1980

[Data are estimates based on a sample; see introduction. For meaning of symbols, see introduction. For definitions of terms, see appendices A and B.]

United States Urban and Rural and Size of Place Inside and Outside SMSA's	United States Total	Urban				Rural						
		Total	Inside urbanized areas		Outside urbanized areas		Total	Places of 10,000 or more		Outside SMSA's		
			Total	Central cities	Urban fringe	Places of 10,000 or more		Places of 2,500 to 10,000				
Total persons (number)	226 545 805	167 054 638	139 182 696	67 035 743	72 146 956	13 480 685	14 391 257	39 491 167	7 036 378	5 617 903	159 430 577	57 115 228
Persons with two or more sample characteristics reported (number)	224 693 705	165 662 837	138 010 738	66 293 634	71 717 104	13 372 516	14 279 583	39 030 868	6 992 371	5 601 241	168 054 276	56 439 429
Percent of total	99.2	99.2	99.2	98.9	99.4	99.2	99.2	99.2	99.2	99.7	99.2	99.2
Persons with one or more allocations (number)	101 691 680	75 701 442	63 307 213	32 370 310	30 936 903	5 982 279	6 411 950	25 990 238	3 071 475	2 555 025	76 254 154	25 437 136
Percent of total	44.9	45.3	45.5	48.3	42.9	44.4	44.6	45.5	43.7	45.5	45.0	44.5
Total persons (number)	226 545 805	167 054 638	139 182 696	67 035 743	72 146 956	13 480 685	14 391 257	39 491 167	7 036 378	5 617 903	159 430 577	57 115 228
Relationship	1.1	1.1	1.1	1.1	1.0	0.9	1.0	1.0	0.9	0.8	1.1	1.0
Sex	0.7	0.8	0.8	0.8	0.9	0.7	0.7	0.8	0.6	0.6	0.8	0.7
Age	1.6	1.7	1.7	1.9	1.5	1.6	1.5	1.6	1.5	1.2	1.7	1.6
Age	1.5	1.5	1.5	1.6	1.4	1.5	1.6	1.6	1.6	1.6	1.5	1.6
Age	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Origin	2.3	2.3	2.2	2.6	1.9	2.3	2.3	2.3	2.4	2.1	2.2	2.4
Race of birth	4.9	5.1	5.2	6.2	4.3	4.4	4.4	4.3	4.3	3.1	5.0	4.4
Persons in rural areas (number)	59 491 167	-	-	-	-	-	-	39 491 167	7 036 378	5 617 903	23 979 262	25 311 905
Form residence	7.4	-	-	-	-	-	-	-	7.4	2.5	8.5	7.3
Persons in households (number)	220 807 382	162 343 457	135 698 586	64 995 072	70 703 511	12 701 422	13 842 251	38 844 925	6 873 407	5 617 903	145 291 191	55 516 191
Relationship	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.0	1.0	0.8	1.1	1.0
Persons in group quarters (number)	5 738 423	4 612 181	3 484 112	2 040 669	1 463 643	779 068	549 006	926 342	160 971	-	4 139 386	1 999 037
Type of group quarters	13.1	12.5	12.9	12.7	13.1	9.4	14.3	16.5	18.7	-	13.1	13.0
Foreign born persons (number)	14 079 906	12 916 965	12 018 131	6 434 775	5 393 356	470 905	423 299	1 164 941	162 239	73 151	12 920 185	1 159 731
Citizenship	5.9	5.8	5.8	6.5	4.9	6.2	6.1	6.8	8.4	6.0	5.8	6.7
Year of immigration	7.9	7.7	7.6	8.5	6.8	9.1	9.3	10.1	9.6	8.9	7.7	10.1
Persons 5 years and over (number)	210 247 435	155 311 191	129 538 675	62 261 617	67 269 658	12 482 704	13 297 810	34 936 266	6 805 211	5 275 720	157 499 006	52 748 447
Language spoken at home	6.5	6.0	7.9	8.2	7.5	8.6	8.5	8.7	8.4	7.8	8.0	8.7
Persons who speak a language other than English at home (number)	23 060 040	20 131 994	17 977 078	10 358 201	7 618 977	1 092 176	1 040 340	2 928 466	423 965	293 391	19 213 284	3 246 756
Language	11.1	10.2	10.0	9.5	10.6	12.1	13.0	17.3	14.1	14.6	10.5	15.3
Ability to speak English	8.6	8.1	8.0	8.0	7.9	9.3	9.6	11.1	10.5	11.1	8.2	11.1
Residence in 1975	8.0	8.3	8.4	9.6	7.3	7.8	7.4	7.1	6.9	4.3	8.2	7.3
Persons 21 years and over (number)	149 747 345	111 648 126	93 407 331	45 237 931	46 149 420	8 787 283	9 452 191	28 099 141	4 640 795	2 739 661	112 687 889	37 159 376
Armed Forces status in 1975	5.1	5.3	5.4	6.1	4.7	4.9	4.8	4.6	4.4	3.5	5.3	4.7
College attendance in 1975	6.0	6.2	6.3	7.0	5.4	5.6	5.6	5.4	5.1	4.3	6.2	5.4
Work status in 1975	5.3	5.6	5.7	6.4	5.0	5.2	5.1	4.6	4.4	3.5	5.5	4.8
Women 15 years and over (number)	91 482 478	68 926 311	57 421 623	28 148 149	29 273 474	5 589 193	5 911 495	22 556 347	3 870 997	2 115 740	68 925 473	23 547 205
Children ever born	6.0	6.1	6.2	7.2	5.2	5.8	5.8	5.7	5.8	5.8	6.0	6.0
Women 15 to 44 years (number)	52 878 032	39 802 142	33 493 145	16 206 695	17 286 450	3 173 040	3 134 957	13 073 890	1 474 770	1 029 966	40 647 693	12 430 320
Children ever born	6.1	6.1	6.2	7.2	5.2	5.6	5.7	6.0	5.8	5.8	6.0	6.2
Ever-married persons 15 to 54 years (number)	84 907 133	61 416 681	51 371 179	23 150 093	23 221 027	4 843 127	5 202 115	23 490 452	2 837 740	1 999 980	63 648 431	21 258 502
Times married	5.5	5.7	5.9	7.3	4.7	5.1	4.9	4.8	4.5	2.4	5.6	5.0
Date of first marriage	9.7	10.0	10.2	12.2	8.5	9.3	9.1	9.0	8.5	6.8	9.9	9.4
Persons 15 to 54 years whose first marriage ended in widowhood or divorce (number)	21 477 649	16 329 022	13 727 956	6 806 140	6 921 816	1 301 763	1 309 313	5 138 617	610 246	270 238	16 526 078	4 953 570
Whether widowed or divorced after first marriage	7.0	6.8	6.7	7.1	6.3	7.1	7.2	7.8	7.7	7.6	6.9	7.9
Persons 3 years old and over (number)	216 560 922	159 835 041	133 256 285	64 879 301	69 176 986	12 862 007	13 716 749	36 725 911	6 709 666	5 411 594	142 122 061	64 438 911
School enrollment	4.5	4.6	4.7	5.5	3.9	4.2	4.2	4.1	4.0	3.2	4.5	4.3
Persons 3 years old and over enrolled in school (number)	62 054 304	44 296 276	38 719 094	18 394 463	20 324 251	3 839 725	3 717 485	15 757 990	1 725 206	1 406 481	47 151 225	14 902 799
Year of school	5.3	5.4	5.5	6.3	4.7	4.8	5.0	5.1	5.0	4.2	5.3	5.3
Persons 3 to 24 years old (number)	120 906 439	89 508 837	74 741 725	36 285 682	38 486 042	7 330 420	7 408 712	31 397 782	3 507 494	2 550 345	91 115 135	29 791 504
School enrollment	1.1	5.2	5.3	6.2	4.5	4.6	4.7	4.7	4.5	3.9	5.1	4.9
Persons 25 years old and over (number)	131 633 487	98 343 360	82 311 223	39 654 780	42 866 662	7 395 421	8 432 696	36 492 647	4 217 112	3 469 743	99 684 051	33 151 636
Highest year of school attended	2.9	3.0	3.1	3.0	2.6	2.9	2.9	2.6	2.7	1.4	3.0	2.8
Finished highest year	9.3	9.7	9.9	10.0	9.0	9.1	9.0	8.0	8.6	6.6	9.6	8.4
Persons 15 years and over (number)	171 307 029	130 603 242	108 971 600	52 784 621	56 185 971	10 536 451	11 095 991	44 704 387	5 404 900	4 403 329	131 709 003	43 598 620
Marital status	1.0	1.0	1.1	1.1	1.1	0.8	0.8	0.8	0.8	0.6	1.0	0.8
Income in 1979	11.5	11.6	11.7	11.0	10.5	11.0	11.1	11.3	10.8	12.2	11.6	11.3
Persons with income in 1979 allocated (number)	20 063 406	15 074 657	12 694 063	6 819 270	5 874 793	1 156 984	1 223 410	5 008 549	582 364	521 782	15 213 026	4 870 580
Percent of income allocated	18.9	18.3	18.3	18.1	18.4	18.3	19.2	20.5	18.6	20.9	18.6	18.6
0.1 to 9.9 percent	2.0	2.0	2.0	1.7	2.2	2.0	2.0	1.9	1.9	2.4	2.0	1.9
10.0 to 24.9 percent	1.5	1.4	1.4	1.4	1.4	1.6	1.7	1.5	1.8	2.1	1.4	1.4
25.0 to 49.9 percent	5.5	5.3	5.3	5.2	5.2	5.6	5.8	5.4	5.9	3.3	5.3	5.3
50.0 to 99.9 percent	5.6	5.5	5.4	5.4	5.5	5.9	5.9	5.7	6.0	8.5	5.4	5.9
100 percent	69.8	70.4	70.7	71.1	70.1	69.7	68.4	60.1	68.8	42.7	70.3	68.4
Persons 16 years and over (number)	171 214 238	127 719 450	106 540 061	51 699 068	54 843 993	10 316 274	10 841 115	43 494 081	5 274 910	4 280 684	128 487 395	43 528 683
Labour force status in 1979	3.9	4.0	4.1	5.0	3.3	3.5	3.6	3.7	3.3	2.9	4.0	3.7
Unemployment in 1979	4.7	4.9	5.0	5.9	4.1	4.3	4.3	4.0	3.9	3.1	4.8	4.3
Veterans status	15.9	16.1	16.3	17.9	14.7	15.0	15.5	14.0	14.9	16.6	16.1	15.4
Male	4.6	4.8	4.8	5.8	4.0	4.4	4.4	4.2	4.0	3.1	4.7	4.4
Female	4.4	4.5	4.6	5.6	3.7	4.1	4.1	4.0	3.7	2.7	4.5	4.1
Persons 16 years and over, at work (number)	141 999 181	103 940 393	83 841 249	40 149 311	42 541 738	5 466 592	5 583 674	23 266 161	2 770 345	2 432 470	73 068 595	21 930 592
Hours worked	4.4	4.7	4.7	7.8	5.8	4.2	4.3	4.0	4.0	4.9	6.7	6.6
Means of transportation to work (number)	94 617 294	73 190 809	61 836 962	28 124 312	33 206 449	5 631 451	5 729 212	23 426 481	2 735 866	2 434 102	74 389 731	22 227 565
Carpooling arrangements	5.4	5.5	5.6	6.6	4.7	4.8	4.8	4.3	4.7	6.6	5.5	5.1
Carpooling arrangements	5.1	5.1	5.2	6.1	4.5	4.8	4.8	4.1	4.7	8.1	5.1	5.2
Private vehicle occupancy	7.1	7.4	7.5	8.8	6.4	6.9	6.6	6.5	6.1	9.9	7.2	6.8
Travel time to work	9.4	9.3	9.4	10.5	8.2	8.6	8.6	8.4	8.4	18.5	9.3	9.6

Annex 3 (cont.)

Table A-1. Computer Allocation Rates for Nonresponse or Inconsistency: 1980

[For meaning of symbols, see Introduction. For definitions of terms, see Appendixes A and B.]

United States
Urban and Rural and Size
of Place
Inside and Outside SMSA's

United States	Urban						Rural			Inside SMSA's	Outside SMSA's	
	Total	Inside urbanized areas			Outside urbanized areas		Total	Places of 1,000 to 2,500				
		Total	Central cities	Urban fringe	Places of 10,000 or more	Places of 2,500 to 10,000		Other rural				
Year-round housing units (number).....	66 692 823	64 636 819	53 797 169	27 137 139	26 660 010	5 207 542	5 632 108	22 054 604	2 803 454	19 252 548	64 401 743	22 091 080
Planning facilities.....	1.0	1.0	1.0	1.0	1.0	0.8	0.8	0.9	1.0	0.9	1.0	1.0
Complete planning for exclusive use.....	1.0	1.0	1.0	1.0	1.0	0.8	0.8	0.9	1.0	0.9	1.0	1.0
Lending complete planning for multiple use.....	--	--	--	--	--	--	--	--	0.1	--	--	0.1
Complete planning but used by another household.....	--	--	--	--	--	--	--	--	--	--	--	--
Some but not all planning facilities.....	--	--	--	--	--	--	--	--	--	--	--	--
No planning facilities.....	--	--	--	--	--	--	--	--	--	--	--	--
Units of address.....	2.3	2.1	2.7	2.3	1.9	2.1	2.3	2.7	2.3	2.8	2.1	2.6
1.....	1.6	1.4	1.3	1.4	1.3	1.5	1.7	2.1	1.7	2.1	1.4	2.0
2 to 9.....	0.3	0.3	0.3	0.4	0.2	0.3	0.2	0.1	0.2	0.1	0.3	0.2
10 or more.....	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	--	0.3	0.1
Mobile home or trailer.....	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.5	0.3	0.5	0.2	0.4
Condominium status.....	3.5	3.5	3.5	3.8	3.1	3.8	3.7	3.5	3.5	3.6	3.5	3.7
Noncondominium.....	3.5	3.5	3.4	3.8	3.1	3.8	3.7	3.5	3.4	3.6	3.4	3.6
Condominium.....	--	--	--	--	0.1	--	--	--	--	--	--	--
Rooms.....	1.7	1.7	1.7	2.1	1.8	1.5	1.5	1.8	1.9	1.8	1.7	1.7
1 room.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2 rooms.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
3 rooms.....	0.2	0.3	0.3	0.4	0.2	0.2	0.2	0.1	0.2	0.1	0.3	0.2
4 rooms.....	0.4	0.4	0.4	0.5	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4
5 rooms.....	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4
6 rooms.....	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
7 rooms.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2
8 or more rooms.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2
Occupied housing units (number).....	80 399 673	60 551 717	50 541 185	25 273 501	25 265 864	4 838 838	5 171 694	19 837 956	2 550 142	17 287 816	60 497 718	19 891 955
Owner-occupied housing units.....	2.0	2.1	2.1	2.3	1.8	1.9	2.1	2.0	2.0	2.0	1.9	2.0
Rented for cash rent.....	1.0	0.9	0.9	0.9	0.9	0.9	1.1	1.4	1.3	1.4	0.9	1.3
Rented for cash rent.....	1.0	1.1	1.2	1.5	0.9	0.9	1.0	0.5	0.7	0.5	1.1	0.7
No cash rent.....	--	--	--	--	--	--	--	0.1	--	0.1	--	--
Vacant housing units (number).....	6 302 150	4 085 102	3 255 964	1 861 658	1 394 236	348 704	460 414	2 219 048	253 314	1 964 736	4 104 025	2 199 125
Vacancy status.....	5.7	5.9	6.8	5.9	6.3	4.7	5.5	5.4	5.4	5.3	5.9	5.2
For sale only.....	1.7	1.5	1.5	1.3	1.7	1.3	1.8	2.0	2.2	1.9	1.5	1.9
For rent.....	1.7	2.0	2.1	2.3	1.8	1.7	1.4	1.1	1.3	1.0	1.9	1.2
Owned or sold, awaiting occupancy.....	0.4	0.2	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Held for occasional use.....	0.4	0.3	0.4	0.4	0.3	0.2	0.3	0.4	0.4	0.3	0.4	0.4
Other vacant.....	1.6	1.7	1.8	1.5	2.2	1.2	1.5	1.5	1.5	1.5	1.8	1.4
Duration of vacancy.....	16.3	16.2	16.1	16.1	16.1	16.6	17.0	16.3	16.3	16.3	16.6	15.6
less than 2 months.....	5.9	6.8	6.9	6.6	7.2	6.9	5.8	4.3	5.0	4.2	6.7	4.3
2 up to 6 months.....	4.9	4.9	4.9	4.7	5.2	4.9	5.2	4.8	5.2	4.7	5.1	4.5
6 or more months.....	5.5	4.5	4.3	4.8	3.6	4.8	6.0	7.3	6.1	7.4	4.8	6.8
Specified owner-occupied housing units (number).....	29 470 456	29 698 778	24 223 790	10 028 731	14 194 929	2 550 282	2 925 056	9 771 878	1 331 826	8 240 042	29 720 166	9 750 390
Value.....	4.5	4.6	4.6	4.6	4.6	4.7	4.6	4.7	4.6	4.6	4.5	4.5
Less than \$10,000.....	0.3	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
\$10,000 to \$14,999.....	0.3	0.2	0.2	0.3	0.1	0.3	0.3	0.5	0.4	0.6	0.2	0.5
\$15,000 to \$19,999.....	0.3	0.2	0.2	0.3	0.1	0.3	0.4	0.6	0.5	0.6	0.2	0.6
\$20,000 to \$24,999.....	0.4	0.3	0.2	0.4	0.2	0.4	0.4	0.7	0.6	0.7	0.3	0.6
\$25,000 to \$29,999.....	0.4	0.3	0.2	0.3	0.2	0.3	0.4	0.6	0.5	0.6	0.3	0.6
\$30,000 to \$34,999.....	0.4	0.3	0.3	0.3	0.2	0.3	0.4	0.6	0.5	0.7	0.3	0.6
\$35,000 to \$39,999.....	0.3	0.3	0.2	0.3	0.2	0.3	0.4	0.5	0.4	0.6	0.3	0.5
\$40,000 to \$49,999.....	0.5	0.5	0.5	0.5	0.5	0.5	0.6	1.0	0.7	1.0	0.5	0.8
\$50,000 to \$59,999.....	0.5	0.4	0.4	0.4	0.4	0.3	0.4	0.7	0.4	0.7	0.4	0.5
\$60,000 to \$79,999.....	0.6	0.5	0.5	0.4	0.6	0.4	0.4	0.8	0.5	0.9	0.6	0.6
\$80,000 to \$99,999.....	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.3	0.1	0.3	0.3	0.2
\$100,000 to \$149,999.....	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1
\$150,000 to \$199,999.....	0.1	0.1	0.1	0.1	0.1	--	--	0.1	--	0.1	0.1	--
\$200,000 or more.....	--	--	0.1	0.1	0.1	--	--	--	--	--	0.1	--
Owner-occupied condominium housing units (number).....	1 224 558	1 177 226	1 125 078	385 481	749 397	17 477	24 771	47 232	5 438	41 804	1 178 554	51 022
Value.....	3.6	3.6	3.6	4.4	3.1	3.0	3.9	4.7	5.1	4.6	3.6	4.2
Specified vacant for sale only housing units (number).....	681 893	474 871	347 182	153 451	213 736	49 534	58 450	206 022	31 153	174 869	487 487	193 406
Price asked.....	16.5	15.8	15.7	18.4	13.7	15.5	16.7	18.1	17.1	18.3	15.8	18.1
Specified owner-occupied housing units (number).....	25 001 137	23 283 917	20 065 926	12 223 966	7 741 960	1 723 415	1 494 578	5 314 220	580 130	1 934 090	21 696 826	4 103 311
Contract rent.....	2.9	2.7	2.8	3.1	2.3	2.5	2.6	4.0	3.2	4.3	2.8	3.1
Less than \$50.....	0.1	0.1	0.1	0.1	--	0.1	0.2	0.4	0.3	0.5	0.1	0.3
\$50 to \$99.....	0.1	0.1	0.1	0.1	--	0.1	0.1	0.2	0.2	0.2	0.1	0.3
\$100 to \$199.....	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.3	0.3	0.4	0.1	0.2
\$200 to \$299.....	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2
\$300 to \$399.....	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.4	0.3	0.5	0.2	0.3
\$400 to \$499.....	0.3	0.3	0.3	0.4	0.2	0.3	0.3	0.5	0.4	0.5	0.3	0.4
\$500 to \$599.....	0.3	0.3	0.3	0.4	0.2	0.3	0.3	0.4	0.3	0.4	0.3	0.4
\$600 to \$699.....	0.5	0.5	0.5	0.5	0.5	0.3	0.4	0.5	0.4	0.5	0.5	0.4
\$700 to \$799.....	0.3	0.3	0.3	0.4	0.2	0.3	0.3	0.5	0.4	0.5	0.3	0.4
\$800 to \$899.....	0.3	0.3	0.3	0.4	0.2	0.3	0.3	0.4	0.3	0.4	0.3	0.4
\$900 to \$999.....	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.1
\$1,000 to \$1,499.....	0.1	0.1	0.1	0.1	0.1	--	--	0.1	--	0.1	0.1	--
\$1,500 to \$1,999.....	0.1	0.1	0.1	0.1	0.1	--	--	0.1	--	0.1	0.1	--
\$2,000 or more.....	0.1	0.1	0.1	0.1	0.1	--	--	--	--	--	0.1	--
Specified vacant for rent housing units (number).....	2 131 123	1 774 537	1 445 686	928 021	537 585	157 467	153 484	354 566	71 378	283 196	1 650 833	480 290
Rent asked.....	36.4	32.8	31.7	32.7	28.2	33.6	42.9	53.9	47.0	55.7	33.2	47.3

Annex 3 (cont.)

Table C-1. Percent of Allocation: 1980—Con.

[Data are estimates based on a sample; see Introduction. For meaning of symbols, see Introduction. For definitions of terms, see appendices A and B.]

United States Urban and Rural and Size of Place inside and Outside SMSA's	United States	Urban					Rural			Outside SMSA's		
		Total	Inside urbanized areas		Outside urbanized areas		Total	Rural farm	Inside SMSA's			
			Total	Central cities	Urban fringe	Places of 10,000 or more					Places of 2,500 to 10,000	
Employed persons 16 years and over (thousand)	97 639 253	73 734 048	43 406 377	29 611 781	33 394 796	5 612 133	5 725 338	33 865 287	2 785 377	3 478 173	79 125 232	22 514 103
Industry	6.7	6.9	7.0	8.4	5.9	5.9	5.9	6.0	5.5	5.4	6.8	6.1
Occupation	6.7	6.9	7.0	8.3	5.9	6.0	6.1	6.3	5.8	5.5	6.8	6.3
Class of worker	6.6	6.7	6.9	8.2	5.7	5.9	6.0	6.1	5.6	5.3	6.7	6.3
Manufactured persons 16 to 64 years (thousand)	144 666 422	108 025 970	90 864 736	43 396 518	47 468 118	8 489 817	8 651 837	34 661 862	4 166 734	7 568 650	109 883 568	34 783 064
Work disability status	4.4	4.6	4.7	3.5	3.9	4.0	4.0	4.1	3.8	2.9	4.6	4.1
Work prevention	1.7	1.7	1.5	2.1	1.4	1.6	1.7	1.8	1.6	1.4	1.7	1.8
Public transportation disability status	8.8	8.8	8.9	9.8	6.1	8.3	8.6	8.8	8.6	8.0	8.9	8.7
Noninstitutionalized persons 65 years and over (thousand)	24 158 166	17 906 962	14 276 445	7 584 064	6 792 381	1 995 563	1 934 934	6 251 202	1 005 490	712 034	17 190 818	7 007 326
Public transportation disability status	17.8	17.8	17.7	17.4	18.0	17.9	18.2	17.9	17.3	17.3	18.0	17.2
Persons 16 years and over, worked in 1979 (thousand)	114 477 261	84 241 508	72 308 357	33 991 412	38 317 148	6 988 817	6 952 134	28 226 735	3 213 328	7 892 208	87 345 829	27 221 412
Weeks worked	9.4	9.4	9.6	10.9	8.4	8.7	8.9	9.4	8.9	12.0	9.4	9.4
Usual hours worked per week	9.7	9.6	9.7	11.0	8.5	9.0	9.2	9.8	9.0	13.2	9.6	9.8
Households (thousand)	80 467 827	60 612 281	38 394 887	25 211 428	25 222 461	4 843 998	5 174 484	19 855 168	2 549 860	1 847 406	60 554 725	19 912 702
Income in 1979	16.8	16.7	16.9	18.1	13.7	13.9	13.8	13.9	13.5	21.8	16.9	16.3
Wages or salary income	11.8	11.8	12.0	13.1	11.0	10.7	10.4	11.9	10.2	16.3	12.0	11.3
Nonfarm self-employment income	9.4	9.5	9.7	10.5	8.8	8.8	8.4	9.3	8.2	10.6	9.6	8.9
Farm self-employment income	12.4	12.3	12.6	13.6	11.6	11.2	11.0	12.4	10.9	15.4	12.5	11.8
Interest dividend or net rental income	11.6	11.7	11.9	12.8	11.0	10.7	10.7	11.4	10.3	12.3	11.9	11.0
Social Security income	12.2	12.3	12.5	13.5	11.5	11.2	11.2	11.9	10.7	12.5	12.5	11.5
Public assistance income	12.7	12.8	13.0	14.0	12.0	11.8	11.8	12.4	11.4	13.1	12.9	12.1
All other income	12.5	12.6	12.7	13.8	11.7	11.5	11.6	12.2	11.2	12.9	12.9	11.8
Households with income in 1979 (thousand)	13 428 612	10 673 287	8 319 228	4 568 654	3 958 549	730 625	803 699	3 285 105	393 174	382 412	10 790 404	3 241 288
Percent of income allocated												
None	14.3	13.9	13.8	13.2	14.6	14.1	15.0	15.5	14.8	16.6	14.1	15.0
0.1 to 9.9 percent	8.9	8.8	8.8	7.6	10.1	8.7	8.7	9.3	9.0	12.1	8.9	8.7
10.0 to 24.9 percent	8.6	8.6	8.5	8.2	8.9	8.7	8.8	8.9	9.1	11.0	8.0	8.8
25.0 to 49.9 percent	11.0	11.1	11.1	11.3	10.8	11.2	11.3	10.7	11.3	12.5	11.0	11.2
50.0 to 99.9 percent	16.4	16.4	16.4	16.9	15.8	17.0	16.3	16.2	16.4	18.8	16.3	16.5
100 percent	40.7	41.2	41.4	42.9	39.7	40.2	39.8	39.4	39.5	29.0	41.1	39.7
Female (thousand)	39 798 133	43 005 667	35 788 119	16 608 545	19 176 574	3 419 769	3 806 779	16 184 466	1 899 912	1 618 992	43 918 934	15 271 999
Income in 1979 (thousand)	17.3	17.3	17.5	19.2	16.0	16.1	16.2	17.4	16.0	22.6	17.4	17.3
Male (thousand)	30 041 649	25 228 564	21 876 549	12 410 772	8 665 397	2 225 889	1 908 336	4 721 285	803 873	367 893	23 656 797	4 283 872
Income in 1979 (thousand)	13.9	13.8	14.1	14.5	13.4	12.1	12.9	14.5	13.3	15.3	14.1	13.1

Page 3

Annex 4. Schedule of Tests for the 1990 Census

1984	Address List Compilation Test
1985	Pretest of Two-Stage Census and of Automation
1986	Pretest
1986	National Content Test
1987	Pretest
1985/1988	Other Special Purpose Tests
1988	Dress Rehearsal

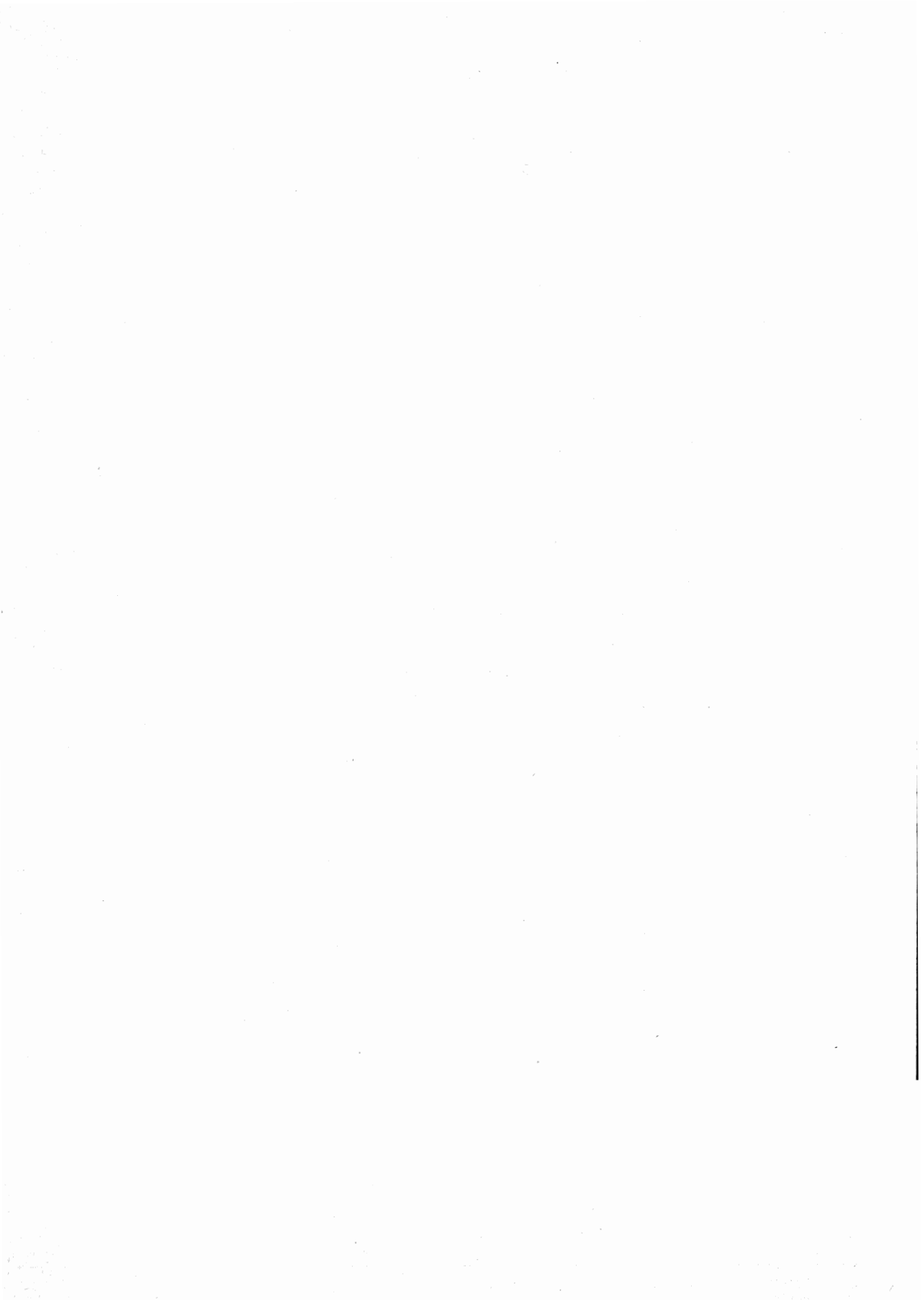
STUDY TOPIC (iv)

Statistics for Small Areas

Discussion leader: Mr J. Brackstone (Canada).

Papers prepared by:

- Denmark
- Italy
- United Kingdom



TEXT OF OPENING ADDRESS AND SUMMARY OF DISCUSSION (a)

Opening remarks

When a statistical office is asked by its Government's Treasury, Finance or Budget Department why an expensive national census is really necessary, a principal reason among the many we can cite is that a census is the only comprehensive source of population and housing statistics for small areas. While sample surveys may be able to delve into greater subject-matter detail, and may be cheaper and faster, they are limited in the geographic detail they can provide. In some countries, population registers or administrative records offer another potential source of statistical data for small areas. However, these are often limited in the range of variables they contain, they may possess quality or coverage weaknesses and, in many cases, periodic calibration to a national census is necessary to make them a useful source of statistical data. So, in most countries, we come back to the census as the primary source of small area data on the population.

It is therefore very appropriate that a seminar on the evaluation of census results and methodology should consider specifically the success of censuses in meeting their objective of producing small-area statistics. It is perhaps surprising that there are so few papers on this topic at this seminar. I feel certain this does not reflect a lack of importance attached to small-area statistics; maybe it indicates that the provision of small-area statistics is not perceived as a problem area.

Given that the production of statistics for small areas is a principal objective of the census, several questions and issues concerning the production and provision of small-area statistics arise. Several of these issues are addressed in the papers submitted to this seminar. Let me enumerate some of these issues for discussion.

(a) Prepared by Mr J. Brackstone.

1. CHOICE OF SMALL AREAS

Can we achieve complete flexibility in allowing users to obtain data for areas they define, or must we restrict retrieval to pre-defined areas? In either case, we will want a set of standard small areas for primary dissemination purposes. How small should these areas be? What boundaries should they respect? Should they remain constant from one census to the next? Maximum flexibility is achieved by coding individual dwellings to a very small geographic area (e.g., city block or block face or, in the limit, by assigning latitude and longitude co-ordinates). These very small areas then become building blocks for creating small areas for which statistics are provided. Although the cost of initially applying a detailed level of geographic coding is high, it is an investment whose benefits can extend over several censuses as well as over non-census applications.

2. CONFIDENTIALITY ISSUES

The smaller the area for which data are released, the greater the chance that individuals will be recognizable in statistical tables. Flexibility in allowing users to define their own areas heightens this problem. The issue is how to extract the maximum usefulness from the census data base while protecting the confidentiality of respondents. Various methods of random disturbance or suppression are being used in different countries to address this problem.

3. RELIABILITY ISSUES

The smaller the area for which data are released, the less reliable the data will tend to be. This is well-known in terms of sampling error, but is equally true in terms of the impact of non-sampling errors on small area data. For example, response errors whose effects may be dissipated at national or state levels, may introduce serious error at the small area level.

A second concern related to reliability of small-area statistics is the visibility of errors. At the national level, statistics are generally checked for reasonableness and consistency with other sources prior to publication, and usually, given that they satisfy these criteria, no individual is in a position to contradict the statistics. However, at the local level, the situation is different. Firstly, there are far more numbers to be published so that it is impossible to check all the figures individually. Secondly, it is far more likely that individuals at the local level will have information that might contradict census results and raise questions about the accuracy of census.

The issue is, therefore, what constraints are placed on considerations of

reliability by the dissemination of small area statistics from census. This issue does not appear to have been raised in the papers submitted to the seminar.

4. METHODS OF DISSEMINATION

The large volume of numbers generated by a small area statistics program also raises questions as to the most appropriate means of making these numbers available to users.

Print publications containing statistics for small areas throughout a country must be restricted to a small set of statistics for each area if they are not to become unmanageably large. Furthermore, many users are not interested in statistics for *all* small areas, but only for selected small areas.

Approaches that have been used to respond to this situation include the production of sets of tables or profiles for individual small areas either in print form or on microfiche, and the production of summary tapes that contain an array of statistics at various small area geographic levels.

Although this seminar is concerned only with censuses, when discussing small-area statistics it is important to consider how census statistics can be integrated with non-census statistics, and how corresponding small area statistics can be produced for intercensal years. In Canada, a Small Area Data Program was recently initiated to give explicit attention to the problem of integrating data for small areas from different sources, and to the development of intercensal small area data.

The concept of the census as a 100% headcount seems to be changing as we have heard in several papers during this seminar. Several countries now combine the traditional census enumeration with the exploitation of administrative or registration sources to complete the statistical picture. Denmark dispensed with the enumeration process entirely in its 1981 census. Sampling and imputation have introduced an element of estimation into the traditional census counting process. To the extent that censuses are becoming more and more a mixture of enumeration methods, administrative data use, and estimation methods, the question of how to produce small area statistics more frequently than every five or ten years takes on a different perspective. The use of administrative data in conjunction with sample survey results and estimation methods is potentially feasible more frequently than is a census enumeration. Therefore intercensal programs of small area statistics may be developed based on administrative data benchmarked to large area sample survey results, with the census being used periodically for purposes of calibration and enrichment of content.

I hope these comments have served to identify some of the major issues related to small-area statistics and will provide a basis for a productive discussion.

REMARQUE D'OUVERTURE

Lorsque le Trésor ou le Ministère des Finances demande à l'organisme statistique d'un pays pourquoi il est vraiment nécessaire d'effectuer un recensement national coûteux, la raison principale invoquée, parmi bien d'autres, est qu'un recensement constitue la seule source exhaustive de statistiques sur la population et le logement pour les petites régions. Les enquêtes par sondage permettent d'étudier un sujet d'une façon plus détaillée, coûtent moins cher et supposent des délais plus courts que les recensements, mais le niveau de détail géographique des données qu'on y recueille est limité. Dans certains pays, les registres de la population ou les dossiers administratifs représentent une autre source possible de données statistiques sur les petites régions. Cependant, ils ne renferment souvent qu'une gamme restreinte de variables, leur qualité ou leur portée laisse parfois à désirer et, dans bien des cas, il faut les étalonner périodiquement sur un recensement national pour en faire une source utile de données statistiques. C'est donc dire que, dans la plupart des pays, le recensement demeure la principale source de données démographiques relatives aux petites régions.

Il est, par conséquent, très opportun que nous profitions d'un séminaire sur l'évaluation des résultats et de la méthodologie du recensement pour étudier précisément la mesure dans laquelle le recensement atteint l'objectif qu'on lui a fixé, à savoir produire des statistiques sur les petites régions. Il est peut-être étonnant que si peu de documents sur ce sujet aient été présentés à ce séminaire. Je suis sûr qu'il ne faut pas voir là un manque d'intérêt pour les statistiques sur les petites régions; peut-être la production de statistiques sur les petites régions ne pose-t-elle tout simplement pas de problèmes.

Le recensement compte parmi ses principaux objectifs la production de statistiques sur les petites régions; or, on a soulevé plusieurs questions et préoccupations à ce propos, dont certaines sont énoncées dans les documents présentés à ce séminaire. Permettez-moi d'en énumérer quelques-unes dont nous pourrions discuter:

1. CHOIX DES PETITES RÉGIONS

Pouvons-nous offrir une souplesse totale en fournissant aux utilisateurs des données portant sur des régions qu'ils définissent eux-mêmes, ou devons-nous nous en tenir à des régions prédéfinies? Dans l'un ou l'autre cas, il nous faut avant tout un ensemble normalisé de petites régions pour fins de diffusion primaire. Combien petites devraient être ces régions? Quelles limites devraient-elles respecter? Devraient-elles demeurer constantes d'un recensement à l'autre? On peut garantir une souplesse maximale en codant chaque logement en fonction d'une région géographique très petite (par ex., un îlot urbain ou un

côté d'îlot, ou, à la rigueur, en lui attribuant des coordonnées de latitude et de longitude). Ces très petites régions deviennent alors des unités de base qui serviront à créer les petites régions pour lesquelles on produira des statistiques. Le coût initial d'un codage géographique détaillé est élevé, cependant, c'est un investissement qui pourrait servir non seulement à plusieurs recensements successifs, mais aussi à d'autres applications.

2. CONFIDENTIALITÉ

Plus la région pour laquelle des données sont diffusées est petite, plus il y a de risques qu'on puisse identifier les personnes dans les tableaux statistiques. Le problème se complique si l'on permet aux utilisateurs de définir eux-mêmes leurs régions. La question est de savoir comment on peut tirer le maximum d'utilité de la base de données du recensement tout en protégeant l'anonymat des recensés. Certains pays appliquent diverses méthodes de perturbation ou de suppression aléatoire pour remédier à ce problème.

3. FIABILITÉ

Plus la région pour laquelle on diffuse des données est petite, moins les données ont tendance à être fiables. Cela est bien connu quand il s'agit d'erreurs d'échantillonnage, et tout aussi vrai lorsque l'on considère l'effet des erreurs non dues à l'échantillonnage sur les données relatives aux petites régions. Par exemple, les erreurs de réponse dont les effets ont tendance à s'atténuer à l'échelle d'un pays ou d'un état peuvent introduire des biais graves au niveau des petites régions.

Un second problème touchant la fiabilité des statistiques sur les petites régions est celui de la visibilité des erreurs. Généralement, avant de publier des statistiques nationales, on les compare avec celles d'autres sources pour voir si elles sont raisonnables et cohérentes. Si elles soutiennent la comparaison, personne ne peut les contredire. La situation est différente dans le cas des statistiques locales. Premièrement, il y a beaucoup trop de chiffres à publier pour qu'on puisse les vérifier tous. Deuxièmement, il est beaucoup plus probable que certaines personnes à l'échelle locale disposent de renseignements qui pourraient contredire les résultats du recensement et mettre en doute leur exactitude.

Par conséquent, la question est de savoir quelles contraintes les considérations de fiabilité imposent à la diffusion des statistiques sur les petites régions tirées du recensement. Personne ne semble avoir soulevé cette question dans les documents présentés au séminaire.

4. MÉTHODES DE DIFFUSION

L'énorme volume de chiffres que suppose un programme de statistiques sur les petites régions nous oblige aussi à nous interroger sur le meilleur moyen de fournir les données aux utilisateurs.

Les publications imprimées renfermant des statistiques sur les petites régions pour un pays entier doivent se limiter à présenter un petit ensemble de données pour chaque région si l'on veut éviter qu'elles ne deviennent démesurément volumineuses. De plus, bien des utilisateurs ne veulent pas obtenir des statistiques pour *toutes* les petites régions, mais seulement pour certaines d'entre elles.

Parmi les solutions utilisées jusqu'ici pour corriger cette situation, citons les suivantes: production d'ensembles de tableaux ou de profils pour des petites régions distinctes, soit sur papier soit sur microfiche, et production de bandes sommaires renfermant une gamme de statistique à divers niveaux géographiques pour les petites régions.

Même si ce séminaire n'est consacré qu'aux recensements, il est important, lorsqu'on parle de statistiques sur les petites régions, de se demander comment les données du recensement peuvent être intégrées avec celles d'autres sources et comment on peut produire des statistiques correspondantes sur les petites régions pour les années intercensitaires. Au Canada, on a récemment mis sur pied un programme de données sur les petites régions pour étudier expressément le problème de l'intégration des données sur les petites régions provenant de sources différentes ainsi que l'élaboration de statistiques sur les petites régions pour les périodes intercensitaires.

Le concept du recensement en tant que dénombrement intégral semble évoluer, comme en témoignent plusieurs documents présentés au cours de ce séminaire. Plusieurs pays combinent aujourd'hui le dénombrement traditionnel par voie de recensement avec l'exploitation des dossiers administratifs ou des registres de la population afin de broser un tableau statistique plus détaillé.

Pour sa part, le Danemark a complètement abandonné la pratique du dénombrement dans son recensement de 1981. L'échantillonnage et l'imputation ont introduit un élément d'estimation dans le dénombrement intégral traditionnel. La question de savoir comment on peut produire des statistiques sur les petites régions à des intervalles plus fréquentes qu'à tous les cinq ou dix ans prend un aspect différent dans la mesure où les recensements font de plus en plus appel à un mélange de méthodes de dénombrement, d'exploitation des dossiers administratifs et de procédures d'estimation. L'utilisation des données administratives, avec des enquêtes par sondage et des méthodes d'estimation, permettrait peut-être des observations plus fréquentes qu'un dénombrement intégral. On pourrait élaborer des programmes intercensitaires de statistique sur les petites régions basés sur des données administratives

ajustées aux résultats d'enquêtes pour de grandes régions, et se servir d'un recensement pour étalonner périodiquement les chiffres et en enrichir le contenu.

J'espère que les observations qui précèdent ont permis de cerner quelques-unes des grandes questions qui se posent à l'égard des statistiques sur les petites régions et qu'elles pourront servir de fondement à une discussion productive.

STATISTICS FOR SMALL AREAS (a)

I. THE BASIS OF THE REGIONAL DIVISION

1. One of the characteristics of population and housing censuses is the possibility they afford of producing statistics for small areas in all parts of the country.

2. This possibility exists because the censuses cover the whole country and because the census data are collected by applying to people at their permanent or temporary address, which then at least can be related to pre-defined geographic areas. This collection method was also used for earlier Danish censuses.

3. Even many years ago, information about address appeared in the Danish population census questionnaires either as a combination of town, street, and house number or, in rural districts as parish, and land registration number. For the local authorities who were responsible for regionally sending out and collecting the questionnaires, this information served mainly as a means of identifying the persons, whereas the central authorities responsible for the census used the information in connection with the checks made on area division and particularly for distinguishing between urban and rural areas.

4. The information on the census questionnaire about the location of the dwelling has never before been incorporated in the census as a variable. An area code was used instead so that an area comprised the smallest unit in the geographic division.

5. In contrast to earlier censuses, the Danish Population and Housing Census of 1st January 1981 was conducted without specifically applying to the public, as it was based on data from a number of computerized registers of public authorities. These registers, which have been established during the past 10-15 years, contain all the information usually collected in a population and

(a) Report prepared by Danmarks Statistik.

housing census such as data on sex, age, place of residence, citizenship, marital status, occupation and education, and about household, family and housing conditions.

II. ADDRESS OF THE PERSON

6. The address of each person is included in the census data. It is taken from the Central Population Register where it appears both as a normal printed postal address and as an address code. In each person record, the address designation is composed of the following elements:

- Municipality code (3-digit number, allocated by the Ministry of the Interior);
- Street code (4-digit number allocated by the municipality);
- House number;
- House letter;
- Storey number;
- Apartment number, etc.

This is the address designation which has been transferred to the person record of the population and housing census. The Central Population Register also contains a supplementary register, namely the street register. The smallest unit in this register is a street or part of a street which is identified by:

- Municipality code;
- Street code;
- House number (s).

8. For each unit i.e. for each street or part of a street, there is information about:

- Street name;
- Parish number;
- Postal code number;
- Code for one or more other geographic divisions (if applicable).

9. The municipalities must include the parish number and postal code number in the street register, but they are free to decide whether they wish to introduce other area divisions.

III. ADDRESS OF THE DWELLING

10. Information in the Population and Housing Census 1981 about dwellings is taken from the Central Register of Buildings and Dwellings. Dwellings in this register are identified by a complete address designation, i.e.:

- Municipality code;
- Street code;
- House number;
- House letter;
- Storey number;
- Apartment number, etc.

11. A dwelling thus has the same address code as the persons who live in it. The address code is used as the key when data from the Central Population Register is to be matched with data from the Central Register of Buildings and Dwellings.

IV. ADDRESSES OF WORKPLACES AND EDUCATIONAL INSTITUTIONS

12. In addition to the address of the place of residence, the census contains information about the address of the workplace of economically active people, and as regards students, the address of the educational institution.

13. The addresses of workplaces are taken from the Register of Enterprises and Establishments, an administrative register providing data about the name and address of each industrial establishment, its kind of economic activity (industry), etc.

14. The address designation is supplied to this register as a normal printed postal address, i.e. with street name, house number, postal code number and postal district. By means of the Central Population Register's street register mentioned above, Danmarks Statistik codes the addresses automatically so that they can be entered in the same code forms as the residence and dwelling addresses on statistical registers such as those used for the Population and Housing Census.

15. Addresses of educational institutions are similarly coded and entered on a special register in Danmarks Statistik. This register is used in connection with the collection of data for education statistics. In this case too the administrative register needs the address in normal printed form, whilst for statistical purposes it has to be in code form. The Central Population Register's street register is also here used in the automatic process necessary for the address coding.

V. ADDRESSES AS A BASIC FOR REGIONAL DIVISIONS

16. As already mentioned all address data in the Danish Population and Housing Census 1981 are expressed in the same code form, and this applies to urban addresses as well as addresses in sparsely populated areas, and to addresses of both residence and workplace. The first three elements in the address code (municipality code, street code and house number) are sufficient to indicate the location of the address as a point on a street map (showing the names of the streets and house numbers). It is thus possible to define any area by stating the house numbers (with the relevant municipality and street codes) which belong to the area — and it is therefore possible to carry out any geographic breakdown of the population census material. Furthermore, the geographic divisions do not necessarily have to be known at the time when the census material is collected. It should also be noted that uniform coding means that commuting surveys can be compiled with any geographic division required.

17. The municipalities have defined the division into parishes and postal code areas. Danmarks Statistik has additionally defined the urban areas by referring to a list of addresses of all occupied dwellings, indicating the inhabited areas on a street map, and then drawing up the dividing line between urban and rural areas. This procedure is analogous to that used in earlier population censuses, when location data consisted of the land registration number. An urban catalogue has been compiled, containing all address codes in each urban area, which in turn has been given a town code number.

VI. STATISTICS FOR SMALL AREAS

(a) *The Population and Housing Census*

18. The smallest geographic units in Danish population censuses have for many years been the parishes — regardless of the number of inhabitants — and urban areas having by definition a certain minimum of inhabitants (200, or in some censuses 250, inhabitants).

19. Up to and including the 1965 census, statistics for the parishes, however, comprised only the number of persons and households. For the period 1930-1965, the smallest geographic areas for which further statistics are available, were municipalities and urban areas.

20. Throughout the 1960s and in particular after the local government reform of 1970 the number of municipalities was reduced from 1389 in 1960 to 277 in 1970. This was the reason why results of the 1970 Population Census were

published at parish level instead of as previously at municipality level. This publication level has been maintained ever since.

21. The number and size of the areas in 1981 are shown in Appendix 1. For parishes, urban areas with at least 200 inhabitants and subdistricts in the municipality of Copenhagen, the 1981 census tables contain the following data:

- Population by sex and 5-year age group;
- Economically active population by industry (12 activity groups) and socio-economic group;
- Economically inactive population by occupation (home-makers, students, pensioners);;
- Dwelling stock by type of dwelling and number of occupants;
- Dwelling stock by number of rooms;
- Dwelling stock by availability of facilities.

22. Statistical users can, for a fee which must at least cover extra expenses, receive other statistics not only for area divisions already comprised in the population census record, but also for any area which can be identified by means of streets or parts of streets. How small these areas may be depends on the degree of detail of the available data.

(b) *Current Statistics of Population and Housing*

23. The administrative registers on which the data in the Population and Housing Census 1981 are based are updated with varying frequency but at least once a year, and they are also the basis for the annual statistics of population and housing.

24. These statistics are published at the country or municipality level, and as they contain the same address data as the Population and Housing Census 1981, it is also possible to supply current statistics for small areas.

25. A system of statistics has been developed so that municipalities and other interested bodies can be annually offered statistics for small areas. This system means that the user can buy a set of tables with a standard range of contents for each municipality, divided into areas. The user determines the geographic division himself. The simplest procedure both for the user and for Danmarks Statistik is of course to use the Central Population Register's existing divisions, or the division into urban areas which Danmarks Statistik updates annually. If a new area division is to be used, it must be defined by means of street codes and house numbers.

26. We have drawn up a list of the types of data which are covered by each of the 5 fields of statistics (designated A-E) which can be offered for the user's

own area divisions. The minimum size of the area is also stated. The minimum size applies only to orders from municipalities. In the case of other users, the minimum size is somewhat higher. Finally, the shortest delivery date for the statistics is stated, providing Danmarks Statistik receives the order at least 4 weeks before that date.

A. *Population Statistics*

Population at beginning and end of year.

Numbers concerning:

- Births;
- Deaths;
- Migration within Danish municipalities;
- Migration between Danish municipalities;
- External migration;
- Marriages;
- Divorces;

Combined with data on;

- Sex;
- Age;
- Marital status;
- Number of households at end of year.

Conditions: Minimum area: No limits (for municipalities).

Delivery: 16th March 1984 in respect of 1983.

B. *Income Statistics*

Population at end of year:

- Total income;
- Total wealth;
- Average income;
- Median income, upper and lower quartiles;
- Activity rates for 1-year age groups;
- Average income for 1-year age groups;
- Family types and family income (by income bracket);
- Number of children, by age, family type and economic activity of parents;

- Taxable persons by:
- Size of income;
- Employment status;
- Industry (main activity during the year);
- Income of in- and out-migrants;
- Wealth;
- Sex and age.

Conditions: Minimum size of area: 300 persons for municipalities.

Delivery: 1st February 1984 in respect of 1982.

C. Housing Statistics

Dwelling stock by type of building and:

- Number of occupants (incl. 0 occupants);
- Average number of occupants;
- Number of rooms;
- Number of occupants per room;
- Size, in terms of floorspace;
- Heating installations;
- Bathing facilities;
- Form of tenure;
- Year of construction;
- Household type, inc. number of children.

Population by age, and by above dwelling data.

Conditions: Minimum: 300 persons for municipalities.

Delivery: 1st February 1984 in respect of 1982.

D. Employment Statistics

Concerning employment at end-November:

By place of residence (night-time population) and by workplace or educational institution (day-time population). Data are included on:

- Sex;
- Age;
- Employment status;
- Industry;

- Gross income;
- Employees, full-time and part-time;
- Students aged over 15 years;
- Unemployed persons.

Conditions: Minimum: 200 persons (night-time or day-time population).

Delivery: 1st November 1983 in respect of 1981 or end-year 1981.

E. *Commuting*

Concerning commuting at end-November:

— By place of residence (night-time population) and by workplace or educational institution (day-time population);

- In- and out-commuters;
- Economically active in- and out-commuters;
- Student in- and out-commuters;
- Industry;
- Employment status;
- Employees, full-time and part-time;
- In- and out-commuters, a maximum of 14 smaller area divisions.

Conditions: Minimum: 200 persons (night-time or day-time population) for municipalities.

Delivery: 1st November 1983 in respect of 1981 or end-year 1981.

VII. PAID INDIVIDUAL SERVICE FOR PRIVATE USERS

27. The service system mentioned earlier is aimed primarily at meeting the requirements of municipal planning authorities for statistics on small areas. Danmarks Statistik is at present working on setting up a supplementary system aimed particularly at producing statistics for market areas of private enterprises.

28. The system comprises a total of 12 magnetic tapes (service tapes). The data can be supplied either as statistics on magnetic tape or as standard printed tables. There is a choice of 12 service tapes or 18 standard tables.

29. The magnetic tape supplied contains, for each area, an enumeration of either persons, families, households or dwellings, combined with 2-3 variables. The customer can then compile various tables based on the information on this tape.

30. The degree of detail is at least 1,000 inhabitants in an area in order to ensure that individual persons, families or households cannot be identified.

31. The 12 service tapes cover the following combinations of variables:

1. Population, in- and out-migration during the year, sex and age group.
2. Households and occupants of the dwelling.
3. Occupied dwellings, type of building, form of tenure and year of construction.
4. Dwellings, type of building, size of dwelling and facilities.
5. Taxable persons, sex, age groups, in- and out-migration during the year.
6. Taxable persons, sex, income groups, aggregate income and employment status.
7. Taxable persons, sex, income groups, aggregate income and industry (6 activity categories).
8. Number of families, family type, income group and aggregate income.
9. Number of reference persons (taxable persons, but including only one partner from married couples), wealth groups and aggregate wealth.
10. Total population, night-time and day-time populations, in- and out-commuters, sex, income groups and age group.
11. Persons with jobs and students, night-time and day-time populations, in- and out-commuters, sex and industry (6 activity categories).
12. Persons with jobs, night-time and day-time populations, sex, employment status, and full-time/part-time employees.

32. The offer of statistics for a municipality divided into small areas, determined by the user himself, mentioned in VIb, complies with an important need in the municipalities. The system was introduced in 1976 with the offer of statistics on population and population movements. Hereafter the other fields of the system were added. Nearly one half of the municipalities are annual customers.

33. In this way the demand for statistics on small areas from the census has essentially decreased.

34. After all, it is the information from the census which is published for parishes and urban areas with at least 200 inhabitants.

35. The Population and Housing census renders the possibility of combining more variables than the annual statistics. As to the 1981 Census no experience as yet can tell us how much this chance will be used for small areas.

Annex I. Number of Roder (1), Urban Areas, Parishes and Municipalities at 1 January 1981

	Roder (1)	Urban areas	Parishes	Municipalities
Under 50	11	—	—	—
50-499	34	628	490	—
500-999	76	343	489	—
1000-1499	145	129	278	—
1500-1999	79	87	141	—
2000-2999	38	93	184	2
3000-3999	4	40	106	4
4000-4999	—	20	139	11
5000-9999	—	37	171	122
10,000-19,999	—	21	89	83
20,000-49,999	—	19	4	38
50,000-99,999	—	2	—	11
100,000 or more	—	4	—	4
Total	387	1423	2091	275

(1) Sub-districts of Copenhagen.

DATA PROCESSING AND DISSEMINATION AT THE MICROAREA LEVEL IN THE ITALIAN CENSUS (a)

1. There is certainly no need to delve into the problem of the actuality of censuses or to go deeper into details on the reasons that justify the use of sample surveys or call for the carrying out of total surveys in particular cases. The question of whether it would be possible to make use, in a more adequate manner, of the Commune registers of resident population (following the example given by some countries that have undertaken this method for some time now) is a matter of growing debate in Italy today.

2. In presenting this report, it is important to point out that guaranteeing the availability of analytic and precise information referring to restricted territorial areas is certainly one of the particular characteristics of the traditional census. Although it is correct to say that such a result is not to be considered as acquired "a priori" in the sense that errors can be found also in censuses, this description can hardly be argued with even by those who severely criticize the census as being a complicated and costly operation.

3. Such a need is particularly felt in our country. The accentuated difference between the demand and availability of statistics at the lowest territorial levels constantly presents the problem of obtaining the necessary information, especially for city planning purposes.

4. This explains the importance accorded, in the preparation of the tabulation plan, to the processing of Commune information (it is worth recalling that there are about 8,000 Italian Communes). This results in a very large number of tables to be provided at this scale, and has placed heavy burdens on electronic programming. The efforts undertaken in this direction are described below.

5. The census volumes, one for each of the 95 Provinces, contain 23 tables showing data processed at the level of individual Communes. The content of

(a) Report prepared by Mr A. Cortese - Central Institute of Statistics.

these tables enables ISTAT to meet even the most difficult cognitive needs, since it has census information on all universes (population, households and houses) involved in the census and they are classified according to the importance of their structural characteristics. The list of the table titles provides in this regard exact elements of evaluation:

Tab. 1 - Area and population density - Resident population (de jure) and present-in-area population (de facto), by sex;

Tab. 2 - Temporary absentees by sex, location of presence and motive of absence;

Tab. 3 - Resident population by sex and marital status;

Tab. 4 - Resident population by sex and age group;

Tab. 5 - Resident population six years of age and over by sex and educational level;

Tab. 6 - Resident population attending regular study courses and/or professional training courses, by sex and age groups;

Tab. 7 - Resident population economically active and non-active, by sex;

Tab. 8 - Resident active population in professional status, by sex and sector of economic activity;

Tab. 9 - Resident active population, by sex, sector of economic activity and status in occupation;

Tab. 10 - Resident active population, in occupational status by sex, age group and sector of economic activity;

Tab. 11 - Resident non-active population, by sex, age group and non-active status;

Tab. 12 - Resident population that returns daily to habitual dwelling place, according to location of work or study;

Tab. 13 - Resident households by number of members;

Tab. 14 - Resident households according to type of household;

Tab. 15 - Total dwellings (occupied or unoccupied);

Tab. 16 - Occupied dwellings by tenancy title;

Tab. 17 - Occupied dwellings by period of construction;

Tab. 18 - Occupied dwellings by number of rooms;

Tab. 19 - Occupied dwellings by service installed;

Tab. 20 - Occupied dwellings by legal characteristics of the owner and by tenancy title;

Tab. 21 - Unoccupied dwellings by reason of non-occupancy;

Tab. 22 - Unoccupied dwellings by service installed;

Tab. 23 - Unoccupied dwellings by legal characteristics of the owner.

6. It is interesting to add that in each of the above volumes there are 31 tables showing data at the provincial level which, upon request, can be processed at the level of the single Commune. These last tables contain very detailed information because each table has the cross-tabulation of more characteristics analysed in their different modalities.

7. Users are offered the faculty of obtaining on tape or paper further information not intended for dissemination in print. This refers to the following list of eleven tables:

Tab. 1 - Resident active population, by sex, sector of economic activity and status of occupation;

Tab. 2 - Resident active population, by sex and sector of economic activity (standard classification of occupations 1971);

Tab. 3 - Resident employed population by type of movement to and from work;

Tab. 4 - Resident population that studies, by type of movement to and from place of study;

Tab. 5 - Resident population frequenting nursery school, by type of movement to and from the school;

Tab. 6 - Resident population frequenting vocational training courses, by type of movement to and from the place of study;

Tab. 7 - Resident population that works or studies, by type of movement carried out to reach the place of work or of study;

Tab. 8 - Resident population, by place of work or of study, the means of transportation used, the time taken and the hour of commencement of work or of lessons;

Tab. 9 - Resident foreigners by sex and foreigners temporarily present by sex and reasons for presence;

Tab. 10 - Total dwellings (occupied or unoccupied) by some characteristics of the building in which they are housed;

Tab. 11 - Dwellings occupied in rent by legal characteristics of the owner (detailed analysis of legal characteristics of the owner).

8. In any case, the tabulation does not end here since the processing of other tables is expected and with which particular cognitive needs shall be met; foremost among these, because of the importance it assumes, is the origin-destination matrix of the inter-Commune flows (commuters) connected with the development of the working activity or with the attendance of a course of studies.

9. In order to complete the framework of the territorial statistics emerging from the census, reference should also be made to the special microareas in which, at the time of the census, the territory of each Commune is subdivided.

Such microareas ("enumeration areas") are no longer seen as purely instrumental territorial units for data collection, as they have also emerged as significant territorial bases of reference of the census data. Commune Census Boards have been advised, in fact, to provide their individualization according to parameters which describe them effectually in a town planning context and in such a way as to favour, through their grouping, the reconstruction of sub-Commune areas having some relevance.

10. In view of such premises, the possibility has been envisaged for users to ask for the processing of the 23 tables referred to above, for all the microareas in which the territory of one or more Communes has been divided. The possible uses of such information are various, as the experience gained from the preceding census has confirmed.

11. In conclusion, it should be stressed that the tabulations made by ISTAT area to be integrated with those which the Regions, Provinces and Communes will be able to carry out on their own. The law that has prescribed the census has, in fact, granted to such Bodies the authority to obtain the individual data (rendered anonymous) by placing them in a position to provide personally the satisfaction of cognitive needs, should they appear at a local level.

CENSUS SMALL AREA STATISTICS - THE CASE OF UNITED KINGDOM (a)

1. In England and Wales and Scotland, 1981 Census results were made available for a number of sub-regional levels through the 1981 Small Area Statistics (SAS).

2. The SAS are a set of standard tables produced for small area throughout Great Britain which provide over 4,000 separate counts covering every topic in the census including those processed on a 10 per cent sample basis. The items included in these standard tables were decided after extensive consultation with the local authorities and others who were likely to be the main users. The tables are available on magnetic tape, as paper copy or in microfilm (film or fiche) and there are maps provided to show the areas to which the SAS relate. A paper copy of the tables (in English only) is shown in CES/SEM. 17/R. 27/Add. 1). The numbers in the cells are data reference numbers.

3. The smallest geographical unit for the SAS is the enumeration district (containing on average about 160 households with persons present in England and Wales but only about 100 households in Scotland). The SAS are also produced for other, larger areas such as electoral wards, parliamentary constituencies and local authority districts. In Scotland, though not in England and Wales, they are available too for postcode sectors which are aggregates of individual post codes (each sector contains on average about 2,000 households or 5,500 persons). At the ed level in particular the SAS serve as "building bricks" which can be aggregated to larger, and perhaps non-standard, geographical zones which may be required by particular users — e.g. catchment areas for retail outlets, schools, water authorities.

4. The charges for the SAS are relatively modest — at around £3 per area for paper copy, £1.65 for microfilm or £1.10 for magnetic tape. Apart from purchase direct from the census office special arrangements have also been made whereby

(a) Report prepared by the Office of Population Censuses and Surveys.

the SAS can be purchased from one of several commercial agencies who have been licensed by the census offices to market the SAS and to handle the dissemination.

5. Strict procedures have been applied to all aspects of the census to ensure that confidentiality of the information given is preserved. In particular care has been taken to ensure that information has not been released outside the census offices in any way in which persons or households could be identified from it. In this regard extra precautions have had to be taken with the SAS simply because with very small areas the risk of accidentally revealing the identity of persons through the statistics is greater. Two particular measures have therefore been taken. First at the ed and ward levels the "100 per cent" figures have been modified slightly by adding +1, 0 or -1 at random to each cell so that no individual or household could be identified with certainty. (This was not done with 10 per cent sample data). Secondly, at these levels, if the area contained fewer than 25 persons or 8 households present on census night, then, most of the figures have been suppressed (Although the average size of an ed was much greater than this, a few very small ones did occur).

6. The other form of small-area statistics produced from the census are those for grid squares. From the 1971 Census a set of standard statistics was produced for each 1-kilometre square of the National Grid in Great Britain (but not for N. Ireland). However the value of these statistics as "building bricks" was limited because the size of the population contained within each 1 km grid square varied very greatly — from zero in some of the remoter areas of the country to over 24,000 (the Earls Court area of London). As a result, and because of the considerable cost of entering grid square coordinate references on each household record, it was decided to produce the statistics in 1981 only for those customers who were prepared to pay substantially towards their production. In the event orders for only about six local authority areas have been received.

STANDARD TABLE LAYOUTS AND CELL NUMBERS FOR SMALL AREA
STATISTICS, 100% AND 10%, TABULATED FROM 1981 CENSUSES
IN THE UNITED KINGDOM (a)

Census 1981

User Guide 52

Small Area Statistics 100% and 10%

Standard Table layouts and cell numbers

OPCS
Customer Services
Segensworth Road
Titchfield
Fareham
Hants
PO15 5RR

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These layouts relate to the Small Area Statistics tables produced on paper or film. Magnetic tape versions of the tables contain some additional counts which are totals of columns. (See User Guides 48 and 49 for details of additional counts).

* Pages 1-6 relate to areas throughout Great Britain.

Pages 7,8 relate to areas throughout England and Wales. Table 39 will appear for areas in Wales only.

The numbers within the layouts are the cell numbers — they can be used to uniquely identify cells of the tables. Where a cell is shown as XXX this denotes a blank cell (i.e. which will not contain data). The cell number can be deduced from the surrounding sequence. Note that there are no cell numbers for the following:

XXX in Table 11

XXX in Table 44

XXX in the 9 cells located between cells 5104 and 5105 of Table 49.

* Please note that the page numbers quoted refer to those printed in the top left-hand corner of the sheets.

(a) Report prepared by the Office of Population Censuses and Surveys.

CENSUS 1981 SMALL AREA STATISTICS
PAGE 1 100%

ED No
Map Reference
Note: # = ED same as in 1971
= Special Enumeration District
Crown copyright reserved Frame No:
Separate explanatory notes are available

1 All persons present; plus absent residents * in private households

	TOTAL PERSONS	In private households		Not in private households	
		Males	Females	Males	Females
1 All present res	1	3	4	6	7
2 All absent res	8	10	11	xxx	xxx
3 All visitors	15	17	18	20	21
Res in UK	22	24	25	27	28
Res outside UK	29	31	32	34	35
ALL PRESENT 1981	36	38	39	41	42
1971 BASE (1+1)					
ALL RESIDENT 1981	43	45	46	48	49
1981 BASE (1+2)					

2 All residents

Age	TOTAL PERSONS	Males		Females		Net'd Males
		SWD	Mrr'd	SWD	Mrr'd	
TOTAL	50	52	53	55	56	190
0-4	57	59	xxx	62	xxx	xxx
5-9	64	66	xxx	69	xxx	xxx
10-14	71	73	xxx	76	xxx	xxx
15-19	78	80	xxx	83	xxx	xxx
16-19	85	87	88	90	91	xxx
20-24	92	94	95	97	98	xxx
25-29	99	101	102	104	105	xxx
30-34	106	108	109	111	112	xxx
35-39	113	115	116	118	119	199
40-44	120	122	123	125	126	200
45-49	127	129	130	132	133	201
50-54	134	136	137	139	140	202
55-59	141	143	144	146	147	203
60-64	148	150	151	153	154	204
65-69	155	157	158	160	161	205
70-74	162	164	165	167	168	206
75-79	169	171	172	174	175	207
80-84	176	178	179	181	182	208
85+	183	185	186	188	189	209

3 Persons present not in private households

Establishments	TOTAL PERS	Males (M)	Females (F)	Not usually resident		Residents							
				Staff #		Other		M		F			
				M	F	M	F	M	F	M	F		
TOTAL #	210	211	212	214	215	217	218	219	220				
Hotels/boarding houses	221	222	223	225	226	228	229	230	231				
Children's homes	232	233	234	236	237	239	240	241	242				
Old people's homes	243	244	245	247	248	250	251	252	253				
Psychiatric hospitals	254	255	256	258	259	261	262	263	264				
Other hospitals	265	266	267	269	270	272	273	274	275				
Schools and colleges	276	277	278	280	281	283	284	285	286				
Prison dept estates	287	288	289	291	292	294	295	296	297				
Hostels/lodging houses	298	299	300	302	303	305	306	307	308				
Other establishments	309	310	311	313	314	316	317	318	319				

4 All residents

Country of birth	TOTAL PERSONS	Males	Females
TOTAL		321	322
England		324	325
Scotland		327	328
Wales		330	331
Rest of UK		333	334
Irish rep		336	337
Old Comm'th		339	340
New Comm'th		342	343
East Africa		345	346
Africa Rem		348	349
Caribbean		351	352
India		354	355
Bangladesh		357	358
Far East		360	361
Mediterr		363	364
Remainder		366	367
Pakistan		369	370
Other E.C.		372	373
Other Europe		375	376
Rest of World		378	379

5 All residents aged 16 or over

Economic Position	TOTAL PERSONS	Males		Females	
		SWD	Mrr'd	SWD	Mrr'd
ALL PERSONS 16+	380	382	383	385	386
Total econ active	307	309	310	312	313
Working	394	396	397	399	400
Seeking work	401	403	404	406	407
Temp sick	400	410	411	413	414
Total econ inact	415	417	418	420	421
Pers sick	422	424	425	427	428
Retired	429	431	432	434	435
Student	436	438	439	441	442
Other inactive	443	445	446	448	449

NOTES
* Persons returned as usually resident but absent on census night in private households with one or more other persons present (Table 1)
Includes campers/vagrants etc (Table 3)
Includes relatives of staff (Tables 3 and 6)

6 All persons present

Age	TOTAL PERSONS	In private households		Not in private households					
		All present		Residents					
		M	F	M	F				
TOTAL	450	452	453	455	456	457	458	459	460
0-4	461	463	464	466	467	468	469	470	471
5-15	472	474	475	477	478	479	480	481	482
16-24	483	485	486	488	489	490	491	492	493
25-34	494	496	497	499	500	501	502	503	504
35-44	505	507	508	510	511	512	513	514	515
45-54	516	518	519	521	522	523	524	525	526
55-59	527	529	530	532	533	534	535	536	537
60-64	538	540	541	543	544	545	546	547	548
65-69	549	551	552	554	555	556	557	558	559
70-74	560	562	563	565	566	567	568	569	570
75+	571	573	574	576	577	578	579	580	581
Single	582	584	585	587	588	589	590	591	592
Married	593	595	596	598	599	600	601	602	603
Students aged 16 or over	604	606	607	609	610	611	612	613	614

7 All residents aged 16 or over in employment

Employment status	Males	Females	
		SWD	Mrr'd
ALL IN EMPLOYMENT	615	616	617
Apprentices and trainees	618	619	620
Employees supervising others	621	622	623
Other employees	624	625	626
Self-empl without employees	627	628	629
Self-empl with employees	630	631	632
ALL EMPLOYEES	633	634	635
Working full-time	636	637	638
Working part-time	639	640	641

8 All residents aged 1 or over with a usual address 1 year before census different from present usual address

Age	TOTAL PERSONS	Males		Females	
		SWD	Mrr'd	SWD	Mrr'd
TOTAL	642	644	645	647	648
1-4	649	651	xxx	654	xxx
5-15	656	658	xxx	661	xxx
16-24	663	665	666	668	669
25-34	670	672	673	675	676
35-44	677	679	680	682	683
45-59	684	686	687	689	690
60-64	691	693	694	696	697
65+	698	700	701	703	704

9 All Economically Active (EA) residents

Age	TOTAL PERSONS EA	Males EA	Females EA		In emp working f/t		Not in employment		Self empl pers		
			SWD	Mrr'd	Females		Males				
					SWD	Mrr'd	Males	Females			
TOTAL	719	720	722	723	790	792	793	860	862	863	705
16-19	724	725	727	728	795	797	798	865	867	868	706
20-24	729	730	732	733	800	802	803	870	872	873	707
25-29	734	735	737	738	805	807	808	875	877	878	708
30-34	739	740	742	743	810	812	813	880	882	883	709
35-39	744	745	747	748	815	817	818	885	887	888	710
40-44	749	750	752	753	820	822	823	890	892	893	711
45-49	754	755	757	758	825	827	828	895	897	898	712
50-54	759	760	762	763	830	832	833	900	902	903	713
55-59	764	765	767	768	835	837	838	905	907	908	714
60-64	769	770	772	773	840	842	843	910	911	913	715
65-69	774	775	777	778	845	847	848	915	917	918	716
70-74	779	780	782	783	850	852	853	920	922	923	717
75+	784	785	787	788	855	857	858	925	927	928	718

PAGE 2		CENSUS 1981 SMALL AREA STATISTICS										100%		
10 Private households (H) with residents; residents (P)														
11 Households with the following persons:														
12 Private households (H) with residents; residents (P); rooms in household spaces														
13 Private households (H) with residents; residents (P); rooms in household spaces														
14 Private households with residents; residents (P); rooms in household spaces														
15 Private households with residents														
16 Private households with residents; residents (P); present residents and visitors; rooms present; rooms and cars in such h/holds														
17 Line 1: 1981 private households* (1981 pop base); present and absent residents; rooms present, or with a visitor or visitors present but no usual residents in a household with 0 persons*														
1	2	3	4	5	6	7	8	9	10	11	12	13		
18	19	20	21	22	23	24	25	26	27	28	29	30		
31	32	33	34	35	36	37	38	39	40	41	42	43		
44	45	46	47	48	49	50	51	52	53	54	55	56		
57	58	59	60	61	62	63	64	65	66	67	68	69		
70	71	72	73	74	75	76	77	78	79	80	81	82		
83	84	85	86	87	88	89	90	91	92	93	94	95		

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CENSUS 1981 SMALL AREA STATISTICS
PAGE 3
100%

ED #	ED #	ED #	Households with persons aged 16 or over in private households		Persons in households		Persons aged 16 or over in private households	
			Households with persons aged 16 or over in private households	Persons aged 16 or over in private households	Persons in households	Persons aged 16 or over in private households		
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90

18 Private households with residents: Residents

Households with the following adults *	Households with persons aged 0-15		Persons aged 0-15		Persons aged 16 or over in private households		Persons aged 16 or over in private households	
	Households with no persons aged 0-15	Persons aged 0-15	Households with two or more persons aged 0-15	Persons aged 0-15	Households with one person aged 0-15	Persons aged 0-15	Households with no persons aged 0-15	Persons aged 0-15
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90

19 Married women resident in private households

Economic position	Males		Females		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	SMD	Mrc'd					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

20 Residents aged 16 or over in private households

Economic position	Males		Females		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	SMD	Mrc'd					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

21 Residents in private households

Economic position	Males		Females		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	SMD	Mrc'd					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

22 Private households with residents: residents aged 16 or over

Households with the following adults *	Persons aged 0-15		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	Households with no persons aged 0-15	Persons aged 0-15					
1	2	3	4	5	6	7	8
10	11	12	13	14	15	16	17
19	20	21	22	23	24	25	26
28	29	30	31	32	33	34	35
37	38	39	40	41	42	43	44
46	47	48	49	50	51	52	53
55	56	57	58	59	60	61	62
64	65	66	67	68	69	70	71
73	74	75	76	77	78	79	80
82	83	84	85	86	87	88	89
90							

23 Married women resident in private households

Age	TOTAL PERSONS		Married women in empl.		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	Work	W/Time					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

24 Residents aged 16-24 in private households

Age	Males		Females		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	SMD	Mrc'd					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

25 Residents aged 0-15 in private households

Age	Males		Females		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	SMD	Mrc'd					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

26 Residents in private households

Age	Males		Females		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	SMD	Mrc'd					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

27 Residents in private households: residents aged 16 or over

Age	Males		Females		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	SMD	Mrc'd					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

28 Residents in private households: residents aged 16 or over

Age	Males		Females		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	SMD	Mrc'd					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90

29 Residents in private households: residents aged 16 or over

Age	Males		Females		TOTAL PERSONS	Age	TOTAL PERSONS	Males	Females
	SMD	Mrc'd	SMD	Mrc'd					
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31</									

4 DEC 1980

CENSUS 1981 SMALL AREA STATISTICS							NOTES																																																																																																																																																																																																																																																						
PAGE 4 100%							#Persons aged 16 and over (Tables 27 + 31)																																																																																																																																																																																																																																																						
ED No							#Inc households with 80 persons usually resident aged 16 and over (Table 29)																																																																																																																																																																																																																																																						
Map Reference							*Inc renting from LAs, New Town Corporations and Scottish Special Housing Assoc (Table 29)																																																																																																																																																																																																																																																						
Note: 1 = ED same as in 1971 IS = Special Enumeration District							*Inc renting from LAs, New Town Corporations and Scottish Special Housing Assoc (Table 29)																																																																																																																																																																																																																																																						
Copyright reserved Frame No.							Separate explanatory notes are available																																																																																																																																																																																																																																																						
28 Private households with residents not in self-contained accommodation; rooms in such households							27 Lone adults / resident in private households of one adult with residents aged 0-15, number of persons aged 0-15 in such households																																																																																																																																																																																																																																																						
<table border="1"> <thead> <tr> <th rowspan="2">Households with the following persons</th> <th colspan="6">H/holds not in self-contained accom</th> <th rowspan="2">TOTAL ROOMS</th> </tr> <tr> <th>TOTAL</th> <th>One or more persons per rm</th> <th>Bath + inside WC excl</th> <th>Lack bath</th> <th>Lack inside WC</th> <th>No car</th> </tr> </thead> <tbody> <tr> <td>TOTAL</td> <td>2224</td> <td>2228</td> <td>2232</td> <td>2233</td> <td>2234</td> <td>2248</td> <td>2244</td> </tr> <tr> <td>1 person</td> <td>2225</td> <td>2229</td> <td>2235</td> <td>2236</td> <td>2237</td> <td>2249</td> <td>2245</td> </tr> <tr> <td>2 persons</td> <td>2226</td> <td>2230</td> <td>2238</td> <td>2239</td> <td>2240</td> <td>2250</td> <td>2246</td> </tr> <tr> <td>3+ persons</td> <td>2227</td> <td>2231</td> <td>2241</td> <td>2242</td> <td>2243</td> <td>2251</td> <td>2247</td> </tr> </tbody> </table>							Households with the following persons	H/holds not in self-contained accom						TOTAL ROOMS	TOTAL	One or more persons per rm	Bath + inside WC excl	Lack bath	Lack inside WC	No car	TOTAL	2224	2228	2232	2233	2234	2248	2244	1 person	2225	2229	2235	2236	2237	2249	2245	2 persons	2226	2230	2238	2239	2240	2250	2246	3+ persons	2227	2231	2241	2242	2243	2251	2247	<table border="1"> <thead> <tr> <th rowspan="2">In households with child(ren):</th> <th colspan="3">Male lone 'parents'</th> <th colspan="3">Female lone 'parents'</th> </tr> <tr> <th>Econ active</th> <th>In employment</th> <th></th> <th>Econ active</th> <th>In employment</th> <th></th> </tr> </thead> <tbody> <tr> <td>Aged 0-4 with or w/out any aged 5-15</td> <td>2194</td> <td>2195</td> <td>2200</td> <td>2201</td> <td>2202</td> <td>2209</td> <td>2210</td> <td>2215</td> <td>2216</td> <td>2217</td> </tr> <tr> <td>Aged 5-15 only</td> <td>2196</td> <td>2197</td> <td>2203</td> <td>2204</td> <td>2205</td> <td>2211</td> <td>2212</td> <td>2218</td> <td>2219</td> <td>2220</td> </tr> <tr> <td>TOTAL PERSONS AGED 0-15</td> <td>2198</td> <td>2199</td> <td>2206</td> <td>2207</td> <td>2208</td> <td>2213</td> <td>2214</td> <td>2221</td> <td>2222</td> <td>2223</td> </tr> </tbody> </table>		In households with child(ren):	Male lone 'parents'			Female lone 'parents'			Econ active	In employment		Econ active	In employment		Aged 0-4 with or w/out any aged 5-15	2194	2195	2200	2201	2202	2209	2210	2215	2216	2217	Aged 5-15 only	2196	2197	2203	2204	2205	2211	2212	2218	2219	2220	TOTAL PERSONS AGED 0-15	2198	2199	2206	2207	2208	2213	2214	2221	2222	2223																																																																																																																																																									
Households with the following persons	H/holds not in self-contained accom							TOTAL ROOMS																																																																																																																																																																																																																																																					
	TOTAL	One or more persons per rm	Bath + inside WC excl	Lack bath	Lack inside WC	No car																																																																																																																																																																																																																																																							
TOTAL	2224	2228	2232	2233	2234	2248	2244																																																																																																																																																																																																																																																						
1 person	2225	2229	2235	2236	2237	2249	2245																																																																																																																																																																																																																																																						
2 persons	2226	2230	2238	2239	2240	2250	2246																																																																																																																																																																																																																																																						
3+ persons	2227	2231	2241	2242	2243	2251	2247																																																																																																																																																																																																																																																						
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	Econ active	In employment		Econ active	In employment																																																																																																																																																																																																																																																								
Aged 0-4 with or w/out any aged 5-15	2194	2195	2200	2201	2202	2209	2210	2215	2216	2217																																																																																																																																																																																																																																																			
Aged 5-15 only	2196	2197	2203	2204	2205	2211	2212	2218	2219	2220																																																																																																																																																																																																																																																			
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age	1+	2255	2286	2287	2288	2289	2290	2291	2292	2293	2345	Mr'd male with arr'd female	0	2256	2294	2295	2296	2297	2298	2299	2300	2301	2346	without others	1+	2257	2302	2303	2304	2305	2306	2307	2308	2309	2347	3+, Mr'd male(s) with arr'd female(s) with/without others	0	2258	2310	2311	2312	2313	2314	2315	2316	2317	2348	1+	1+	2259	2318	2319	2320	2321	2322	2323	2324	2325	2349	2+ Others	0	2260	2326	2327	2328	2329	2330	2331	2332	2333	2350	1+	1+	2261	2334	2335	2336	2337	2338	2339	2340	2341	2351	Households containing pers of pens age only (any number)	0	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	Persons aged 0-4		2362	2366	2367	2368	2369	2370	2371	2372	2373	2398	Persons aged 5-15		2363	2374	2375	2376	2377	2378	2379	2380	2381	2399	Pers of pensionable age up to and including 74		2364	2382	2383	2384	2385	2386	2387	2388	2389	2400	Persons aged 75+		2365	2390	2391	2392	2393	2394	2395	2396	2397	2401	<table border="1"> <thead> <tr> <th colspan="7">Households with migrants</th> </tr> <tr> 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Total persons 75+	2572	2576	2584	2585	2586	2592	2596																																																																																																																																																																																																																																																						
Total persons 85+	2573	2577	2587	2588	2589	2593	2597																																																																																																																																																																																																																																																						
<table border="1"> <thead> <tr> <th colspan="7">Households with 3 or more persons 0-15</th> </tr> <tr> <th>Households</th> <th>Adults*</th> <th>Persons 0-4</th> <th>Persons 5-15</th> <th>Other h/holds with persons 0-15</th> <th>Adults*</th> <th>Persons 0-4</th> <th>Persons 5-15</th> </tr> </thead> <tbody> <tr> <td>2444</td> <td>2453</td> <td>2462</td> <td>2463</td> <td>2466</td> <td>2470</td> <td>2491</td> <td>2500</td> </tr> <tr> <td>2445</td> <td>2454</td> <td>2465</td> <td>2466</td> <td>2467</td> <td>2471</td> <td>2492</td> <td>2501</td> </tr> <tr> <td>2446</td> <td>2455</td> <td>2468</td> <td>2469</td> <td>2470</td> <td>2474</td> <td>2495</td> <td>2503</td> </tr> <tr> <td>2447</td> <td>2456</td> <td>2471</td> <td>2472</td> <td>2473</td> <td>2477</td> <td>2498</td> <td>2504</td> </tr> <tr> <td>2448</td> <td>2457</td> <td>2474</td> <td>2475</td> <td>2476</td> <td>2480</td> <td>2481</td> <td>2482</td> </tr> <tr> <td>2449</td> <td>2458</td> <td>2477</td> <td>2478</td> <td>2479</td> <td>2482</td> <td>2483</td> <td>2484</td> </tr> <tr> <td>2450</td> <td>2459</td> <td>2480</td> <td>2481</td> <td>2482</td> <td>2485</td> <td>2486</td> <td>2487</td> </tr> <tr> <td>2451</td> <td>2460</td> <td>2483</td> <td>2484</td> <td>2485</td> <td>2488</td> <td>2489</td> <td>2490</td> </tr> <tr> <td>2452</td> <td>2461</td> <td>2486</td> <td>2487</td> <td>2488</td> <td>2491</td> <td>2492</td> <td>2493</td> </tr> </tbody> </table>							Households with 3 or more persons 0-15							Households	Adults*	Persons 0-4	Persons 5-15	Other h/holds with persons 0-15	Adults*	Persons 0-4	Persons 5-15	2444	2453	2462	2463	2466	2470	2491	2500	2445	2454	2465	2466	2467	2471	2492	2501	2446	2455	2468	2469	2470	2474	2495	2503	2447	2456	2471	2472	2473	2477	2498	2504	2448	2457	2474	2475	2476	2480	2481	2482	2449	2458	2477	2478	2479	2482	2483	2484	2450	2459	2480	2481	2482	2485	2486	2487	2451	2460	2483	2484	2485	2488	2489	2490	2452	2461	2486	2487	2488	2491	2492	2493																																																																																																																																																																
Households with 3 or more persons 0-15																																																																																																																																																																																																																																																													
Households	Adults*	Persons 0-4	Persons 5-15	Other h/holds with persons 0-15	Adults*	Persons 0-4	Persons 5-15																																																																																																																																																																																																																																																						
2444	2453	2462	2463	2466	2470	2491	2500																																																																																																																																																																																																																																																						
2445	2454	2465	2466	2467	2471	2492	2501																																																																																																																																																																																																																																																						
2446	2455	2468	2469	2470	2474	2495	2503																																																																																																																																																																																																																																																						
2447	2456	2471	2472	2473	2477	2498	2504																																																																																																																																																																																																																																																						
2448	2457	2474	2475	2476	2480	2481	2482																																																																																																																																																																																																																																																						
2449	2458	2477	2478	2479	2482	2483	2484																																																																																																																																																																																																																																																						
2450	2459	2480	2481	2482	2485	2486	2487																																																																																																																																																																																																																																																						
2451	2460	2483	2484	2485	2488	2489	2490																																																																																																																																																																																																																																																						
2452	2461	2486	2487	2488	2491	2492	2493																																																																																																																																																																																																																																																						

16 APRIL 1982

CENSUS 1981 SMALL AREA STATISTICS
PAGE 5
10%

44 Residents aged 18 or over in employment (10% sample)

Socio-economic group (SEC)	Industry					TOTAL EMPLOYMENT	Working full time	Working part time	Working dist of residence
	Agric	Energy and water	Manuf	Const and Catering	Trans-Port Services				
1	4223	4224	4225	4226	4227	4228	4229	4230	4231
2	4231	4232	4233	4234	4235	4236	4237	4238	4239
3	4239	4240	4241	4242	4243	4244	4245	4246	4247
4	4249	4248	4249	4250	4251	4252	4253	4254	4255
5	4259	4260	4261	4262	4263	4264	4265	4266	4267
6	4271	4272	4273	4274	4275	4276	4277	4278	4279
7	4281	4282	4283	4284	4285	4286	4287	4288	4289
8	4291	4292	4293	4294	4295	4296	4297	4298	4299
9	4301	4302	4303	4304	4305	4306	4307	4308	4309
10	4311	4312	4313	4314	4315	4316	4317	4318	4319
11	4321	4322	4323	4324	4325	4326	4327	4328	4329
12	4331	4332	4333	4334	4335	4336	4337	4338	4339
13	4341	4342	4343	4344	4345	4346	4347	4348	4349
14	4351	4352	4353	4354	4355	4356	4357	4358	4359
15	4361	4362	4363	4364	4365	4366	4367	4368	4369
16	4371	4372	4373	4374	4375	4376	4377	4378	4379
17	4381	4382	4383	4384	4385	4386	4387	4388	4389
18	4391	4392	4393	4394	4395	4396	4397	4398	4399
19	4401	4402	4403	4404	4405	4406	4407	4408	4409
20	4411	4412	4413	4414	4415	4416	4417	4418	4419
21	4421	4422	4423	4424	4425	4426	4427	4428	4429
22	4431	4432	4433	4434	4435	4436	4437	4438	4439
23	4441	4442	4443	4444	4445	4446	4447	4448	4449
24	4451	4452	4453	4454	4455	4456	4457	4458	4459
25	4461	4462	4463	4464	4465	4466	4467	4468	4469
26	4471	4472	4473	4474	4475	4476	4477	4478	4479
27	4481	4482	4483	4484	4485	4486	4487	4488	4489
28	4491	4492	4493	4494	4495	4496	4497	4498	4499
29	4501	4502	4503	4504	4505	4506	4507	4508	4509
30	4511	4512	4513	4514	4515	4516	4517	4518	4519
31	4521	4522	4523	4524	4525	4526	4527	4528	4529
32	4531	4532	4533	4534	4535	4536	4537	4538	4539
33	4541	4542	4543	4544	4545	4546	4547	4548	4549
34	4551	4552	4553	4554	4555	4556	4557	4558	4559
35	4561	4562	4563	4564	4565	4566	4567	4568	4569
36	4571	4572	4573	4574	4575	4576	4577	4578	4579
37	4581	4582	4583	4584	4585	4586	4587	4588	4589
38	4591	4592	4593	4594	4595	4596	4597	4598	4599
39	4601	4602	4603	4604	4605	4606	4607	4608	4609
40	4611	4612	4613	4614	4615	4616	4617	4618	4619
41	4621	4622	4623	4624	4625	4626	4627	4628	4629
42	4631	4632	4633	4634	4635	4636	4637	4638	4639
43	4641	4642	4643	4644	4645	4646	4647	4648	4649
44	4651	4652	4653	4654	4655	4656	4657	4658	4659
45	4661	4662	4663	4664	4665	4666	4667	4668	4669
46	4671	4672	4673	4674	4675	4676	4677	4678	4679
47	4681	4682	4683	4684	4685	4686	4687	4688	4689
48	4691	4692	4693	4694	4695	4696	4697	4698	4699
49	4701	4702	4703	4704	4705	4706	4707	4708	4709
50	4711	4712	4713	4714	4715	4716	4717	4718	4719
51	4721	4722	4723	4724	4725	4726	4727	4728	4729
52	4731	4732	4733	4734	4735	4736	4737	4738	4739
53	4741	4742	4743	4744	4745	4746	4747	4748	4749
54	4751	4752	4753	4754	4755	4756	4757	4758	4759
55	4761	4762	4763	4764	4765	4766	4767	4768	4769
56	4771	4772	4773	4774	4775	4776	4777	4778	4779
57	4781	4782	4783	4784	4785	4786	4787	4788	4789
58	4791	4792	4793	4794	4795	4796	4797	4798	4799
59	4801	4802	4803	4804	4805	4806	4807	4808	4809
60	4811	4812	4813	4814	4815	4816	4817	4818	4819
61	4821	4822	4823	4824	4825	4826	4827	4828	4829
62	4831	4832	4833	4834	4835	4836	4837	4838	4839
63	4841	4842	4843	4844	4845	4846	4847	4848	4849
64	4851	4852	4853	4854	4855	4856	4857	4858	4859
65	4861	4862	4863	4864	4865	4866	4867	4868	4869
66	4871	4872	4873	4874	4875	4876	4877	4878	4879
67	4881	4882	4883	4884	4885	4886	4887	4888	4889
68	4891	4892	4893	4894	4895	4896	4897	4898	4899
69	4901	4902	4903	4904	4905	4906	4907	4908	4909
70	4911	4912	4913	4914	4915	4916	4917	4918	4919
71	4921	4922	4923	4924	4925	4926	4927	4928	4929
72	4931	4932	4933	4934	4935	4936	4937	4938	4939
73	4941	4942	4943	4944	4945	4946	4947	4948	4949
74	4951	4952	4953	4954	4955	4956	4957	4958	4959
75	4961	4962	4963	4964	4965	4966	4967	4968	4969
76	4971	4972	4973	4974	4975	4976	4977	4978	4979
77	4981	4982	4983	4984	4985	4986	4987	4988	4989
78	4991	4992	4993	4994	4995	4996	4997	4998	4999
79	5001	5002	5003	5004	5005	5006	5007	5008	5009
80	5011	5012	5013	5014	5015	5016	5017	5018	5019
81	5021	5022	5023	5024	5025	5026	5027	5028	5029
82	5031	5032	5033	5034	5035	5036	5037	5038	5039
83	5041	5042	5043	5044	5045	5046	5047	5048	5049
84	5051	5052	5053	5054	5055	5056	5057	5058	5059
85	5061	5062	5063	5064	5065	5066	5067	5068	5069
86	5071	5072	5073	5074	5075	5076	5077	5078	5079

45 Residents; private households with residents (100% - 10% sample)

Sex and age	Industry					TOTAL EMPLOYMENT	Working full time	Working part time	Working dist of residence
	Agric	Energy and water	Manuf	Const	Catering				
1	4430	4431	4432	4433	4434	4435	4436	4437	4438
2	4440	4441	4442	4443	4444	4445	4446	4447	4448
3	4450	4451	4452	4453	4454	4455	4456	4457	4458
4	4460	4461	4462	4463	4464	4465	4466	4467	4468
5	4470	4471	4472	4473	4474	4475	4476	4477	4478
6	4480	4481	4482	4483	4484	4485	4486	4487	4488
7	4490	4491	4492	4493	4494	4495	4496	4497	4498
8	4500	4501	4502	4503	4504	4505	4506	4507	4508
9	4510	4511	4512	4513	4514	4515	4516	4517	4518
10	4520	4521	4522	4523	4524	4525	4526	4527	4528
11	4530	4531	4532	4533	4534	4535	4536	4537	4538
12	4540	4541	4542	4543	4544	4545	4546	4547	4548
13	4550	4551	4552	4553	4554	4555	4556	4557	4558
14	4560	4561	4562	4563	4564	4565	4566	4567	4568
15	4570	4571	4572	4573	4574	4575	4576	4577	4578
16	4580	4581	4582	4583	4584	4585	4586	4587	4588
17	4590	4591	4592	4593	4594	4595	4596	4597	4598
18	4600	4601	4602	4603	4604	4605	4606	4607	4608
19	4610	4611	4612	4613	4614	4615	4616	4617	4618
20	4620	4621	4622	4623	4624	4625	4626	4627	4628
21	4630	4631	4632	4633	4634	4635	4636	4637	4638
22	4640	4641	4642	4643	4644	4645	4646	4647	4648
23	4650	4651	4652	4653	4654	4655	4656	4657	4658
24	4660	4661	4662	4663	4664	4665	4666	4667	4668
25	4670	4671	4672	4673	4674	4675	4676	4677	4678
26	4680	4681	4682	4683	4684	4685	4686	4687	4688
27	4690	4691	4692	4693	4694	4695	4696	4697	4698
28	4700	4701	4702	4703	4704	4705	4706	4707	4708
29	4710	4711	4712	4713	4714	4715	4716	4717	4718
30	4720	4721	4722	4723	4724	4725	4726	4727	4728
31	4730	4731	4732	4733	4734	4735	4736	4737	4738
32	4740	4741	4742	4743	4744	4745	4746	4747	4748
33	4750	4751	4752	4753	4754	4755	4756	4757	4758
34	4760	4761	4762	4763	4764	4765	4766	4767	4768
35	4770	4771	4772	4773	4774	4775	4776	4777	4778
36	4780	4781	4782	4783	4784	4785	4786	4787	4788
37	4790	4791	4792	4793	4794	4795	4796	4797	4798
38	4800	4801	4802	4803	4804	4805	4806	4807	4808
39	4810	4811	4812	4813	4814	4815	4816	4817	4818
40	4820	4821	4822	4823	4824	4825	4826	4827	4828
41	4830	4831	4832	4833	4834	4835	4836	4837	4838
42	4840</								

1	2	3	4	PAGE 6		CENSUS 1981 SMALL AREA STATISTICS										100%																																													
				5	6	7	8	9	Households					Persons																																															
									10	11	12	13	14	15	16		17	18	19	20	21	22	23	24																																					
25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Map Reference		Notes: # = 1981 name as in 1971, ## = Special Enumeration District, #* = Importing Enumeration District		Crown copyright reserved. Frame No.		Separate explanatory notes are available		The figures in these tables are a 10% sample of the Census		49 Private households with residents: residents, families of resident persons (10% sample)										50 Residents, economically active or retired (10% sample)										51 Residents aged 16 or over in employment (10% sample)										52 Residents in private households, private households (10% sample)										53 Residents economically active but not in employment (10% sample)											

33 Household spaces; permanent buildings; non-permanent accommodations

TOTAL HOUSEHOLD SPACES	Household spaces in permanent buildings with:										Non-perm accom			
	Self-contained accommodation					Not self-contained accommodation								
	Purp- built flats o/side bldg		Sep entr- from o/side bldg		Shared entrance from outside the building		Shared entrance from o/side the building		Shared entrance from o/side the building		Other non-perm accom			
	TOTAL	MC acco	Flats	rooms	2+ rooms	Other	Total	Bed	Other	MC acco	Flats	rooms		
2598	2599	2600	2601	xxx	xxx	xxx	xxx	xxx	xxx	2605	xxx	xxx	2608	2609
2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624
2625	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	2629	xxx	xxx	2632	2633

34 Resident household spaces; rooms; residents in private households

TOTAL ROOMS	Household spaces in permanent buildings										Non-perm accom			
	Purp- built flats o/side bldg					Sep entr- from o/side bldg					Shared entrance from o/side bldg			
	TOTAL	MC acco	Flats	rooms	2+ rooms	Other	Total	Bed	Other	MC acco	Flats	rooms		
2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648
2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663
2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678
2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693
2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708
2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723
2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738
2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753
2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768
2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783
2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798
2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813
2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828
2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843
2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858
2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873
2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888

35 Resident household spaces

TOTAL	Household spaces in permanent buildings										Non-perm accom			
	Purp- built flats o/side bldg					Sep entr- from o/side bldg					Shared entrance from o/side bldg			
	TOTAL	MC acco	Flats	rooms	2+ rooms	Other	Total	Bed	Other	MC acco	Flats	rooms		
2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805
2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820
2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835
2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850
2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865
2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880
2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895
2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910
2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925
2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940
2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955
2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970
2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985
2986	2987	2988	2989	2990	2991	2992	2993	2994	2995	2996	2997	2998	2999	3000

Map Reference
 Note: \$ = ED same as in 1971
 Note: §§ = Special Enumeration District
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 Separate explanatory notes are available

ALL TENURES
 Owner occupied leasehold
 Council, New Town, etc
 Housing Association
 Rented with business
 By virtue of employment
 Other rented unfurnished
 Other rented furnished

Persons usually resident:
 1
 2
 3
 4
 5
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CENSUS 1981 SMALL AREA STATISTICS	
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Note: \$ = ED same as in 1971	
# = Special Enumeration District	
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36 Private households with resident heads born in the New Commonwealth or Pakistan							
Households	New Commonwealth or Pakistani headed households						
	Total	1 or more persons per room	Bath + inside WC excl	Lack bath	Lack inside WC	Not in self-cont accom	No car
Households	2868	2869	2870	2871	2872	2873	2874

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37 Residents in private households																
Birthplace of household head	TOTAL PERSONS	Age and birthplace of persons												TOTAL HEADS OF HOUSEHOLDS		
		All ages		0-4		5-15		16-29		30-44		45 to pensionable age			Pensionable age and over	
		In UK	Outside UK	In UK	Outside UK	In UK	Outside UK	In UK	Outside UK	In UK	Outside UK	In UK	Outside UK		In UK	Outside UK
TOTAL	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2950
UK	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2951
Irish Republic	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2952
New Commonwealth and Pakistan	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2953
Rest of World	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2954

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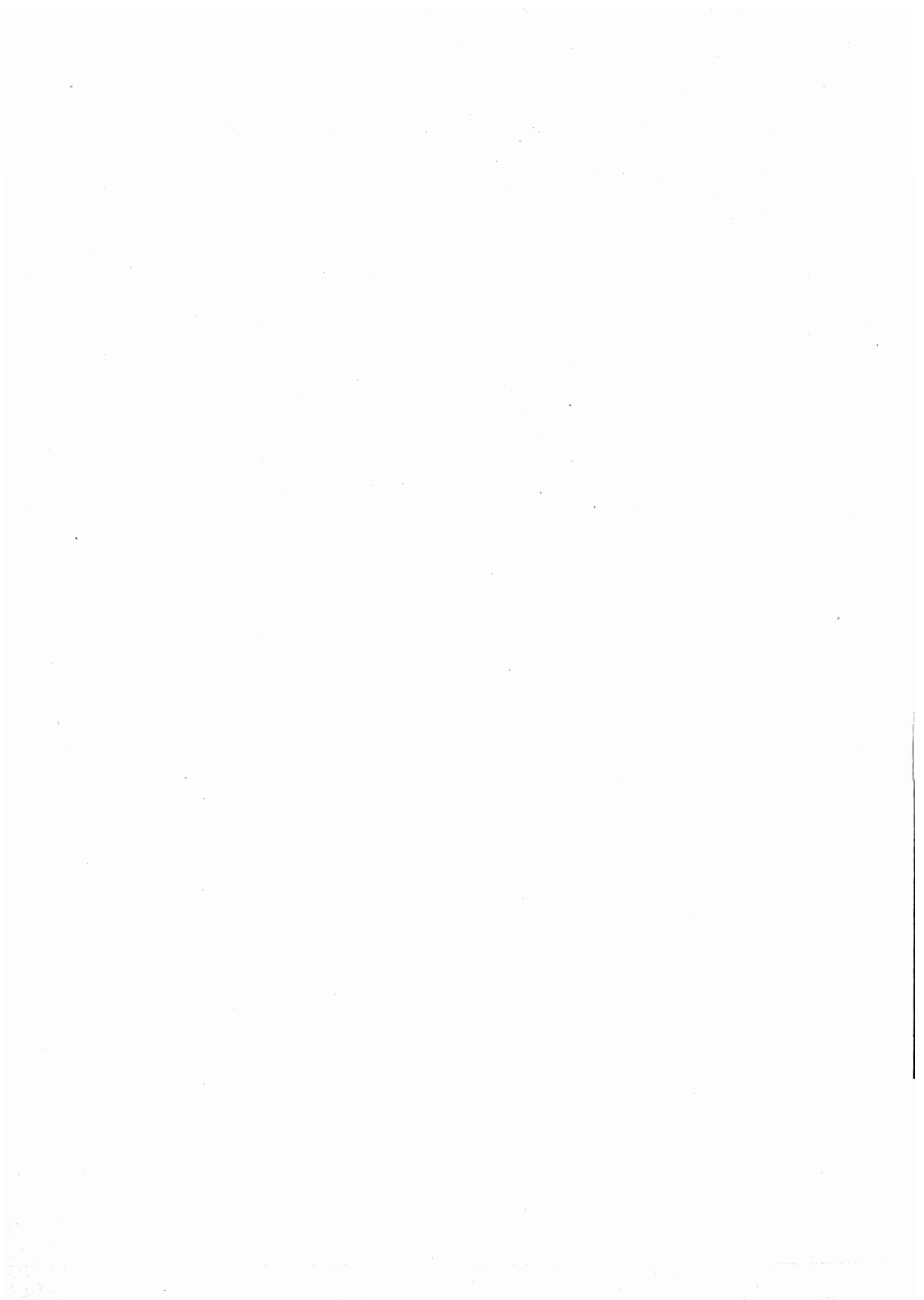
38 Households (H) with residents, rooms and resident persons (P) in owner occupied accommodation in permanent buildings															
Tenure	TOTAL HOUSEHOLDS	Households with the following persons							TOTAL ROOMS	Persons per room	No car				
		1	2	3	4	5	6	7+							
Freehold	2955	2956	2957	2958	2959	2960	2961	2962							
Leasehold	2963	2964	2965	2966	2967	2968	2969	2970							
Tenure	TOTALS	Households with the following rooms							TOTALS	TOTAL ROOMS	Persons per room	No car			
		1	2	3	4	5	6	7+							
F/hold (H/P)	2971	2972	2973	2974	2975	2976	2977	2978	2979						
L/hold (H/P)	2980	2981	2982	2983	2984	2985	2986	2987	xxx						
L/hold (H/P)	2989	2990	2991	2992	2993	2994	2995	2996	2997						
L/hold (H/P)	2998	2999	3000	3001	3002	3003	3004	3005	xxx						
Tenure	TOTALS	Bath and inside WC present		Lack inside WC or WC nor		Neither inside WC nor		Lack bath		Lack inside WC		Share inside WC		Persons per room	No car
		Bath excl	One/bath shared	bath	WC	bath	WC	bath	WC	MC	MC				
F/hold (H/P)	3007	3008	3009	3010	3011	3012	3013	3014	3039	3040	3047				
L/hold (H/P)	3015	3016	3017	3018	3019	3020	3021	3022	3041	3042	3048				
L/hold (H/P)	3023	3024	3025	3026	3027	3028	3029	3030	3043	3044	3049				
L/hold (H/P)	3031	3032	3033	3034	3035	3036	3037	3038	3045	3046	3050				

39 Persons aged 3 or over: Pres & abs h'hold residents						
Age	TOTAL PERSONS	Speaking Welsh				Not Speaking Welsh
		Total	Not Speaking English	Speaking English Reads and writes Welsh	Others	
TOTAL RESIDENTS	3051	3052	3053	3054	3055	3056
3-4	3057	3058	3059	3060	3061	3062
5-15	3063	3064	3065	3066	3067	3068
16-24	3069	3070	3071	3072	3073	3074
25-44	3075	3076	3077	3078	3079	3080
45-64	3081	3082	3083	3084	3085	3086
65+	3087	3088	3089	3090	3091	3092
Present residents and visitors (1981) (1971 Base)	3093	3094	3095	3096	3097	3098

STUDY TOPIC (v)

Plans for Future Work

Paper prepared by the ECE secretariat.



**PLANS FOR FUTURE WORK ON THE PREPARATION
OF RECOMMENDATIONS FOR THE 1990 ROUND OF POPULATION
AND HOUSING CENSUSES IN THE ECE REGION (a)**

1. In 1977 the Conference of European Statisticians convened four meetings on censuses of population and/or housing (two of which were convened jointly with the ECE Committee on Housing, Building and Planning) to draw up the Recommendations for the 1980 Censuses of Population and Housing in the ECE Region. The recommendations were developed within the framework of the 1980 World Population and Housing Census Programme for censuses to be carried out by countries during the 1975-1984 period. The recommendations for the ECE region which the four meetings drew up were endorsed by the Conference of European Statisticians at its twenty-fifth and twenty-sixth plenary sessions in 1977 and 1978, and by the Committee on Housing, Building and Planning at its thirty-eighth and thirty-ninth sessions in the same years (1). The scope of the 1980 ECE population and housing census recommendations is limited to:

- (i) a list of "basic" topics which countries should cover in their censuses;
- (ii) a list of "additional" topics which countries may wish to consider including in their censuses;
- (iii) recommended definitions and classifications for each of the basic topics;
- (iv) suggested definitions and/or classifications for most of the additional topics; and
- (v) a standard tabulation programme.

2. The secretariat recently commenced work on the preparation of a new set of recommendations for the 1990 round of population and housing censuses in the ECE region (i.e. for censuses to be carried out during the 1985-1994 period).

(a) Report prepared by the ECE Secretariat.

In particular, in the summer of 1983 it issued a questionnaire in which countries were asked to submit information on the extent to which they complied with the 1980 recommendations and to provide suggestions for work to be concentrated on in preparing amended recommendations for the 1990 round of population and housing censuses in the region. This questionnaire was intended *inter alia* to provide the secretariat with concrete indications of whether member countries considered the 1980 recommendations to be deficient in any important ways and of the types of changes that would have to be made to them so that an improved set of recommendations could be prepared for the 1990 round of population and housing censuses. Although work on the in-depth analysis of the responses to this questionnaire is scheduled to commence only in the summer of 1984, the secretariat has examined the responses to the portion of the questionnaire in which countries had been requested to provide suggestions for work to be concentrated on in preparing amended recommendations for the 1990 round of censuses. This examination revealed that:

(i) most countries consider the 1980 recommendations to be generally satisfactory for national and international purposes, and therefore not in need of major revision; and

(ii) comparatively few countries offered concrete suggestions of ways in which the 1980 recommendations should be revised, particularly with reference to the lists of basic topics and to the definitions and classifications that have been recommended for each of the basic topics (2).

3. Since it appears that fewer changes will have to be made to the 1980 recommendations than had to be made to the 1970 recommendations, the secretariat feels that only three meetings may be required to prepare the draft recommendations for the 1990 round of population and housing censuses. These three meetings are planned to be convened under project 12.4.3 (Population and Housing Censuses) of the programme of work of the Conference of European Statisticians. In addition, a fourth meeting is planned to be convened under project 12.4.1 (Framework for the integration of Social and Demographic Statistics) to consider topics which *inter alia* are relevant to the planned future work of the Conference of European Statisticians with respect to the preparation of recommendations for the 1990 round of censuses in the ECE region. The planned (3) dates, types of meetings and terms of reference for these four meetings are summarized below:

(i) Informal Meeting on Censuses of Population (1984/85, with participation by a small group of interested countries) to (i) review difficulties experienced by countries in attempting to comply with the recommendations for the 1980 censuses of population in the ECE region (reports by national rapporteurs and the secretariat); (ii) identify the portions of the recommendations for the 1980 censuses of population in the ECE region that are considered to be in need

of revision; and (iii) elaborate and propose preparatory work to be undertaken by the secretariat and countries for the 1986/87 meeting on population and housing censuses (Project 12.4.3).

(ii) Informal Meeting on Censuses of Housing (1985/86, jointly with the ECE Committee on Housing, Building and Planning, with participation by a small group of interested countries) to (i) review difficulties experienced by countries in attempting to comply with the recommendations for the 1980 censuses of housing in the ECE region (reports by national rapporteurs and the secretariat); (ii) identify the portions of the recommendations for the 1980 censuses of housing in the ECE region that are considered to be in need of revision; and (iii) elaborate and propose preparatory work to be undertaken by the secretariat and countries for the 1986/87 meeting on population and housing censuses (Project 12.4.3).

(iii) Informal Meeting on Socio-economic Group Classifications (1984/85, with participation by a small group of interested countries) to consider the development of a sound socio-economic classification scheme for assigning socio-economic positions to households and to individuals, and capable of being used with data from censuses, household surveys and other sources (Project 12.4.1).

(iv) Meeting on Censuses of Population and Housing (1986/87, jointly with the ECE Committee on Housing Building and Planning, with invitations to be sent to all ECE member countries) to review the results of the informal meetings (including follow-up work) and to review draft recommendations for the 1990 round of censuses of population and housing in the ECE region (terms of reference to be defined later in the light of the results of the informal meetings) (Project 12.4.3).

4. As can be seen from the above, the planned informal meetings in 1984/85 and 1985/86 are viewed by the secretariat as being preparatory meetings for the 1986/87 meeting. The major purposes of the informal meetings are to identify the portions of the 1980 recommendations which ECE member countries would like to have revised, to specify the types of changes that they would like to have incorporated into the 1990 recommendations and to recommend to the Conference further work to be carried out by countries and by the secretariat as input to the preparation of a draft set of recommendations for the 1990 round of censuses which is to be reviewed at the 1986/87 meeting.

5. As noted previously, a small number of ECE countries have already offered some suggestions for ways in which the 1980 recommendations could be amended and improved (see footnote 2), and the detailed analysis of the responses submitted by countries to the secretariat's 1983 questionnaire on population and housing censuses should reveal other possible improvements which could be incorporated into the new set of recommendations. In addition,

the following two suggestions for improvements (relating to population censuses) have been made by recent meetings that have been convened by the Conference of European Statisticians:

(i) improvements could be made to the definitions of households and families contained in the 1980 recommendations (see the report of the January 1983 Informal Meeting on the Co-ordination of Statistics of Households and Families, CES/494, Annex, Section I); and

(ii) work should be undertaken on the development of a sound socio-economic classification scheme which could be used for assigning socio-economic positions to households and to individuals, and which would be capable of being used with data from censuses, household surveys and other sources (see the report of the February 1984 Meeting of the Working Party on the Framework for the integration of Social and Demographic Statistics, CES/WP.34/56, Sections V and IX).

6. The secretariat intends to have the three informal meetings referred to in paragraph 3 above consider all the above suggestions and any other suggestions for improvements which are put forward prior to the dates of the meetings. The informal meetings will also be invited to consider the results of past work and developments in planned future work undertaken by other international organizations which will have a bearing on the content of the recommendations for the 1990 round of censuses (e.g. work undertaken by UNESCO on the International Standard Classification of Education (ISCED) and by the ILO on the definition of labour force, employment and unemployment and on the classifications of occupation (ISCO), status in employment and type of activity).

7. The planned future work to be undertaken by the Conference on the preparation of a new set of recommendations for the 1990 round of population and housing censuses is important because countries will take the new recommendations into account when deciding what types of information to collect in their 1990 census. Countries will also be guided in such decisions by the experiences they had in conducting their last census, including any problems that they may have encountered in attempting to comply with the 1980 recommendations. Since most countries in the ECE region take a population and housing census only once every ten years, the recommendations that the Conference prepares and adopts for the 1990 round of censuses will be one of the important factors which will influence what types of census data will be available for countries in the region until around the year 2000 when member countries would take their next census.

8. In view of these considerations and as input to the important future work in this field planned by the Conference, participants at the Seminar on the Evaluation of Census Results and Methodology will be invited during the seminar:

(i) to describe any difficulties that their countries encountered in attempting to comply with the Recommendations for the 1980 Censuses of Population and Housing in the ECE Region, particularly with reference to the list of "basic" topics, the definitions and classifications recommended for the basic topics and the recommended tabulation programme; and

(ii) to identify those portions of the 1980 recommendations which the secretariat and the participants at the planned informal meetings on population censuses (1984/85) and on housing censuses (1985/86) should pay special attention to in preparatory work they undertake on the revision of the 1980 census recommendations, and particularly concerning any portions of the 1980 recommendations which have not been mentioned in the present note as requiring further work.

In order to facilitate comments along the lines suggested above being put forward by participants at the seminar, delegates to the seminar are invited to examine the recommendations for the 1980 censuses of population and housing in the ECE region contained in the publication referred to in footnote 1 of this note.

(1) The recommendations have been published in *Recommendations for the 1980 Censuses of Population and Housing in the ECE Region* (Statistical Standards and Studies - No. 31, United Nations Publication Sales No. E.78.II.E.6).

(2) Some suggestions were made to improve the definitions and/or classifications of the following *basic* topics: urban, semi-urban and rural areas (derived topic (c)); marital status (topic 5); type of activity (topic 7); occupation (topic 8); and socio-economic status (derived topic (d)).

(3) The secretariat anticipates that the Conference of European Statisticians will finalize the plans for meetings (i), (ii) and (iii) at its forthcoming plenary session (Geneva, June 1984), and for meeting (iv) at its 1986 plenary session on the basis of its review of the results of the three earlier meetings.

REPORT OF THE SEMINAR (a)

I. INTRODUCTION

1. The Seminar on the Evaluation of Census Results and Methodology was held in Rome, Italy, from 7 to 11 May 1984, at the invitation of the Government of Italy and in co-operation with the Italian Central Institute of Statistics (ISTAT).

2. The purpose of the Seminar was to provide a forum for countries in the ECE region to review miscellaneous problems that member countries had encountered in undertaking their most recent censuses of population and housing to exchange views on the methodologies and procedures that had been used in the censuses and to evaluate the results that were obtained from the various census operations.

3. Opening addresses were delivered by Mr G. d'Amato, Under-Secretary of State to the Presidency of the Council of Ministers, on behalf of the Government of Italy, Prof. G.M. Rey, President of the Central Statistical Office of Italy; and Mr W. Haeder, Director of the Statistical Division of the Economic Commission for Europe.

4. The Seminar was attended by participants from: Austria; Belgium; Bulgaria; Canada; Czechoslovakia; Denmark; Finland; France; German Democratic Republic; Germany, Federal Republic of; Hungary; Ireland; Italy; Netherlands; Norway; Poland; Portugal; Spain; Sweden; Switzerland; Turkey; United Kingdom and United States. Representatives of the Holy Sea attended the Seminar under the provisions of article VIII of the terms of reference of the Economic Commission for Europe. A representative of Israel also attended under the provisions of article XI of the terms of reference of the Economic Commission for Europe. The following international organization was repre-

(a) Report prepared by the ECE Secretariat.

sented: Food and Agriculture Organization. Also present was a representative of the Inter-American Statistical Institute.

5. Mr L. Pinto (Italy) was elected Chairman and Mr F. Whitehead (United Kingdom) was elected Vice-Chairman.

6. The study programme of the Seminar, which had been approved by the Conference of European Statisticians at its thirtieth plenary session in June 1982, included the following items:

(i) problems encountered in the pre-enumeration, enumeration and post-enumeration phases of the census;

(ii) national experiences in the use of sampling in the different phases of the census;

(iii) coverage and content errors;

(iv) statistics for small areas; and

(v) plans for future work on the preparation of recommendations for the 1990 round of population and housing censuses.

7. The Seminar had before it the following documents:

(a) Usage of Sampling Methods in Different Phases of the Censuses of Population and/or Housing Conducted in ECE Countries in or around 1980, prepared by the ECE Secretariat (CES/SEM. 17/2);

(b) Plans for Future Work on the Preparation of Recommendations for the 1990 Round of Population and Housing Censuses in the ECE Region, prepared by the ECE Secretariat (CES/SEM. 17/3);

(c) Problems in the Integration of the Population Census and the System for Civil Registration, prepared by the Committee for the Integrated Social Information System to the Council of Ministers of the People's Republic of Bulgaria (CES/SEM. 17/R.1);

(d) Automatic Processing of the Results of the 1980 Population and Household Census in Czechoslovakia, prepared by the Czechoslovak Federal Statistical Agency (CES/SEM. 17/R.2, in Russian only);

(e) Problems Experienced during the Preliminary, Main and Follow-up Surveys — Problems of the 1983 Population Census in the Federal Republic of Germany, prepared by the Federal Statistical Office of the Federal Republic of Germany (CES/SEM. 17/R.3, in English only);

(f) The 1980 Population and Housing Census of Hungary — Evaluation of the Census Results and Methods, prepared by the Hungarian Central Statistical Office (CES/SEM. 17/R.4, in English only);

(g) Preparatory Work, Data Collection and Other Operations in the 1981 Population Census of Italy, prepared by the Italian Central Institute of Statistics (CES/SEM. 17/R.5, in English only);

(h) Problems Encountered in the Pre-enumeration, Enumeration and

Post-enumeration Phases of the Norwegian Population and Housing Census 1980, prepared by the Central Bureau of Statistics of Norway (CES/SEM. 17/R.6, in English only);

(i) The Influence of Preparatory Work on the Completeness of the Census, prepared by the Central Statistical Office of Poland (CES/SEM. 17/R.7, in English only);

(j) Automated Coding of Occupation and Socio-economic Classification in the 1980 Census of Population, prepared by Statistics Sweden (CES/SEM. 17/R.8, in English only);

(k) Diagrams and Thematic Mapping in the Swedish Population and Housing Census of 1980, prepared by Statistics Sweden (CES/SEM. 17/R.9, in English only);

(l) Preparatory Work in the Field for the 1977 Population and Housing Census in Romania, prepared by the Romanian Central Statistical Office (CES/SEM. 17/R.10, in French only);

(m) The Organization and Conducting of Population Censuses in the Soviet Union, prepared by the Central Statistical Board of the USSR (CES/SEM. 17/R.11, in English and Russian only);

(n) Problems Encountered in Different Phases of the Census — the Case of the United Kingdom, prepared by the Office of Population Censuses and Surveys of the United Kingdom (CES/SEM. 17/R.12);

(o) The Experience of the People's Republic of Bulgaria in a Sample Application at the Different Stages of the Population Census, prepared by the Committee for the Integrated Social Information System to the Council of Ministers of the People's Republic of Bulgaria (CES/SEM. 17/R.13);

(p) The Use of Sampling in the 1981 Census of Canada, prepared by Statistics Canada (CES/SEM. 17/R.14);

(q) National Experience Regarding the Use of Sample Surveys during the Various Phases of Census-taking, prepared by the Federal Statistical Office of the Federal Republic of Germany (CES/SEM. 17/R.15, in English only);

(r) Use of the Sampling Method in the 1981 Census of Population in Italy, prepared by the Central Institute of Statistics of Italy (CES/SEM. 17/R.16, in English only);

(s) Norwegian Experiences in the Use of Sampling in Different Phases of the Census, prepared by the Central Bureau of Statistics of Norway (CES/SEM. 17/R.17, in English only);

(t) Polish Experiences in the Use of Sampling in Population Censuses in 1950-1983, prepared by the Central Statistical Office of Poland (CES/SEM. 17/R.18, in English and Russian only);

(u) Sampling in the 1981 Censuses in the United Kingdom, prepared by

the Office of Population Censuses and Surveys of the United Kingdom (CES/SEM. 17/R.19);

(v) Two Instances of Sample Checking of the Coding and Collection of Data from the French Census of 1982, prepared by the French Institute of Statistics and Economic Studies (INSEE) (CES/SEM. 17/R.20, in English and French only);

(w) Measuring the Quality of Data in the 1981 Census of Population and Housing of Canada, prepared by Statistics Canada (CES/SEM. 17/R.21);

(x) Quality of Census Data in Italy, prepared by the Italian Central Institute of Statistics (CES/SEM. 17/R.22, in English only);

(y) The 1980 Federal Population Census: Ways of Filling in Gaps and Correcting Errors in Individual Forms, prepared by the Federal Statistical Office of Switzerland (CES/SEM. 17/R.23, in French only);

(z) Checks of the Coverage of the 1981 Censuses in the United Kingdom, prepared by the Office of Population Censuses and Surveys of the United Kingdom (CES/SEM. 17/R.24);

(aa) Statistics for Small Areas, prepared by Danmarks Statistik (CES/SEM. 17/R.25, in English only);

(bb) Data Processing and Dissemination at the Microarea Level in the Italian Census, prepared by the Italian Central Institute of Statistics (CES/SEM. 17/R.26, in English only);

(cc) Census Small Area Statistics — the Case of the United Kingdom (CES/SEM. 17/R.27), and Standard Table Layouts and Cell Numbers for Small Area Statistics, Tabulated from 1981 Censuses in the United Kingdom (CES/SEM. 17/R.27/Add. 1, in English only), prepared by the Office of Population Censuses and Surveys of the United Kingdom;

(dd) Preparation and Holding of the Population Census in Czechoslovakia and Processing of the Results, prepared by the Czechoslovak Federal Statistical Agency (CES/SEM. 17/R.28, in Russian only);

(ee) Coverage and Content Errors in the 1980 US Decennial Census, prepared by the United States Bureau of the Census (CES/SEM. 17/R.29, in English only);

(ff) Portions of the Responses to the June 1983 ECE Questionnaire on Population and Housing Censuses Relating to Study Topic (i) of the Seminar, prepared by the ECE Secretariat (CES/SEM. 17/CRP.1);

(gg) Portions of the Responses to the June 1983 ECE Questionnaire on Population and Housing Censuses Relating to Study Topic (iii) of the Seminar, prepared by the ECE Secretariat (CES/SEM. 17/CRP.2).

In addition, copies of the following documents were distributed to participants during the Meeting as background information:

- (i) Census and Small Areas by the National Institute of Statistics of Belgium (in French only);
- (ii) Problems Encountered before, during and after Enumeration in the 1981 Census in Belgium, by the National Institute of Statistics of Belgium (in French only);
- (iii) 1981 Census of Canada Design Effects, by Statistics Canada (in English only);
- (iv) Reverse Record Check Tabulations, by Statistics Canada (in English and French);
- (v) Description of the Danish Population and Housing Census 1981, by Danmarks Statistik (in English only);
- (vi) Control Study in Connection with the 1980 Population and Housing Census of Finland, by the Central Statistical Office of Finland (in English only);
- (vii) The Experiences of the German Democratic Republic in Using the Sampling Method at the Various Stages of the Census of Population, by the Central Statistical Office of the German Democratic Republic (in English only);
- (viii) The Population and Housing Census in the German Democratic Republic 1981, by the Central Statistical Office of the German Democratic Republic (in English only);
- (ix) Methodology of Correcting Errors on Individual Forms in the 1981 Censuses of Population and Housing in Spain, by the Central Statistical Office of Spain (in French only);
- (x) Evaluation of Results in the 1981 Population and Housing Censuses in Spain, by the Central Statistical Office of Spain (in French only);
- (xi) The Census Bureau Looks to 1990, by the US Bureau of the Census (in English only);
- (xii) Overview of Israel's 1983 Census of Population and Housing, by the Central Bureau of Statistics of Israel (in English only);
- (xiii) Quality Control of the Data Capture and Coding, by the Central Bureau of Statistics of Israel (in English only);
- (xiv) The Use of Sampling in the 1983 Census of Population and Housing, by the Central Bureau of Statistics of Israel (in English only).

II. PROBLEMS ENCOUNTERED IN DIFFERENT PHASES OF THE CENSUS

8. The Seminar considered this topic on the basis of reports by Bulgaria (CES/SEM. 17/R.1), Czechoslovakia (CES/SEM. 17/R.2 and R.28), the Federal Republic of Germany (CES/SEM. 17/R.3), Hungary (CES/SEM. 17/R.4), Italy (CES/SEM. 17/R.5), Norway (CES/SEM. 17/R.6), Poland (CES/SEM. 17/R.7),

Romania (CES/SEM. 17/R.10), Sweden (CES/SEM. 17/R.8 and R.9), the USSR (CES/SEM. 17/R.11), the United Kingdom (CES/SEM. 17/R.12), and a note by the ECE secretariat (CES/SEM. 17/CRP.1). Mr R. Barnes of the United Kingdom served as the discussion leader on this topic.

9. The discussion under this study topic revealed that most countries considered their last census to be a success. However, as would be expected in a statistical operation as extensive and complex as a national census, virtually all countries encountered problems and difficulties of one type or another. Although most participants reported that the problems or difficulties were not of major significance, a few representatives stated that the ones which had been encountered in their countries were of considerable importance.

10. In this respect, the participants were informed of the problems encountered by the Federal Statistical Office of the Federal Republic of Germany which had led to the cancellation of the census just prior to its scheduled date.

11. As noted above, most of the problems and difficulties were such that they did not jeopardize the over-all success of the census. Many of these problems and difficulties were technical in nature and related on the whole to particular operational aspects of the census, some of which are described in paragraphs 12-20 below..

12. One source of problems reported by countries relates to the choice of the basic collection method. The decision to employ mail out — mail back, drop off — pick up, interviewer canvassing or some other variation is conditioned by factors such as literacy levels, budgetary considerations, ability to recruit enumerators and the availability of adequate lists of postal addresses.

13. A large number of countries indicated difficulties in obtaining maps that were adequately up-to-date, legible and of sufficiently large scale to be used for enumerator assignments, and that covered the total population living in the area.

14. Despite the method chosen, obtaining complete inner city coverage proved elusive for some countries, which suggested that other techniques might be necessary for future censuses.

15. Some countries spoke of problems in connection with the selection of an appropriate population base to measure, as some countries use several definitions of population and report data on each of them. For example, some participants stated that publishing *de facto*, *de jure* and provisional population figures had led to confusion on the part of the public.

16. Several countries felt that a major reason for under-enumeration was the handling of dwellings that had been reported as vacant when in fact they were occupied but their occupants could never be reached. Possible solutions were proposed such as providing forms to be returned by mail at a later date by the occupants, re-interview by a second enumerator, or the use of imputation.

17. A few countries stated that determining the place of usual residence was problematic when classifying persons with multiple residences, e.g.

students, pensioners and individuals with vacation homes. This suggested that an improved definition of residence might be required for future censuses.

18. A lack of both trained enumerators and staff was cited as another handicap by several delegations. Because of the ten year interval between censuses in his country and the high turnover of personnel, one delegate spoke of the shortage of experienced census staff.

19. In the post-enumeration phase it was noted that a lack of standard software programmes to perform tabulations contributed to delays in the processing and publication of census results. Such delays diminished the usefulness of the data to users because of the rapid population changes in some areas. One country, however, reported on its success in using coding procedures which allowed 72 per cent of the responses relating to the occupation and socio-economic classification to be coded in an automated manner. This procedure proved to be comparatively inexpensive and resulted in a considerable saving of time over the previous manual method, at the same time benefiting from the additional information provided by an occupational description.

20. Several other delegates reported on problems which arose when budgetary limitations were imposed on census operations as part of a general austerity programme. In some cases the statistical offices ran out of money and either postponed or cancelled part of their census programmes.

21. In addition to the technical problems which generally were related to the more operational aspects of the census, a number of other issues arose which had (or had the potential of having) a considerable and possibly significant impact on the census in the countries concerned.

22. Among this latter group of issues, the most important one which was referred to by several participants was the public's perception of the role and place of the census in their country. The discussion which took place on this question revealed that the situation varied markedly from one country to another. For example some participants reported that the population in their countries had a very positive attitude towards the census. One illustration of this which was mentioned in this connection was that in Norway 95 per cent of the census questionnaires had been returned to the statistical office by mail without a reminder being sent to the households concerned. On the other hand, some participants indicated that in their countries segments of the public had reacted negatively to the census. In some cases the criticisms tended to come from specific geographical areas within the country and small numbers of individuals, and therefore their over-all impact on the census was limited. However, in other cases the negative views towards the census tended to be much more widespread, resulting, for example, in the case of the Netherlands, in the Parliament deciding not to take a census in 1981, and in the case of the Federal Republic of Germany in judicial proceedings in which it ultimately was decided to postpone the census. The discussion revealed that the nature of

the criticisms varied from one country to another, and that they generally involved concerns about possible invasion of privacy, lack of confidentiality, the linking of census data to other data sources such as population registers and the use of individual data for administrative purpose in addition to purely statistical ones.

23. The discussion demonstrated that census-taking in countries with administrative registers differed from census-taking in countries without such registers. The participants also discussed how census-taking differed even in countries that have registers. Some participants expressed concern about whether the exchange of information between the census and the registers was one-way or two-way. Most participants felt that it was important that the exchange be one-way, that is, from the register to the census, and that census data should not be used to update the register.

24. The purposes for which census results were used by governments were also cited by some participants as being of special importance in determining the public's attitude toward the census. Several illustrations of this were provided, including the use of census data in distributing federal funds to lower levels of government within the country and for the determination of political representation on the national level. Two participants reported that the use of census data for such purposes had forced the statistical office to appear in court to defend census practices and procedures. One example which was mentioned in this connection related to the United States, where the Bureau of the Census had to defend its position as regards adjustments for under-coverage in the census.

25. In concluding its discussion on this topic, the participants reiterated that despite the various types of problems that had been encountered in different countries, in most cases the census generally was considered to be an overall success. A number of countries attributed the success of their census programmes to a variety of factors, including: the use of straightforward census procedures; the use of short, uncomplicated census forms; the absence of questions which were controversial or might touch public sensitivities; limiting questions to those that were considered essential and could be defended in terms of their relevance using an effective, widespread publicity campaign; promulgating the guarantee of data confidentiality; the early planning of processing and computing systems; and the accumulated experience gained by key staff from previous censuses.

III. USE OF SAMPLING IN DIFFERENT PHASES OF THE CENSUS

26. The Seminar considered this study topic on the basis of reports prepared by Bulgaria (CES/SEM. 17/R.13), Canada (CES/SEM. 17/R.14), the Federal Republic of Germany (CES/SEM. 17/R.15), Italy (CES/SEM. 17/R.16),

Norway (CES/SEM. 17/R.17), Poland (CES/SEM. 17/R.18) and the United Kingdom (CES/SEM. 17/R.19), and a note by the ECE Secretariat (CES/SEM. 17/2). Dr M. Ebert of the German Democratic Republic served as the discussion leader for this topic.

27. The reports presented described many ways in which sampling had been used by countries in the region in the pre-enumeration, enumeration and post-enumeration phases of their population and housing censuses. Many countries reported that they had conducted pilot censuses in the pre-enumeration phase which had been used for a wide range of different purposes such as testing the wording of questions on the census form, evaluating public reaction to the introduction of bilingual questionnaires, designing well-structured forms, testing the application of edit rules, and for determining enumerator pay scales. The discussion revealed that sampling had also been used in some countries in the design of machine-readable forms. One country reported that it had conducted experiments to test the feasibility of using an optical reader in the processing of the census forms, and that the results obtained in the experiment lead it to decide not to use the optical readers.

28. One participant stressed that caution should be exercised in interpreting the results of the census pretests, particularly since his country's experience had been that some census operations functioned smoothly in the census pretest but subsequently failed in the full census.

29. A few countries reported that they had used sampling in the data collection phase of the census by using two types of census forms, a "short" form containing the basic census questions which had to be completed by most households in the country, and a "long" form containing the basic census questions and other supplementary questions which had to be completed by the remaining households that had been selected to receive the long form. The participants noted that two of the important advantages associated with using a combination of long and short forms were that it reduced data collection costs and minimized the respondent burden. The countries which had used this approach in their census reported that some of the questions which had been included on the long census form were questions on migration, fertility and source of income, all of which were topics for which universal coverage of the population was not required and which therefore were particularly appropriate for inclusion on the census long forms. In this respect, a participant stated that his country was considering the possibility of preparing a number of different long forms for use in the next census, with different questions to be answered by different subsamples of the population, one of the purposes being to increase the number of topics covered in the census without increasing the respondent burden.

30. Despite these possible advantages, one participant questioned whether the cost advantage of this data collection technique might arise only where respondents were to return the completed census forms to the statistical office

by mail. Another participant indicated that his country would be reluctant to use a combination of long and short forms, partly because of concern over possible complaints from the public that the statistical office was not treating all residents of the country in the same way. Another participant asked whether the sampling selection procedures used for the long forms would introduce bias into the census results, but a participant from one of the countries which has used the long forms stated that his country had not uncovered any evidence of major bias resulting from the use of this type of sampling in its census.

31. Another important purpose for which sampling methods have been used by some countries is the preparation of advance tabulations of selected topics. Despite the aid of computers in the processing of census results, serious lags exist between the date on which a census is conducted and the date of the publication of total census results. In order to make some of the basic census results available more quickly, some countries reported that they employed sampling techniques to produce advance tabulations for selected topics. This has resulted not only in the user being given access to data sooner, but has also permitted comparisons to be made between provisional figures based on samples and the final results. It was pointed out, however, that a possible disadvantage of advance tabulations is that it may delay the full processing of the census data.

32. A number of delegations reported that the decision to use sampling in the final processing and tabulation of census results was conditioned by cost and time restraints. Because of the substantial coding efforts required for some of the census questions, one country relied upon sampling to process these variables in order to reduce expenditures of time and financial resources. For characteristics which are needed for large areas or for the entire population only, tabulations may be produced more quickly and less expensively through sampling than on a complete basis, and generally with small sampling errors.

33. Another country indicated that only a subsample of questionnaires was selected for coding place of work and migration data as a means of introducing cost reduction measures in coding operations. This raised the prospect that public opinion might be adversely affected if data were collected for the total population, but processed only on a sampling basis, particularly since the public might conclude that unnecessary data had been collected. However, several delegations said that criticisms of this type had not been made in their countries.

34. Several participants stated that they grossed up the results for the users, using raking ratio estimation methods or other procedures, thereby ensuring consistency between the sample estimates and the total counts. However, one country reported that it published its sample results unaltered and left the user to gross them up.

35. Many countries reported that another major purpose for which sampling methods were used was to assess the accuracy of selected census

operations such as coding and keypunching, and also in post-enumeration surveys to provide information on the magnitude and extent of content and coverage errors. The participants agreed that this was an important use of sampling in the census operation because it provided both the users and the producers of the statistics with information which they require on the coverage of the statistics and the quality of the responses given. However, one participant stressed that statistical offices should make greater efforts to determine why various types of errors occur and whether the errors are random or systematic.

36. Several countries reported that another use of sampling was the production of public use samples (e.g. a tape containing data for a sample of the population which is made available to the public). The participants reviewed the major uses of such samples, and stressed the importance of removing all identifying information from the data records before providing the public with access to them.

37. Numerous other issues were raised in the discussion pertaining to sampling, including its possible increasing importance in future censuses, the adequacy and impact of public information campaigns, the choice of sampling frames, the legal basis for sampling and the protection of confidentiality.

IV. COVERAGE AND CONTENT ERRORS

38. The Seminar considered this study topic on the basis of documents submitted by Canada (CES/SEM. 17/R.21), France (CES/SEM. 17/R.20), Italy (CES/SEM. 17/R.22), Switzerland (CES/SEM. 17/R.23), the United Kingdom (CES/SEM. 17/R.24) and a note by the ECE Secretariat (CES/SEM. 17/CRP.2). Mr R. Zasepa of Poland served as the discussion leader for this topic.

39. The importance of controlling the quality of census data was stressed by many participants. It was observed that this was a question of growing concern in all countries, and it was noted that all countries aimed at reducing coverage and content errors in the census to the greatest extent possible and at obtaining as high quality census data as is practical and possible.

40. The discussion revealed that countries in the region used many different techniques, procedures and approaches in the various phases of the census operation in order to help to ensure that data of the desired quality would be obtained from the census. Some of the examples mentioned by participants applicable to the pre-enumeration phase were the conducting of census pre-tests, restricting the length of the questionnaire and designing the census forms so that they would be easy for respondents to fill in. Other examples referred to that were applicable in later phases of the census operation were ensuring that the census forms were filled in as *completely and correctly as possible*, imputing for non-response, testing the accuracy of card punching procedures, validating that the data were captured correctly, and removing errors made by the optical

readers. In addition to using several of these procedures, most countries in the region also assessed the accuracy of their census data by conducting consistency checks, comparing the census results with data from other sources, and conducting post-enumeration surveys or field checks.

41. Several participants described their country's experience in using post-enumeration surveys to check on the accuracy of the census data by comparing responses on the census forms with those given in the follow-up survey. It was agreed that post-enumeration surveys provided statistical offices with a wide range of information on non-sampling errors in the census which could be of considerable use to both producers and users of the statistics.

42. The participants noted with interest that a few countries in the region had used post-enumeration surveys to derive estimates of the extent of under-coverage in their census, including separate estimates of under-coverage for different population groups and geographical areas within the country. The results indicated that higher rates of under-coverage were often found, for example, among young adults and in inner city areas. The participants agreed that producers and users of statistics require information on coverage errors as well as on content errors, and noted that in most countries much less information has been produced on content errors than on coverage errors.

43. Several participants also stressed the importance of making the results of quality checks available at the same time as or as soon as possible after the release of the actual census results. This would enable users to be informed promptly of errors in the census, and also provide statisticians with additional time to improve the procedures to be used in the next census. The participants also agreed on the need of elaborating additional ways of presenting more detailed information from the quality checks to users.

44. It was also pointed out that statistical offices would make the census results more valuable to users if they imputed answers for missing data, thereby removing the temptation for users to treat this in their own manner. There was general agreement that statistical offices were better equipped for this task because of their access to more information which could be used for this purpose.

45. Another issue raised concerning the evaluation process was the costs involved in assessing the quality of the data and the optimal distribution of resources among various activities such as census design, control and error measurement. In this connection, most countries reported that they did not have such a breakdown of costs. One participant also suggested that even though the financial costs associated with quality checks can be high in a census, expenditures of this type are often warranted because of the important administrative purposes for which census data are used by Governments.

V. STATISTICS FOR SMALL AREAS

46. The Seminar had before it, for consideration of this study topic, papers prepared by Denmark (CES/SEM. 17/R.25), Italy (CES/SEM. 17/R.26) and the United Kingdom (CES/SEM. 17/R.27 and Add. 1). Mr G. Brackstone (Canada) served as the discussion leader for this topic.

47. The participants agreed that censuses constitute, and will continue to constitute in the near future, the main source of information on small areas in the majority of the countries of the region, as they provide detailed information on a large number of subjects that population registers and other administrative sources are generally unable to provide. The request for statistics for small areas is continuously increasing and comes not only from local authorities, planners and social researchers, but also from business circles, which use the data for market research and various other purposes.

48. Several problems relating to the collection of data for small areas were identified during discussion. One related to the choice of the definition of the smallest area for which the data would be available. Several countries reported using the enumeration district as a pre-defined micro-area for the compilation of small area statistics. In other cases, grid squares were used; it was noted that, while this method presents the advantage of consistency over time, it had the disadvantage of a very large variance in the number of households and individuals present in each area. Mention was also made of the use of postal codes as a basis for compiling small area statistics. It was agreed that the most flexible method was probably the use of geographical co-ordinates, which allows the grouping of individual data according to any area definition that might be required, but it was mentioned that the costs involved were relatively high. It was however observed that if the initial investment was high, the co-ordinates could be used for several surveys and that this method also ensured consistency over time.

49. Another problem in the compilation of statistics for small areas concerns the protection of confidentiality. Several methods were mentioned as being used by national statistical offices for this purpose, such as defining a minimum number of households or persons that should be included in the area, suppressing sensitive cells, and introducing random disturbances in the value of the individual cells.

50. Ensuring the quality of the data for small areas was also mentioned as an important problem, particularly for data obtained through sampling procedures, where the number of units included in the sample for a given area may be very low. Even errors other than sampling errors may have a larger influence on data for small areas than on global data; in addition, any error in data for small areas is more likely to be pointed out by the users than a similar error for the whole country.

51. The choice of the method employed for disseminating data on small

areas was also viewed as a very important factor. Considering the large amount of data involved and the limited number of users interested in the tables for a given area, several statistical offices have decided to discontinue publishing all the tables for small areas on paper, and instead either to provide printed tabulations to users upon request, or provide them with data on computer-readable forms. One country reported making the individual data available to local authorities, after having made them unidentifiable, so that they could be used for whatever purpose the local authorities considered useful.

52. During discussion, some participants reported encountering more difficulties in coding place of work than in coding place of residence, the latter being often pre-coded on the census forms. It was however stressed that information on both was necessary for studying commuting patterns, which are required for traffic planning and for social research.

53. Several participants stressed the importance of being able to use data from registers and other administrative sources for updating the census results, in order to obtain data on small areas that reflect the rapid changes in several phenomena.

VI. PLANS FOR FUTURE WORK ON CENSUS RECOMMENDATIONS

54. The Seminar conducted its discussion on this topic on the basis of a note by the Secretariat (CES/SEM. 17/3).

55. The participants were informed of the work which the Conference is expected to undertake during the next few years on the preparation of an updated set of recommendations for the 1990 round of population and housing censuses in the ECE region. They were also informed that some countries had previously provided the Secretariat with suggestions concerning possible revisions to the list of basic topics and to the recommended definitions and classifications of these topics when they responded to the Secretariat's 1983 questionnaire on population and housing censuses. The participants noted that these included suggestions to improve the definitions and/or classifications of the following basic topics: urban, semi-urban and rural areas; marital status; type of activity; and socio-economic activity. They also noted that earlier meetings convened by the Conference had suggested that improvements be made to the definitions of households and families contained in the 1980 recommendations, and that work be undertaken on the development of a sound socio-economic classification scheme for use with census data, which could be used for assigning socio-economic positions to households and to individuals.

56. There was general agreement among the participants that there appeared to be no major gaps in the work planned to be undertaken by the Conference on the preparation of a new set of recommendations for the 1990 round of censuses in the region. However, during discussion, two additional

suggestions concerning possible revisions to the 1980 recommendations were put forward, namely, to improve the definition of place of usual residence and to clarify how part-time workers and the unemployed are to be treated in the census. In addition, one participant stressed the importance of completing the work on the new set of recommendations in time for them to be taken into account in planning the Programme for the 1990 World Census of Agriculture.

57. Reference was also made to the increasing tendency of some countries in the region to rely more heavily on registers as partial or total substitutes for censuses. The participants noted that this might make it more difficult for some of these countries to comply as fully with the census recommendations in the future.

58. One participant stated under this item that it would be useful for countries in the region to have copies of technical documentation such as census manuals from the other countries, and suggested therefore that the Conference consider organizing an exchange of such information among member countries.

59. The Seminar was informed that an earlier session of the Working Party on EDP had recommended to the Conference that a joint meeting be held between EDP specialists and specialists in population and housing censuses to consider computer-related aspects of population and housing censuses, and that the secretariat had envisaged the possibility of such a meeting being convened by the Conference around 1987 or 1988. There was general agreement among the participants that this type of joint meeting would be very useful, but several participants stressed the advisability of holding it within the next 12-18 months because the computer plans for the next census will have to be finalized shortly after that.

VII. OTHER BUSINESS

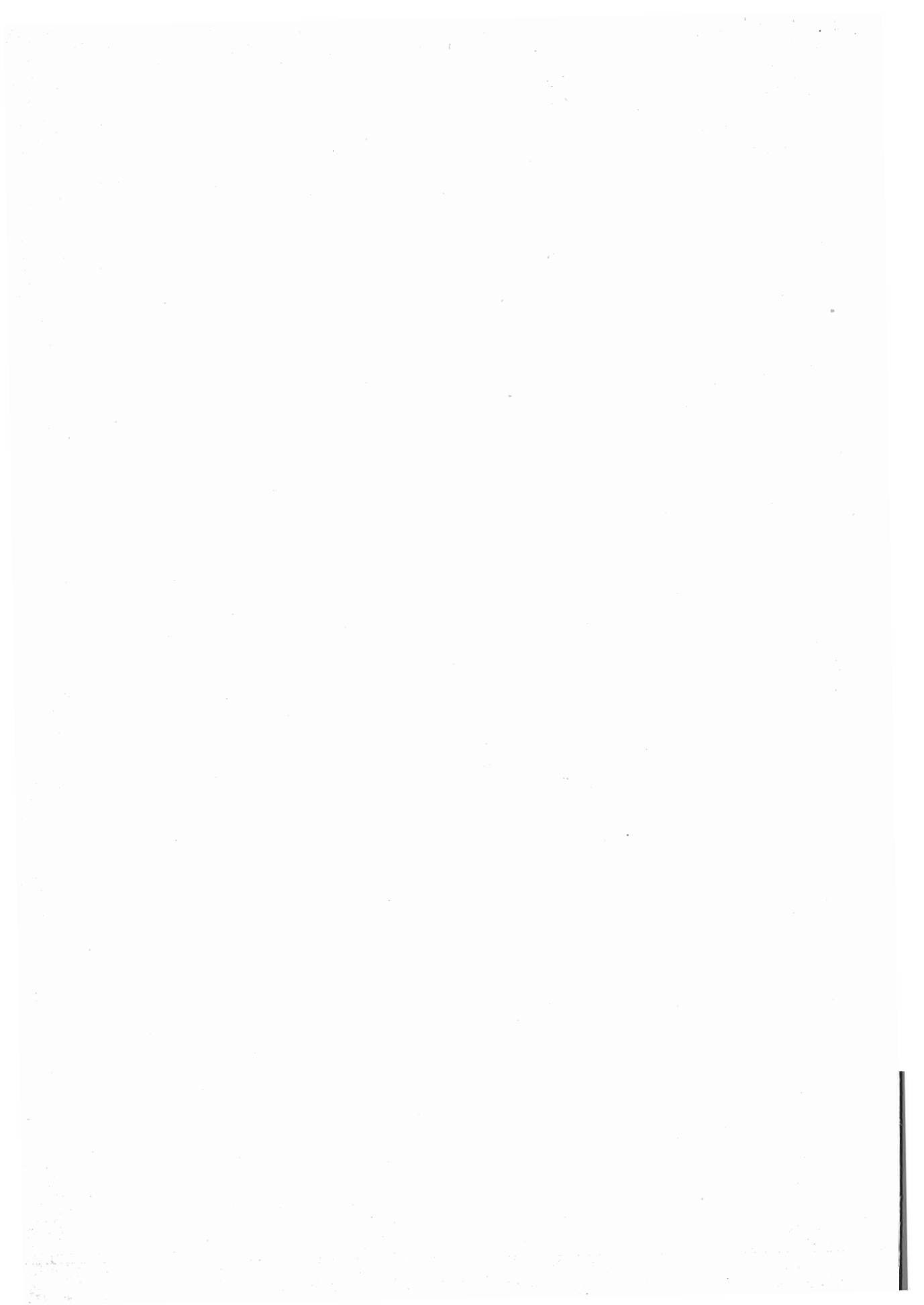
60. The Seminar expressed its thanks to the authors of the national reports and to the four discussion leaders for their respective roles in stimulating a fruitful discussion of each of the study topics. Participants agreed that the exchange of experience that had taken place at the Seminar had been very useful and suggested to the Conference that consideration be given to the possibility of organizing this type of meeting again in the future.

61. The participants expressed their warm appreciation to the Government of Italy and to ISTAT for hosting the meeting, for the facilities they had provided and for the hospitality which had been extended to them.

VIII. ADOPTION OF THE REPORT

62. The Seminar adopted the present report at its closing session.

OTHER DOCUMENTATION



LE RECENSEMENT ET LES ZONES GEOGRAPHIQUES DE PEU D'ETENDUE (a)

L'élaboration d'une statistique par quartier a été réalisée pour la première fois au recensement général de la population et des logements du 31 décembre 1970. Chaque commune, la plus petite unité administrative belge, a été découpée en parties homogènes dénommées «secteurs statistiques» ou quartiers. Le découpage s'est fait à partir de caractéristiques structurelles d'ordre social, économique ou morphologique. Il a été réalisé avec la collaboration des autorités locales.

A l'aide de cartes topographiques existantes, de photos aériennes récentes et de contrôles sur le terrain pour les cas difficiles, les 2.379 communes furent subdivisées en 14.823 quartiers. En moyenne, on comptait six quartiers par commune avec 651 habitants et la superficie moyenne d'un quartier était de 206 ha.

Au 1er janvier 1977, eut lieu en Belgique, un important mouvement de fusions de communes. De 2.379 leur nombre fut ramené à 596 et la superficie moyenne a été quadruplée (5.120 ha en 1981 contre 1.282 ha en 1970).

Les communes après fusion sont souvent devenues des ensembles d'une grande étendue à caractère fort hétérogène. Le découpage par quartiers se justifiait d'autant plus comme plus petite unité de base du recensement. Il dut être adapté aux nouvelles limites des communes.

Le redécoupage qui a été réalisé à l'occasion du recensement de 1981 tient compte de l'évolution des ensembles d'habitat, des nouveaux travaux d'infrastructure à rôle parfois séparateur, de l'évolution des densités de population par quartier.

(a) Rapport présenté par le Service du recensement de l'Institut national de Statistique de Belgique.

Le nouveau découpage comprend 19.373 quartiers avec une moyenne de 32 quartiers par commune; le nombre moyen d'habitants par quartier est de 508 et la superficie moyenne de 158 ha. Plus de la moitié des quartiers de 1970 demeurent cependant inchangés.

C'est par le biais du recensement par quartier que la Belgique compte assurer la comparabilité des résultats du recensement de 1981 au niveau communal avec les résultats des recensements précédents.

L'établissement des résultats du recensement par quartier nécessite l'attribution d'un code à chaque quartier et la reproduction de ce code sur chaque bulletin de recensement.

En 1970, la codification de chaque bulletin a été faite soit par les agents recenseurs soit par l'administration communale sur base de cartes topographiques où apparaissaient les quartiers et leur numéro de code.

En 1981, la codification des quartiers a été informatisée. Au départ d'un fichier comprenant pour toutes les voies publiques du Royaume, le nom et un numéro de code, on constitua un nouveau fichier attribuant à toute voie publique une codification complémentaire relative au quartier où elle se situait. Pour la réalisation de ce fichier un long travail préparatoire a été nécessaire.

Ainsi qu'en 1970, un matériel cartographique où figuraient les limites des quartiers a été réalisé avec la collaboration des services spécialisés de l'Aménagement du territoire et des autorités locales. Sur base de cette documentation, les administrations communales furent invitées à vérifier les noms et les codes des voies publiques et à les enrichir par l'attribution d'un code relatif au quartier.

A la suite de cette opération chaque voie publique était décrite par un code de minimum douze chiffres: quatre chiffres pour le code postal de la voie publique, quatre chiffres pour le numéro d'ordre de cette voie, quatre chiffres pour le code du quartier.

Une même voie publique pouvait s'étendre sur plusieurs quartiers à cause, soit de son étendue, soit de l'existence d'un élément séparateur qui imposait de fixer la limite du quartier en travers ou dans l'axe de la rue. Les limites administratives des communes actuelles ou des anciennes communes ont souvent été déterminantes pour la fixation des limites des quartiers.

Un fichier informatisé comprenant la description de toutes les voies publiques en fonction des quartiers a pu ainsi être réalisé. Ce fichier comprend 300.000 articles.

Il a permis d'automatiser l'attribution du code "quartier" grâce à l'exploitation des adresses de résidence. Cette adresse de résidence a été introduite dans l'ordinateur en même temps que les autres données du bulletin de logement et, comme en 1970, par le biais du code d'identification de chaque ménage le code du quartier de résidence peut être attribué aux données recueillies sur les autres bulletins de ce ménage.

Ce système devait permettre de diminuer le nombre d'erreurs, d'omissions

et d'augmenter la fiabilité des données.

Dans un premier passage, 95% des adresses de résidence enregistrées ont été codifiées par quartier. Après corrections, on espère que pour au moins 98% des adresses, un code "quartier" pourra être attribué, ce qui peut être considéré comme un réel succès.

Il faut en effet tenir compte du fait que la période pendant laquelle le fichier descriptif des quartiers a été constitué n'était pas particulièrement favorable: à la suite des fusions de communes, on rencontrait souvent dans une même commune plusieurs voies publiques portant le même nom et les modifications destinées à remédier à cet état de choses étaient en cours.

Le fichier descriptif par quartier va non seulement permettre de décrire chaque quartier en fonction des données du recensement mais également, l'exploitation théorique de données par rue ou pour tout ensemble constitué de voies publiques dûment identifiées. Ce fichier devrait également permettre l'exploitation par quartier de toutes les données dont l'adresse est connue et constitue un instrument se prêtant à un échantillonnage par quartier.

Parallèlement à ce fichier principal, un fichier annexe a été réalisé, comprenant pour chaque commune, les codes et dénominations des quartiers qui la composent. Un autre fichier destiné à faciliter les comparaisons entre les données de 1970 et celles de 1981, décrit la relation existant entre les quartiers des deux derniers recensements.

Actuellement les premiers résultats au niveau des quartiers sont en cours d'élaboration.

Pour la fin de l'année 1984, les données générales relatives à la population et aux logements pourront être ventilées par quartier. Toutefois la diffusion de ces informations dépendra de l'ordre de grandeur des chiffres.

Les dispositions légales en matière de secret statistique s'appliquent évidemment aussi aux données par quartier.

En principe, on devrait avoir pour chaque quartier le code et le nom du quartier suivi des fréquences des caractéristiques décrites à l'annexe ci-jointe.

Pour les grandes villes à forte densité de population, on y ajoutera la répartition de la population étrangère par nationalité ou groupes de nationalité et la répartition de la population par groupes d'âges.

Le système permettant d'exploiter, au niveau des quartiers toutes les informations du recensement stockées dans les mémoires de l'ordinateur, on peut évidemment imaginer d'autres ventilations selon les nécessités.

Annexe: Liste des tableaux par quartier (en préparation)

POPULATION (nombre de personnes)	— hommes
— Belges*, étrangers, ensemble de la population	— femmes
	— total

- Taille du ménage (nombre de ménages)
 - 1 personne
 - 2 personnes
 - 3 personnes
 - 4 personnes
 - 5 personnes et plus
- Nombre de ménages privés
- Nombre de personnes appartenant à des ménages privés
- Nombre moyen de personnes par ménage privé
- Etat civil*
 - célibataire
 - marié (y compris les personnes légalement séparées de corps)
 - veuf, veuve et divorcé(e)
- Classes d'âges
 - 0-14 ans
 - 15-24 ans
 - 25-44 ans
 - 54-64 ans
 - 65 ans et plus

LOGEMENTS (nombre)

- Logements privés habités
 - dans un immeuble d'habitation
 - dans une ferme
 - dans un bâtiment, une autre habitation*
 - type de logement inconnu
 - total
- Logements collectifs habités
- Total des logements habités (particuliers, collectifs et mobiles)
- Titre d'occupation des logements privés habités
 - propriétaire
 - locataire (y compris en viager, logement de service ou mis à disposition)*
 - inconnu*
- Année de construction des logements privés habités
 - avant 1919
 - 1919-1945
 - 1946-1961
 - 1962-1970
 - 1971 et plus tard
- inconnue
- Logements transformés depuis début 1971
- Superficie totale habitée (en 100 m²)
- Nombre total des pièces (nombre de pièces)
- Nombre total d'habitants de logements privés
- Nombre de maisons unifamiliales (nombre de logements)
- Immeubles comportant plusieurs logements (nombre de logements)
 - 2 logements
 - 3-4 logements
 - 5-9 logements
 - 10 logements et plus
 - inconnu*
- Superficie des logements privés
 - inférieure à 45 m²
 - 45- 84 m²
 - 85-104 m²
 - 105 m² et plus
 - inconnue*
- Commodités des logements privés habités
 - eau courante à l'intérieur du logement (1)
 - lieux d'aisances pourvus d'une chasse d'eau (2)
 - salle de bains ou douche (3)
 - chauffage central (4)
 - cuisine d'au moins 4 m²
 - (1) et (2) et (3) sans chauffage central
 - (1) et (2) et (3) avec chauffage central
 - téléphone
 - disposant d'une voiture*
 - disposant d'un terrain d'au moins 50 m² attenant au logement*
 - isolation du logement*
 - combustible utilisé (énergie) pour le chauffage du logement privé
 - gasoil, fuel-oil, mazout
 - charbon
 - gaz de houille ou gaz naturel
 - électricité
 - autres
 - inconnu.

PROBLEMES RENCONTRES AVANT, PENDANT ET APRES LE DENOMBREMENT (a)

I. PRESENTATION DU RECENSEMENT DU 1ER MARS 1981

1. Bases legales

Le recensement organisé le 1er mars 1981 est le 14e depuis l'indépendance de la Belgique.

La loi de 1856 sur le recensement et la tenue des registres de population en constitue la base fondamentale.

Cette loi, qui imposait l'organisation d'un recensement de la population toutes les années se terminant par le millésime 0, a été modifiée par la loi du 11 juillet 1980 afin de permettre à la Belgique de se conformer à une directive du Conseil de la C.E.E. prévoyant l'organisation d'un recensement de la population entre le 1er mars et le 31 mai 1981 dans les pays de la Communauté.

L'arrêté royal du 24 décembre 1980 fixe la date et les modalités d'exécution du recensement de 1981 dont l'organisation est confiée à l'Institut national de Statistique avec la collaboration des administrations communales.

2. Objectifs

Le recensement du 1er mars 1981 porte uniquement sur la population et les logements.

Auparavant, chaque recensement de la population s'accompagnait régulièrement d'un recensement de l'industrie et du commerce.

Aujourd'hui, l'I.N.S. dispose d'un fichier de toutes les unités de production où sont stockées les informations fournies par l'Office national de Sécurité

(a) Rapport présenté par le Service des Recensements de l'Institut national de Statistique de Belgique.

Sociale et l'Administration de la Taxe à la Valeur ajoutée (T.V.A.). Ce fichier, régulièrement tenu à jour, constitue un inventaire permanent des unités économiques.

En Belgique, le recensement constitue, d'une part une vaste opération administrative permettant de déterminer le chiffre officiel de la population de différentes divisions administratives du pays, d'autre part une opération scientifique permettant l'élaboration de statistiques culturelles, économiques et sociales.

Sur le plan administratif

Le recensement général de la population est organisé en vue de déterminer le chiffre officiel de la population du Royaume et de chaque commune. Ce chiffre est par la suite authentifié par un arrêté royal.

La révision et le contrôle des registres de population des communes est prescrit à l'occasion de chaque recensement. Il ne s'agit pas de remettre en cause la tenue des registres par les communes mais d'en vérifier le contenu tous les dix ans par cette vaste enquête sur le terrain.

On constate en effet lors de chaque recensement qu'un certain nombre de personnes doivent être rayées des registres de population (13.407 personnes en 1981, soit 0,14% de la population). Dans 90% des cas, il s'agit de personnes qui sont parties à l'étranger sans informer la commune de leur départ. Il arrive également que certaines personnes déménagent pour une autre commune où elles s'inscrivent sans que la commune d'origine ne les raye de ses registres. Dans les deux cas, il en résulte une sur-estimation du chiffre de population que seul un recensement permet de rectifier.

Le recensement de 1981 présente un intérêt particulier en ce sens qu'il est le premier organisé après les fusions de communes intervenues le 1er janvier 1977.

Le chiffre officiel de la population fixé par le recensement est à la base de certaines dispositions légales.

La répartition des membres de la Chambre des Représentants entre les arrondissements électoraux est notamment établie sur cette base. La Constitution prévoit expressément à cet effet l'organisation d'un recensement tous les dix ans.

Le nombre des membres des Conseils provinciaux et communaux ainsi que le nombre d'échevins de chaque commune est aussi fixé à partir des résultats du recensement de la population.

Sur le plan statistique

La fixation du chiffre de la population est importante en raison des intérêts qui y sont liés mais elle n'est qu'un des objectifs poursuivis par le recensement. L'intérêt majeur de cette vaste opération réside surtout dans la possibilité

d'effectuer des recherches approfondies sur la situation démographique, économique, sociale et culturelle de la nation. Pour les utilisateurs, qu'ils soient publics ou privés, il s'agit d'un outil de gestion d'un très grand intérêt.

A cet égard, celui de 1981 est particulièrement important étant donné la conjoncture actuelle.

Il devrait permettre de mieux évaluer les profondes mutations intervenues dans la population au cours de la dernière décennie.

Caractère obligatoire du recensement

En Belgique, la participation au recensement est obligatoire. La loi impose en effet que toute personne ayant sa résidence habituelle dans le pays fournisse les renseignements demandés.

En vertu de l'article 6 de l'arrêté royal du 24 décembre 1980, seules les personnes suivantes ne sont pas comprises dans le recensement:

1) les agents diplomatiques étrangers et les autres étrangers qui y sont assimilés résidant en Belgique ainsi que les membres de leur ménage et les domestiques étrangers demeurant avec eux;

2) les militaires appartenant aux forces armées d'une puissance étrangère faisant partie de l'O.T.A.N. qui séjournent en Belgique pour l'objet de leur mission. Par contre, les membres de leur ménage, établis en Belgique, doivent être recensés dans la commune où ils ont leur résidence habituelle.

Confidentialité des réponses fournies

Si la participation au recensement est obligatoire, la loi garantit en contrepartie le caractère confidentiel des réponses de chaque recensé.

En aucun cas, les renseignements recueillis à cette occasion ne peuvent être utilisés contre les individus ou à des fins fiscales. La loi est formelle à ce sujet; l'arrêté royal d'exécution du 24 décembre 1980 précise l'usage qui peut être fait des renseignements recueillis.

Sur un des bulletins de recensement, le bulletin modèle A, sont mentionnées les données que la loi autorise à figurer dans les registres de population (nom, date et lieu de naissance, état civil, filiation, nationalité, profession, adresse et composition du ménage). Aussi les administrations communales conservent-elles ce bulletin de ménage pour permettre la vérification des dits registres.

Les renseignements extraits des autres bulletins demeurent confidentiels et ne servent qu'à l'établissement de tableaux statistiques globaux et anonymes.

Quiconque détient, à quelque titre que ce soit, des renseignements individuels recueillis à l'occasion des recensements est lié par le secret professionnel.

3. Options méthodologiques

Recensement par voie postale ou par l'intermédiaire d'agents recenseurs

Pour mener à bien les opérations de recensement, deux voies différentes pouvaient être envisagées:

- soit faire appel à des agents recenseurs pour effectuer le travail sur le terrain — méthode utilisée lors des recensements précédents —,
- soit adopter une méthode de recensement par voie postale à l'instar de ce qui est réalisé dans plusieurs pays (par exemple en Suède).

Cette seconde solution semblait à priori la plus rapide et la moins onéreuse.

Toutefois, afin d'en tester l'efficacité, le Conseil supérieur de Statistique a estimé utile d'organiser une enquête-pilote.

Cette enquête-pilote a eu lieu en mars 1979.

Lors du dépouillement, il est apparu que pour 45% seulement des ménages sollicités les résultats de l'enquête postale étaient valables (bulletins rentrés spontanément et correctement remplis); dans plus de la moitié des cas, une visite ultérieure d'un agent recenseur était requise. Donc, les dépenses liées à la collecte des renseignements auraient dû couvrir à la fois les indemnités des agents recenseurs et les frais d'envois postaux.

Dans le cas d'un recensement par voie postale, il fallait de toute façon mettre au point une méthode permettant de dénombrer de manière exhaustive les logements inoccupés, les résidences de vacances, les secondes habitations et les logements collectifs destinés à des séjours de vacances, ce qui impliquait, de la part des agents recenseurs, l'établissement d'un inventaire de tous les bâtiments et logements.

Un problème similaire se serait posé pour les demeures mobiles ainsi que pour le dénombrement des personnes temporairement présentes; là également, un recensement exclusivement par voie postale aurait été inopérant.

D'un point de vue strictement financier, cette solution n'apparaissait pas avantageuse.

Par ailleurs, seul le recours à des agents recenseurs permet, en principe, de dépister toutes les personnes non inscrites aux registres de population puisque ceux-ci sont tenus de visiter systématiquement tous les logements. Dans la pratique, il est souvent apparu que cette mission des agents recenseurs n'avait pas été strictement remplie.

En outre, les résultats du recensement-pilote ne permettaient pas d'espérer un déroulement rapide des opérations — au contraire. En effet, les agents recenseurs, indispensables en tout état de cause, n'auraient pu intervenir qu'à la suite du dénombrement des ménages ayant négligé de renvoyer les bulletins dûment remplis.

Suivant l'avis du Conseil supérieur de Statistique, il a été décidé de

recourir, comme par le passé et comme cela se fait dans la plupart des pays de la Communauté européenne, à la collaboration d'agents recenseurs communaux.

Utilisation de bulletins de ménage préimprimés

Depuis 1968, il existe en Belgique une banque de données sur la population: le "Registre national".

Au moment du recensement de 1981, le Registre national n'avait pas encore d'existence légale et les communes n'étaient pas tenues de s'y affilier.

Néanmoins, nombre d'entre elles avaient fait appel à cet organisme public pour la gestion informatisée de leur fichier de population. Après transmission au Registre national de tous les renseignements figurant à leurs registres de population, ces communes lui communiquent au fur et à mesure toutes les modifications à y apporter, de sorte qu'elles peuvent disposer en permanence de données actualisées.

En conséquence, l'I.N.S. a estimé que cette documentation, qui concernait plus de 85% de la population était intéressante à exploiter.

A l'aide des données fournies par les communes au Registre national et stockées sur bande magnétique par ce dernier, l'I.N.S. a préimprimé par ordinateur les bulletins de ménage.

Cette procédure a été utilisée là où la documentation était jugée fiable par le Registre national et sous réserve de l'accord des communes intéressées, soit dans 73% des communes belges représentant 77% de la population.

Une procédure semblable a été suivie pour quelques autres communes qui, tout en n'étant pas affiliées au Registre national, disposaient cependant des mêmes données sur des supports informatiques exploitables.

Les documents préimprimés ne devant pas être remplis par les recensés mais seulement vérifiés et le cas échéant rectifiés et complétés, ils représentaient une facilité pour le recensé mais également un gain de temps appréciable pour les agents recenseurs et les administrations communales.

Dans les communes ne disposant pas de fichier de la population informatisé et celles dont la documentation n'était pas suffisamment fiable, le recensement s'est effectué au moyen de documents non préimprimés.

4. Travaux préparatoires

Mise au point des textes légaux

Une des tâches préparatoires au recensement a été la mise à jour des textes de lois et arrêtés nécessaires à son exécution. Outre la loi précitée du 2 juin 1856 sur les recensements généraux et les registres de population, citons entre autres

l'arrêté royal du 14 juillet 1980 ordonnant le numérotage des maisons et autres bâtiments.

A la suite des fusions de communes, cette opération était particulièrement importante. Dans une même commune, plusieurs voies publiques portaient parfois le même nom et l'identification était d'autant plus difficile.

On devait donc non seulement renuméroter les maisons suivant un ordre logique, mais également changer le nom de certaines voies publiques pour éviter les synonymes dans une même entité. Cette opération s'est souvent déroulée à une époque proche du recensement, ce qui n'a pas facilité les travaux préparatoires.

Élaboration des questionnaires et instructions

Dès 1978, des projets de questionnaires ont été élaborés puis soumis au Conseil supérieur de Statistique et testés lors de l'enquête-pilote.

L'examen des réponses obtenues par l'enquête-pilote a amené l'I.N.S. à proposer au Conseil une sensible simplification des bulletins. De nombreuses administrations et établissements scientifiques ont demandé à l'I.N.S. l'insertion dans les bulletins de recensement de questions qui les intéressaient spécifiquement. Un choix délicat a donc dû être fait pour maintenir un difficile équilibre entre les souhaits de certains et la possibilité de les réaliser.

Par ailleurs, le maintien de plusieurs questions était imposé par les exigences de la comparabilité dans le temps tandis que d'autres figuraient dans les directives et recommandations internationales que la Belgique est tenue de respecter. Notons à cet égard que le contenu des différents bulletins est conforme au programme de recensement élaboré par les Nations-Unies.

Un grand effort a été fait pour améliorer la présentation des bulletins: l'énoncé des questions, qui doivent être faciles à comprendre et permettre une réponse rapide et précise, a également fait l'objet de soins particuliers.

Afin d'éviter des interprétations divergentes des différentes questions posées, l'élaboration d'instructions détaillées s'est avérée nécessaire. Concrètement ont été réalisés:

- un feuillet d'instructions pour les recensés;
- un manuel pour l'agent recenseur;
- une brochure destinée aux administrations communales.

Détermination des secteurs statistiques ou quartiers

Dès 1957, le Conseil supérieur de Statistique s'est préoccupé de la nécessité de découper des agglomérations urbaines en quartiers, en vue des opérations de recensement.

Ce n'est cependant qu'en prévision du recensement de 1970 que le décou-

page en secteurs statistiques ou quartiers de toutes les communes de Belgique a été réalisé.

La subdivision en secteurs statistiques offre la possibilité de travailler sur une autre échelle que celle des limites administratives et a pour but:

1) de donner un meilleur aperçu de la répartition spatiale de la population et de permettre la détermination des différents noyaux d'habitat;

2) de préciser la structure interne des communes tant sur le plan démographique, économique et social que sur celui de l'habitat.

La méthodologie suivie pour la détermination des quartiers est exposée dans un rapport séparé.

Campagne d'information

Le recensement de la population est une opération de grande envergure ayant des implications budgétaires importantes que seules peuvent justifier l'utilité et la fiabilité des renseignements obtenus. Il convenait donc de sensibiliser l'opinion par une information adéquate afin de retenir toutes les conditions nécessaires à sa réussite.

L'action à entreprendre devait remplir un triple rôle:

— informer, pour éviter tout effet de surprise susceptible de provoquer une réticence au recensement;

— rassurer sur le caractère confidentiel des données collectées et sur la facilité des réponses à fournir;

— motiver, en mettant en évidence l'utilité du recensement pour l'étude de nombreux sujets.

Dans les faits, la campagne d'information s'est traduite par:

— la réalisation d'une affiche;

— la mise à la disposition de la presse de notes d'informations;

— l'organisation d'une conférence de presse par le Ministre des Affaires économiques;

— l'insertion à trois reprises d'avis dans la presse quotidienne;

— la tenue de conférences à l'intention des administrations communales;

— l'élaboration d'un dépliant d'information distribué aux recensés et traduit en sept langues.

5. Types et contenu des bulletins de recensement

Bulletins de base

— Bulletins de ménage modèles A et C1, où doivent être mentionnées les personnes présentes ou non, qui constituent à la date du 1er mars 1981, un ménage et qui font partie de la population de résidence habituelle de la commune.

Le bulletin de ménage modèle A est destiné aux administrations communales et doit servir à la révision des registres de population; le bulletin de ménage modèle C1 est destiné à l'I.N.S.

Au moyen des bulletins de ménage modèles A et C1, on recueille les données individuelles traditionnelles: sexe, état civil, âge et nationalité de chaque habitant ainsi que la composition du ménage.

Ces bulletins permettent de fixer le chiffre de la population et aussi d'en étudier la structure par agê et par sexe.

— Bulletin individuel modèle B: à établir pour chaque personne inscrite sur les bulletins de ménage.

Le bulletin individuel modèle B qui devait être rempli par chaque habitant renseigne le lieu de naissance, le degré d'instruction (diplômes), la profession, le statut social (chef d'entreprise, employé, ouvrier, etc...) ainsi que l'activité dans laquelle s'exerce la profession. Ce bulletin comprend en outre des questions sur la mobilité résidentielle, sur les flux de la main d'oeuvre et de la population scolaire (lieu de travail ou de scolarité, temps nécessaire pour s'y rendre, moyen de locomotion), et enfin sur la nuptialité et la fécondité (nombre d'enfants nés vivants, enfants encore en vie, date du mariage ou du veuvage, âge des enfants, etc...).

— Bulletin de logement modèle C2: à compléter par chaque ménage pour le logement qui constitue sa résidence habituelle.

Le bulletin de logement C2, destiné au relevé du nombre de logements, donne une description détaillée de la nature, des dimensions et de certains aspects qualitatifs de ceux-ci tels que les commodités, le mode de chauffage et l'isolation.

— Bulletin spécial de logement modèle D: à remplir par l'agent recenseur pour tout logement inoccupé, seconde habitation ou résidence de vacances situé dans sa circonscription.

Autres bulletins

Des bulletins spéciaux ont été utilisés pour:

- 1) les ménages occupant une demeure mobile;
- 2) les personnes se trouvant le 1er mars à un autre lieu que leur résidence habituelle;
- 3) les agents diplomatiques, les agents consulaires et de chancellerie de carrière, de nationalité belge, en fonction à l'étranger, ainsi que les membres de leur famille demeurant avec eux;
- 4) les personnes faisant partie des forces armées belges stationnées en Allemagne, les membres de leur ménage autorisés à les suivre et les personnes faisant partie de la suite de l'armée;
- 5) les militaires qui sont détachés, soit à l'étranger, soit auprès d'institutions internationales.

Pour le recensement des trois dernières catégories de personnes, une procédure particulière, sans intervention des agents recenseurs, a été suivie.

6. Deroulement des operations

Désignation des agents recenseurs

C'est aux administrations communales qu'il incombait de désigner les agents recenseurs.

Leur recrutement devait se faire avec discernement, le succès de l'opération dépendant d'eux en grande partie. Appelés à contacter les ménages, des garanties morales et de discrétion étaient exigées à leur sujet ainsi qu'une formation leur permettant d'appliquer les instructions et de les expliquer, s'il le fallait. La connaissance de la ou des langues officielles de la commune était également requise.

Il apparaissait ainsi que priorité devait être donnée aux employés communaux et aux membres de la police communale, étant donné leur connaissance de la population, de la composition des ménages et des instructions qui règlent la tenue des registres de population.

Distribution des bulletins

L'agent recenseur devait se présenter entre le 16 et le 28 février 1981 dans tous les bâtiments de sa circonscription destinés à l'habitation ou pouvant servir d'habitation.

Seuls les immeubles occupés par les diplomates étrangers accrédités en Belgique et par les étrangers privilégiés ne devaient pas être visités.

A chaque chef de ménage ayant sa résidence habituelle dans la commune, l'agent recenseur remettait en l'invitant à les remplir:

- un bulletin de ménage modèle A;
- un bulletin de ménage modèle C1; (déjà préimprimés dans certaines communes);
- autant de bulletins individuels modèle B qu'il y avait de personnes faisant partie du ménage, même si elles en étaient temporairement absentes;
- un bulletin de logement modèle C2;
- autant de bulletins individuels modèle B bis qu'il y avait de personnes temporairement présentes dans le logement le 1er mars 1981.

La distribution de tous les bulletins devait être terminée le 28 février 1981.

Reprise des bulletins

A partir du 2 mars 1981, l'agent recenseur devait reprendre les bulletins remplis; il les vérifiait et y apportait éventuellement des corrections et/ou des compléments.

Si un ménage était venu s'établir dans sa circonscription après la distribution des bulletins, il devait remettre au chef de ménage les bulletins adéquats et l'inviter à les compléter immédiatement.

Etablissement des bulletins modèle D

Au cours de la phase de reprise des bulletins, l'agent recenseur devait remplir un bulletin spécial de logement D pour les résidences de vacances, les secondes habitations, les logements inoccupés et les logements collectifs destinés à des séjours de vacances situés dans sa circonscription.

Il avait comme instruction de terminer les opérations vers le 15 mars 1981 et de rentrer aussitôt tous les documents à l'administration communale.

Modalités spéciales pour certaines catégories de personnes

Comme il a été dit précédemment, les bâtiments et logements occupés par les diplomates étrangers ou par des étrangers privilégiés ne pouvaient être visités par les agents recenseurs.

Aussi les personnes soumises au recensement et ayant leur résidence habituelle dans les bâtiments bénéficiant du statut d'exterritorialité ont-elles été recensées directement par les soins du Ministère des Affaires étrangères.

C'est le cas notamment des Belges et des étrangers qui, tout en habitant chez un agent diplomatique étranger, ne jouissent pas du droit d'exterritorialité.

Opérations effectuées par les administrations communales

L'administration communale était chargée de surveiller le travail des agents recenseurs, leur donner les explications utiles et leur indiquer éventuellement la manière de procéder pour surmonter certaines difficultés, en tenant compte des instructions émanant de l'I.N.S.

Dès réception des documents de recensement, l'administration communale devait procéder à la vérification des bulletins concernant les personnes ayant leur résidence dans la commune, le contenu de ces bulletins devant être confronté au contenu des registres de population.

Afin de compléter les lacunes éventuelles, l'administration communale pouvait établir elle-même les bulletins manquants:

- sur base de bulletins modèle B bis relatifs à des personnes recensées dans une commune autre que celle de leur résidence habituelle;
- à l'aide des bulletins transmis par l'I.N.S. et relatifs aux militaires et agents diplomatiques ou consulaires en poste à l'étranger;
- d'office pour les personnes ou ménages n'ayant pas été trouvés par l'agent recenseur mais ayant sans nul doute possible conservé leur résidence habituelle dans la commune.

Après vérification et comptage, les bulletins — à l'exception du modèle A — devaient être transmis à l'I.N.S. au plus tard le 29 mai 1981.

7. Traitement des données et publication des résultats

Au fur et à mesure de la rentrée des bulletins de recensement, l'I.N.S. devait procéder à leur contrôle, leur saisie et leur dépouillement.

L'art. 49 § 3 de la Constitution imposant la publication des chiffres officiels de la population au plus tard six mois après la fin des opérations, l'I.N.S. avait en conséquence établi un calendrier pour le traitement des bulletins de recensement permettant de respecter ces impératifs légaux. Les problèmes auxquels l'I.N.S. a été confronté dès le départ et tout au long de ce recensement ont cependant complètement bouleversé le calendrier initialement établi.

On trouvera ci-après l'exposé et l'analyse des difficultés qui, directement ou indirectement, ont freiné et freinent encore le déroulement normal des opérations de recensement, retardant notamment la publication des résultats.

II. PROBLEMES LIÉS AU RECENSEMENT DU 1ER MARS 1981

1. Retard dans les opérations sur le terrain

Le retard encouru durant les opérations de recensement sur le terrain même, c'est-à-dire dans les communes, constitue indiscutablement le premier problème auquel l'I.N.S. s'est trouvé confronté.

Pour pouvoir satisfaire aux obligations légales en matière de fixation des chiffres de la population, il fallait que le travail sur le terrain soit terminé dans le courant de la seconde quinzaine du mois de mars 1981.

Les administrations communales disposaient alors de deux mois pour vérifier ces bulletins et pour accomplir les formalités relatives à la tenue des registres de population. Cela signifiait que tous les documents de recensement devaient être en possession de l'I.N.S. pour le 29 mai 1981 au plus tard.

Seulement 94 communes sur 596 ont scrupuleusement respecté ce délai.

En fait, la réception des documents s'est échelonnée de mai 1981 à mars 1982, de sorte que c'est près de dix mois après l'expiration du délai imparti que l'I.N.S. a reçu les derniers bulletins.

D'autre part, on a relevé pour quasi toutes les communes - bien qu'à des degrés divers —, des documents manquants, des doubles comptages et des formulaires partiellement ou mal remplis.

Il n'est dès lors pas étonnant que des retards aussi importants dans l'exécution du recensement aient finalement donné lieu à des commentaires dans la presse, voire à plusieurs questions parlementaires.

Il n'est donc pas sans intérêt pour l'organisation des recensements futurs de rechercher et d'exposer les causes de ces retards qui sont les suivantes.

a) Difficultés de recrutement d'agents recenseurs

En 1981, comme lors des recensements précédents, les administrations communales se sont d'abord adressées à leur personnel pour l'exécution du recensement. Les employés communaux sont évidemment les mieux à même d'effectuer ce travail étant donné leur connaissance de la population.

Beaucoup d'entre eux cependant, estimant que l'indemnité proposée pour la distribution et la collecte des bulletins ne compensait pas, et de loin, les efforts et les risques de ce travail, ont refusé de participer au recensement.

Afin d'atteindre un nombre suffisant d'agents recenseurs, les administrations communales ont donc été autorisées à faire appel à des chômeurs durant une période limitée (en principe six semaines). Les formalités administratives nécessaires à ce recrutement entraînent une nouvelle perte de temps.

En outre, les personnes recrutées pour ce travail n'étaient pas fort motivées et il apparut souvent que le rendement qualitatif et quantitatif de ces agents se

situait sensiblement au-dessous de la moyenne.

L'I.N.S. qui, initialement, souhaitait le concours de 15.000 agents recenseurs n'a pu en recruter que 12.554 (83,7%) dont 2.264 chômeurs mis au travail (soit 1 recenseur sur 6).

b) Difficultés financières des communes

L'état préoccupant des finances de la plupart des communes belges n'a certainement pas favorisé l'exécution rapide de la partie des travaux de recensement incombant aux services administratifs communaux.

Pour faire face à l'important travail supplémentaire qu'amène chaque recensement général de la population, les administrations communales n'ont pas toujours eu la possibilité, comme lors des recensements précédents, d'engager du personnel supplémentaire, notamment en raison des restrictions budgétaires.

c) Laxisme des mandataires communaux dans certaines communes

Confronté aux retards et lacunes que présentaient les opérations de recensement dans certaines communes, l'I.N.S. n'a cessé d'en appeler — mais souvent en vain — au concours des mandataires locaux.

— L'importance d'un recensement scrupuleusement exécuté a souvent échappé à certains mandataires communaux; en conséquence ils se sentaient peu motivés pour exiger de leur administration que les obligations découlant du recensement soient respectées.

d) Difficultés rencontrées auprès des personnes à recenser

On a observé auprès des recensés une réticence accrue à fournir rapidement et correctement les renseignements demandés.

Dans les Communes où les opérations de recensement se sont déroulées avec des retards considérables, on a constaté en outre, que l'effet de la campagne d'information menée au mois de février 1981 était complètement annihilé.

Les difficultés rencontrées par les agents recenseurs lors de ces visites tardives n'en étaient que plus grandes.

Lorsque l'agent recenseur se présentait au domicile des personnes à recenser, il devait fréquemment constater — surtout dans les grandes agglomérations — que celles-ci avaient déménagé, ce qui nécessitait de fastidieuses recherches pour les retrouver.

2. La notion controversée de «chef de ménage»

L'I.N.S. a également été confronté à des difficultés suscitées par l'utilisation dans les questionnaires et les instructions du terme «Chef de ménage».

Ce terme était utilisé lors des recensements précédents et figure toujours dans les instructions du Ministère de l'Intérieur destinées aux administrations communales et relatives à la tenue des registres de population.

L'utilisation de ce terme dans les formulaires du recensement de 1981 a suscité de violentes critiques aussi bien de la part des recensés que des porte-parole de différents mouvements féminins qui croyaient y déceler, non seulement une forme de discrimination à l'égard de la population féminine, mais aussi la consécration du maintien à l'intérieur des ménages d'un autoritarisme désuet traditionnellement exercé par le mari. Ce point de vue a d'ailleurs reçu une certaine publicité dans la presse.

Sur base des lois du 30 avril 1958 et du 14 juillet 1976 concernant les droits et devoirs réciproques des époux, le Premier Ministre de l'époque a transmis, en juillet 1981, à tous les membres de son gouvernement des directives concernant l'utilisation des termes "chef de famille" et "chef de ménage" dans les formulaires administratifs. A l'avenir, ces expressions devront être abandonnées.

C'est pourquoi le terme "chef de ménage" ne figurera plus dans les textes de l'I.N.S. et sera remplacé par l'expression "personne de référence du ménage" proposée lors des réunions de travail de l'O.N.U. à Genève.

Il faudra cependant voir dans quelle mesure cette notion nouvelle sera bien comprise par la majorité de la population. Lors des campagnes d'information relatives à de futures investigations statistiques ou à des recensements, il y aura lieu d'apporter un soin tout particulier à l'explication de la terminologie utilisée.

3. Bulletins de recensement préimprimés

Le recours aux bulletins préimprimés a soulevé certaines difficultés en raison du long laps de temps qui s'est souvent écoulé entre le moment de l'enregistrement des données sur bande magnétique et la date à laquelle les bulletins de recensement préimprimés étaient distribués pour vérification aux recensés concernés.

Le délai constaté à l'occasion du recensement de 1981 a été de trois mois en moyenne, parfois même plus. Entretemps, surtout dans les grandes agglomérations, diverses modifications étaient intervenues tant dans les données démographiques primaires que dans les adresses de résidence des ménages à recenser. Ce fut notamment le cas pour plus de 70.000 ménages (200.000 personnes) pour lesquels seule une enquête fastidieuse a permis l'adaptation des données, surtout celles ayant trait à la composition du ménage.

4. Recensement des "Etrangers privilégiés"

En vertu de l'article 6 de l'arrêté royal du 6 décembre 1955 relatif au séjour en Belgique de certains étrangers privilégiés, auxquels un titre de séjour spécial a été délivré, et de l'article 7 de l'arrêté royal du 24 décembre 1980 relatif aux opérations de recensement, ces personnes ont été recensées directement par le gouvernement.

Il s'agit le plus souvent de fonctionnaires — et des membres de leur famille — travaillant en Belgique auprès des missions diplomatiques étrangères et des institutions internationales, en premier lieu les Communautés Européennes. Au cours des dernières années, leur nombre a très fortement augmenté.

Ces personnes, qui devaient être recensées par les soins du Ministère des Affaires étrangères, changent souvent de résidence administrative. De plus, elles ne doivent pas être inscrites dans les registres de population des communes. Par ailleurs, le statut spécial dont bénéficient ces fonctionnaires leur confère une grande liberté. Pour toutes ces raisons, ils se sentent peu disposés à participer de bonne grâce au recensement de la population.

Les instances concernées qui ont été contactées à ce propos, et surtout les Communautés européennes, ont souvent été dans l'incapacité de donner le nombre exact et, à plus forte raison, le lieu de résidence des personnes qu'elles emploient.

Ce manque de renseignements a donné lieu à de nombreux litiges entre l'I.N.S. d'une part, les administrations communales et institutions internationales d'autre part, litiges qui n'ont été réglés de manière satisfaisante qu'après de laborieuses recherches par les services compétents des recensements généraux.

5. Problèmes de personnel

Dans la phase préparatoire du recensement, tant le service informatique que le service du recensement proprement dit n'ont disposé que d'un effectif extrêmement réduit atteignant un maximum de vingt personnes.

Pour l'exécution du recensement, un cadre temporaire de 460 personnes était prévu à partir de 1981 mais en réalité, un chiffre maximum de 390 (soit 85%) a été atteint, et encore ne fut-ce qu'en juin 1982, soit plus d'un an après le début des travaux.

Par la suite, les prescriptions légales appliquées aux agents temporaires ainsi recrutés ne permettant pas de les maintenir au travail pendant plus de deux ans, le désengagement progressif de ces agents a débuté dès la fin de 1982; il s'est amplifié par la suite et n'a pas été compensé par de nouveaux recrutements, provoquant de la sorte un ralentissement des opérations de dépouillement et de publication des résultats.

Les données extraites des bulletins de ménage modèle C1 et des bulletins de logement modèles C2 et D ont été publiées respectivement en décembre 1982 et décembre 1983, soit avec un retard de huit mois par rapport aux prévisions.

Actuellement, il ne reste plus un seul agent temporaire en service, et avec le seul personnel statutaire dont il dispose (24 personnes), le service des recensements n'est plus en mesure d'assurer les différentes tâches qui lui sont assignées et notamment le dépouillement des bulletins individuels modèle B qui renferment les caractéristiques socio-économiques de la population.

En dépit de multiples démarches entreprises depuis deux ans, aucune solution n'a encore été apportée à ce problème qui se pose dans une période marquée par de très strictes restrictions budgétaires.

Par ailleurs, même si une solution intervient à brève échéance, le retard accumulé dans les travaux ne pourra être résorbé et la publication des données n'interviendra qu'en 1985. Le décalage entre la réalité et la connaissance qu'on en a à travers les données du recensement sera ainsi porté à quatre ans, ce qui diminue évidemment l'utilité de certains renseignements, surtout dans les domaines susceptibles de mutations rapides.

III. PERSPECTIVES D'AVENIR

Les difficultés que l'I.N.S. a rencontrées lors du dernier recensement de la population, et dont on prévoit qu'elles iront en s'amplifiant, ne font pas bien augurer de l'avenir de l'organisation traditionnelle des recensements.

En effet, les réticences croissantes de la population à l'égard des recensements généraux et leur coût budgétaire élevé mettent en cause la réalisation future de tels dénombrements exhaustifs très détaillés.

Il faudra donc vraisemblablement envisager des solutions alternatives.

1. Simplification du recensement

L'expérience acquise par l'I.N.S. au cours des opérations de recensement en 1981 a démontré qu'une simplification des méthodes de dénombrement s'impose.

La lenteur des opérations sur le terrain a sérieusement compromis l'issue du recensement de la population de 1981. Il conviendrait que la distribution et la collecte des bulletins ainsi que les travaux de contrôle incombant aux administrations communales se déroulent beaucoup plus rapidement.

Il serait donc souhaitable de situer le recensement à deux niveaux:

— d'une part, une opération exhaustive destinée à obtenir les données démographiques primaires de tous les habitants;

— d'autre part, une enquête par sondage, se déroulant conjointement ou peu après le dénombrement exhaustif, auprès d'un échantillon de 5% prélevé de manière aléatoire parmi l'ensemble des ménages. Les membres de ces ménages seraient invités à fournir des données plus détaillées dans les domaines social, économique et culturel.

Une telle procédure réduirait sensiblement le volume des documents à traiter, et partant, le coût de l'opération.

Le recensement exhaustif se ferait à l'aide de bulletins préimprimés en double exemplaire (l'un étant destiné à l'I.N.S., l'autre à l'administration communale), portant uniquement sur des données contenues dans les registres de population.

Des prescriptions légales récentes rendant obligatoire l'affiliation des communes au Registre national, il est permis d'espérer que la mise à jour des données y sera plus rigoureuse.

Pour que l'expérience de la préimpression de certains bulletins, réalisée pour la première fois en 1981, puisse être poursuivie, certains défauts du système devraient cependant être corrigés. Il conviendrait notamment:

— d'apporter plus de soins à l'enregistrement de certaines données telles que la composition des ménages;

— de veiller à l'exactitude des adresses mentionnées (nom des rues et numérotation des bâtiments);

— de réduire le laps de temps séparant la communication des données par les communes au Registre national et la distribution des bulletins préimprimés.

L'exploitation éventuelle des données informatisées du Ministère des Finances concernant le cadastre des bâtiments pourrait également servir de contrôle à la bonne exécution des opérations.

L'alternative — recensement par voie postale ou par agents recenseurs — reste posée. Les deux systèmes pourraient éventuellement être associés: voie postale pour le dénombrement exhaustif, utilisation d'enquêteurs sous l'autorité de l'I.N.S. pour l'enquête par sondage. Dans un premier temps, les enquêteurs seraient également chargés de la collecte des bulletins du recensement exhaustif auprès des ménages qui n'auraient pas renvoyé leur bulletin dans un délai raisonnable.

2. Organisation d'une campagne d'information adaptée

Le premier objectif de la campagne d'information sur le recensement de 1981 était de sensibiliser le grand public, c'est à dire les recensés, et d'obtenir leur collaboration spontanée pour fournir les renseignements demandés.

Comme nous l'avons exposé au point II 1 c et d, les résultats furent décevants en raison du manque de synchronisation entre la distribution des bulletins et la campagne d'information. Celle-ci a été concentrée sur les quinze jours qui précédaient la date de recensement, c'est à dire le 1er mars 1981. Il est évident que dans les communes où la distribution des bulletins a eu lieu au mois de mai, l'impact de la campagne d'information était quasi nul.

Lors du prochain recensement, la campagne d'information devra être poursuivie et même intensifiée. Le recours aux moyens modernes d'information comme la télévision devrait être systématisé.

Une campagne d'information particulière devrait s'adresser aux mandataires publics et plus particulièrement aux responsables locaux.

1981 CENSUS OF CANADA DESIGN EFFECTS (a)

Subject	Factor
<i>Population Characteristics</i>	
— Age	
— Age groups 0-4, 5-9, 10-14, 15-19, 20-24, 25-34, 35-44, 45-54, 55-64, 65+ or any combination of the preceding age groups or any closely related age group (e.g. under 6, 6-14, ...)	0.4
— Other age group categories	0.8
— Sex	0.2
— Marital status	
— Single, married (including or excluding separated)	0.2
— Other marital status categories	0.8
— Highest degree, certificate or diploma/highest level of schooling/highest grade of elementary or secondary/years of other non-university education/trades and other non-university certificates or diplomas	1.0
— School attendance	0.7
— Mobility/CMA and province of residence in 1976/population size group in 1976/migration status/out migration	1.5
— Labour force status or participation	0.8
— Unemployed	1.0
— Hours worked in reference week	1.0

(a) Standard Error Adjustment Factors for characteristics tabulated at the Canada and Province Level (for cross-classifications of two or more subjects, locate the factor for each subject and use the largest).

— Year last worked	0.8
— Class of worker	0.8
— Industry/Occupation	1.0
— Work activity in 1980	0.9
— Mother tongue - English	
— Newfoundland, Prince Edward Island, Nova Scotia	1.0
— New Brunswick, Quebec	0.6
— Other provinces	0.4
— Canada	0.5
— Mother tongue - French	
— New Brunswick, Quebec	0.5
— Other provinces	0.9
— Canada	0.7
— Mother tongue - Neither English nor French	
— Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick	1.3
— Other provinces	0.5
— Canada	0.6
— Mother tongue-Other than English or French (e.g. German, Italian, Ukrainian, ...)	
— All provinces	1.4
— Home language	
— English	1.1
— French	0.9
— Neither English nor French	1.2
— Other	1.6
— Official language	1.1
— Ethnic Origin	1.4
— Place of birth	1.2
— Period of immigration/Age at immigration	1.2
— Citizenship	1.4
— Religion	1.6
— Place of work	0.9

— Income characteristics	0.9
— Number of persons in census families	0
— Number of persons in economic families	0.3
— Age of husband/reference person of economic family	1.3
— Census/Economic family status	
— Husband, wife, lone-parent, children, not in family	0.1
— Lone-parent female, children 15-19 in census families, children 20 and over in census families, reference person female, children under 15 in economic families, single children 15 and over in economic families, unattached individuals	0.3
— Other (eg. lone-parent male, not in family, not in family female,...)	0.8
— All other population characteristics	1.0

Census Family Characteristics (1)

— Census family structure	
— Husband-wife, husband-wife with or without children present, lone-parent	0
— Other (eg. male lone-parent, female lone-parent, ...)	0.7
— Census family type	1.0
— Age of husband, wife or lone-parent	0.8
— Age group of children at home	0.9
— Number of census families with children at home	0
— Highest level of schooling of husband, wife or lone-parent	1.0
— Labour force activity of husband, wife or lone-parent/labour force activity of husband and wife	0.8
— Work activity in 1980 of husband, wife or lone-parent	0.8
— Income characteristics	1.0
— All other census family characteristics	1.0

Economic Family Characteristics (1)

— Economic family structure	0.7
— Age of husband	0.7
— Highest level of schooling of husband or reference person	1.0
— Mother tongue of husband or reference person - English	
— Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec	0.5
— Other provinces	0.2
— Canada	0.3
— Mother tongue of husband or reference person - French	
— New Brunswick, Quebec	0.3
— Other provinces	0.7
— Canada	0.5
— Mother tongue of husband or reference person - Other than English or French	
— Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick	0.8
— Other provinces	0.4
— Canada	0.4
— Class of worker or husband or reference person	0.8
— Place of birth of husband or reference person	0.8
— Weeks worked in 1980 - Husband or reference person	0.9
— Income characteristics	1.0
— All other economic family characteristics	1.0

Household Characteristics (1)

— Structural type	
— Single detached	0.4
— Other	0.7
— Period of construction	0.9
— Length of occupancy	0.9

— Tenure	0
— With or without central heating/Main type of heating equipment/ Principal heating fuel/Principal water heating fuel	1.0
— Condition of dwelling	1.0
— Household type	
— Family households, one family households, primary family households, non-family households, non-family households one person only (two or more persons)	0.3
— Other household type categories (eg. primary family house- holds with or without additional persons, secondary family households, multiple family households, ...)	0.7
— Number of rooms/bathrooms	0.9
— Household size	
— 1 person, 2 persons, 3 or more persons	0.5
— 3 persons, 4 persons, 5 persons, ...	0.9
— Number of persons per room	0.8
— Age of household maintainer	0.7
— Sex of household maintainer	0.4
— Registered condominium	
— Part	0.7
— Not part	0.4
— Gross rent/Gross rent as a percentage of household income	0.9
— Household income	1.0
— Owner's major payments/Owner's major payments as a percen- tage of household income	1.0
— Value of dwelling	0.9
— All other household characteristics	1.0

(1) When determining the standard error of a number relating to families or households, use the number of families or households in the area for selecting the appropriate column in table 1 or 2.

1981 REVERSE RECORD CHECK TABULATIONS (a)

This set of tabulations includes the currently available data from the Reverse Record Check. The data in these tables will form the basic tabular input on coverage error for the 1981 Census publications "Data Quality - Total Population" (catalogue number 99-904) and "Data Quality - Sample Population" (catalogue number 99-905).

The estimates of undercoverage are subject to sampling error (their standard errors are shown in the tables). In general the user can be reasonably certain that the true undercoverage rate will be within plus or minus two times the standard error for the estimated rate (e.g. the Canada level undercoverage rate for persons is 2.01% with a standard error of 0.09%; thus the true undercoverage rate should be in the range of $2.01 \pm 0.18\%$ or between 1.83% and 2.19%).

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(a) Report submitted by Statistics Canada September 1983.

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Table 1
Estimated Population Undercoverage in the 1981 Census
by Region and Province

Region and Province	Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)
Canada (10 provinces only)	2.01	0.09
Atlantic provinces (total)	1.47	0.20
Newfoundland	1.74	0.45
Prince Edward Island	1.17	0.54
Nova Scotia	1.05	0.34
New Brunswick	1.81	0.30
Quebec	1.91	0.21
Ontario	1.94	0.14
Prairie Provinces (total)	1.82	0.23
Manitoba	0.98	0.35
Saskatchewan	0.99	0.37
Alberta	2.54	0.36
British Columbia	3.16	0.33

Table 2
Estimated Population Undercoverage in the 1981 and 1976 Censuses by Sex and by Age Group
for Canada (excluding the Territories)

Sex and Age Group	1981 Census Population Undercoverage		1976 Census Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)	Estimated Rate (%)	Standard Error (%)
Total	2.01	0.09	2.04	0.10
0-4	1.21	0.22	2.31	0.28
5-14	1.23	0.21	1.20	0.16
15-19	2.96	0.52	1.99	0.38
20-24	5.51	0.29	5.31	0.38
25-34	2.31	0.28	2.85	0.28
35-44	2.20	0.26	1.54	0.26
45-54	0.81	0.23	1.22	0.33
55-64	0.91	0.29	0.92	0.20
65 and over	0.71	0.30	1.20	0.25
Male	2.37	0.13	2.46	0.17
0-4	1.32	0.33	2.53	0.46
5-14	1.27	0.29	1.14	0.21
15-19	3.12	0.68	1.93	0.48
20-24	6.03	0.48	5.99	0.52
25-34	2.70	0.44	3.64	0.46
35-44	3.42	0.40	2.33	0.48
45-54	1.21	0.38	1.63	0.41
55-64	0.91	0.40	1.28	0.34
65 and over	0.69	0.47	1.90	0.44
Female	1.65	0.12	1.61	0.10
0-4	1.10	0.33	2.07	0.36
5-14	1.19	0.31	1.26	0.27
15-19	2.80	0.73	2.05	0.51
20-24	4.98	0.43	4.62	0.48
25-34	1.92	0.32	2.03	0.38
35-44	0.93	0.31	0.72	0.24
45-54	0.41	0.26	0.81	0.38
55-64	0.92	0.34	0.58	0.25
65 and over	0.71	0.42	0.64	0.38

Table 3
Estimated Population Undercoverage in the 1981 and 1976 Censuses by Sex and by Marital Status
for Canada (excluding the Territories)

Sex and Marital Status	1981 Census Population Undercoverage		1976 Census Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)	Estimated Rate (%)	Standard Error (%)
Total	2.01	0.09	2.04	0.10
Now Married or Separated	1.22	0.11	1.20	0.12
Divorced	5.10	1.03	9.28	1.61
Widowed	0.64	0.39	2.48	0.59
Never Married	2.86	0.16	2.62	0.15
Age < 15	1.22	0.16	1.53	0.16
Age ≥ 15	4.51	0.27	3.93	0.29
Male	2.37	0.13	2.46	0.17
Now Married or Separated	1.34	0.17	1.30	0.21
Divorced or Widowed	4.94	0.93	9.68	1.66
Never Married	3.24	0.22	3.14	0.22
Age < 15	1.28	0.23	1.55	0.20
Age ≥ 15	5.07	0.36	4.88	0.41
Female	1.65	0.12	1.61	0.10
Now Married or Separated	1.11	0.15	1.11	0.14
Divorced or Widowed	1.06	0.44	2.30	0.55
Never Married	2.43	0.26	2.02	0.20
Age < 15	1.16	0.23	1.50	0.21
Age ≥ 15	3.82	0.47	2.72	0.36

Table 4
Estimated Population Undercoverage in the 1981 and 1976 Censuses by Mother Tongue for Canada
(excluding the Territories)

Mother Tongue	1981 Census Population Undercoverage		1976 Census Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)	Estimated Rate (%)	Standard Error (%)
Total	2.01	0.09	2.04	0.10
English	1.86	0.11	1.55	0.10
French	1.80	0.20	2.76	0.21
Other	3.08	0.26	3.01	0.33

Table 5
Estimated Private Household Undercoverage in the 1981 and 1976
Censuses by Region

Region	1981 Census Private Household Undercoverage		1976 Census Private Household Undercoverage	
	Estimated Rate (%)	Standard Error (%)	Estimated Rate (%)	Standard Error (%)
Canada (10 provinces only)	1.71	0.13	1.97	0.11
Atlantic	1.85	0.28	1.80	0.30
Quebec	1.72	0.29	2.31	0.24
Ontario	1.39	0.23	1.52	0.25
Prairie	1.81	0.27	1.34	0.16
British Columbia	2.40	0.38	3.61	0.39

Table 6
Estimated Private Household Undercoverage in the 1981 and 1976 Censuses by Tenure Status
for Canada (excluding the Territories)

Tenure Status	1981 Census Private Household Undercoverage		1976 Census Private Household Undercoverage	
	Estimated Rate (%)	Standard Error (%)	Estimated Rate (%)	Standard Error (%)
Total	1.71	0.13	1.97	0.11
Owned or Being Bought	0.65	0.11	0.92	0.12
Rented	3.41	0.25	3.61	0.24

Table 7
Estimated Private Household Undercoverage in the 1981 Census by Structural Type for Canada
(excluding the Territories)

Structural Type	1981 Census Private Household Undercoverage	
	Estimated Rate (%)	Standard Error (%)
Total	1.71	0.13
Single Detached	1.32	0.15
Apartment in a building with 5 or more storeys	0.41	0.24
Apartment in a building with less than 5 storeys	3.81	0.74
Duplex	3.02	0.61
Single Attached	1.11	0.22
Movable	3.41	1.08

Table 8
Comparisons of Population Undercoverage among the 1966, 1971, 1976 and 1981 Censuses by Region

Region	1966 Census		1971 Census		1976 Census		1981 Census	
	Estimated Undercov. Rate (%)	Standard Error (%)	Estimated Undercov. Rate (%)	Standard Error (%)	Estimated Undercov. Rate (%)	Standard Error (%)	Estimated Undercov. Rate (%)	Standard Error (%)
Canada (10 provinces only)	2.62	0.13	1.93	0.09	2.04	0.10	2.01	0.09
Atlantic	1.98	0.33	1.66	0.25	1.30	0.21	1.47	0.20
Quebec	2.95	0.62	2.10	0.16	2.95	0.25	1.91	0.21
Ontario	2.65	0.68	1.68	0.13	1.52	0.17	1.94	0.14
Prairie	2.24	0.24	1.75	0.20	1.34	0.16	1.82	0.23
British Columbia	2.84	0.99	2.89	0.32	3.13	0.13	3.16	0.33

Table 9
Comparisons of Population Undercoverage Among the 1966, 1971, 1976 and 1981 Censuses by Sex and Age Group*

Age Groups	Both Sexes (Total)				Female				Male			
	Population Undercoverage Estimated rate (%) In				Population Undercoverage Estimated rate (%) In				Population Undercoverage Estimated rate (%) In			
	1966 Census	1971 Census	1976 Census	1981 Census	1966 Census	1971 Census	1976 Census	1981 Census	1966 Census	1971 Census	1976 Census	1981 Census
Total	2.62 (0.13)	1.93 (0.09)	2.04 (0.10)	2.01 (0.09)	2.35 (0.17)	1.59 (0.11)	1.61 (0.10)	1.65 (0.12)	2.90 (0.20)	2.27 (0.12)	2.46 (0.17)	2.37 (0.13)
0-4	2.96 (0.11)	1.99 (0.27)	2.31 (0.28)	1.21 (0.22)	3.68 (0.17)	2.25 (0.40)	2.07 (0.36)	1.10 (0.33)	2.30 (0.16)	1.73 (0.34)	2.53 (0.46)	1.32 (0.33)
5-14	1.53 (0.21)	0.90 (0.13)	1.20 (0.16)	1.23 (0.21)	1.63 (0.31)	0.87 (0.17)	1.26 (0.27)	1.19 (0.31)	1.44 (0.25)	0.93 (0.18)	1.14 (0.21)	1.27 (0.29)
15-19	3.57 (0.51)	2.60 (0.28)	1.99 (0.38)	2.96 (0.52)	3.35 (0.67)	2.49 (0.38)	2.05 (0.51)	2.80 (0.73)	3.77 (0.67)	2.71 (0.39)	1.93 (0.48)	3.12 (0.68)
20-24	7.76 (0.82)	4.49 (0.28)	5.31 (0.38)	5.51 (0.29)	5.60 (0.89)	4.01 (0.37)	4.62 (0.48)	4.98 (0.43)	9.79 (1.31)	4.97 (0.40)	5.99 (0.52)	6.03 (0.48)
25-39	2.73 (0.32)	2.50 (0.20)	2.61 (0.24)	2.41 (0.24)	2.22 (0.45)	1.58 (0.22)	1.73 (0.29)	1.55 (0.24)	3.23 (0.50)	3.38 (0.31)	3.47 (0.39)	3.25 (0.38)
40-59	1.67 (0.24)	1.40 (0.15)	1.17 (0.18)	1.03 (0.14)	1.09 (0.28)	0.90 (0.17)	0.65 (0.22)	0.78 (0.18)	2.27 (0.39)	1.90 (0.24)	1.70 (0.29)	1.25 (0.26)
60 and over	1.97 (0.37)	1.22 (0.18)	1.02 (0.21)	0.80 (0.26)	2.37 (0.56)	1.10 (0.24)	0.68 (0.26)	0.76 (0.34)	1.72 (0.51)	1.37 (0.28)	1.43 (0.36)	0.85 (0.38)

* Excludes Yukon and Northwest Territories

Values enclosed within parenthesis are the corresponding standard error estimates

Table 10
Estimated Intercensal (1976-1981) Emigration by Frame*

Frame	Estimated Number of Emigrants	Standard Error
Total	296,727	15,539
Census	212,861	13,993
Birth	16,902	4,016
Immigrant	48,423	5,016
Missed in 1976	18,541	2,382

* Excluding Yukon and Northwest Territories

Table 11
Estimated Intercensal (1976-1981) Emigration by Region
(of Residence in 1976) - Census and Missed Frames Only

Region in 1976	Emigration Rate		Number of Emigrants	
	Estimated Rate (%)	Standard Error (%)	Estimated Rate (%)	Standard Error (%)
Canada (10 provinces only)	0.99	0.06	231,402	14,194
Atlantic	0.50	0.08	10,997	1,741
Quebec	0.75	0.14	48,137	9,294
Ontario	1.14	0.11	95,812	8,970
Prairie	0.92	0.09	35,445	3,554
British Columbia	1.61	0.21	41,012	5,311

Table 12
Estimated Intercensal Emigration by Age Groups (in 1976) and Sex* - Census and Missed Frames Only

Sex and Age Groups	Emigration Rate		Number of Emigrants	
	Estimated Rate (%)	Standard Error (%)	Estimated Rate (%)	Standard Error (%)
Both sexes (total)	0.99	0.06	231,402	14,194
0 to 9	0.92	0.14	33,951	5,018
10 to 14	0.63	0.18	14,384	4,035
15 to 19	0.75	0.11	17,863	2,666
20 to 29	1.34	0.20	57,383	8,460
40 to 39	1.91	0.28	57,777	8,563
40 and over	0.65	0.09	50,043	6,832
Male (total)	0.84	0.09	97,863	11,070
0 to 9	0.87	0.21	16,317	4,010
10 to 14	0.80	0.29	9,318	3,388
15 to 19	0.72	0.17	8,716	2,020
20 to 29	0.92	0.18	19,959	3,828
30 to 39	1.62	0.39	24,981	5,998
40 and over	0.50	0.10	18,570	3,879
Female (total)	1.14	0.10	133,539	11,183
0 to 9	0.99	0.18	17,634	3,291
10 to 14	0.45	0.24	5,067	2,727
15 to 19	0.78	0.15	9,147	1,727
20 to 29	1.76	0.31	37,424	6,544
30 to 39	2.22	0.43	32,794	6,300
40 and over	0.78	0.15	31,473	6,099

* Excluding Yukon and Northwest Territories

Table 13
Estimated Population Undercoverage in the 1981 Census by Urban Size Groups / Rural Area

Urban Size Groups / Rural Area	Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)
Canada (10 provinces only)	2.01	0.09
<i>Urban Area (Total)</i>	2.08	0.11
500,000 and over	2.29	0.17
100,000 to 499,999	1.86	0.31
30,000 to 99,999	2.34	0.38
10,000 to 29,999	1.39	0.36
Less than 10,000	1.47	0.34
<i>Rural Area</i>	1.79	0.21

Table 14
Estimated Population Undercoverage in the 1981 Census by Census Metropolitan Area-Parts
and Specific Census Metropolitan Areas

Census Metropolitan Area- Parts and Specific CMA's	Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)
<i>All CMA's (Total)</i>	2.16	0.14
<i>CMA Parts</i>		
Urban Core	2.22	0.15
Urban Fringe	1.99	0.83
Rural Fringe	1.05	0.40
<i>Specific CMA's</i>		
Montreal	2.09	0.30
Toronto	2.77	0.26
Vancouver	2.52	0.38
Other	1.83	0.21

Table 15
Estimated Population Undercoverage in the 1981 Census by Mobility Status (Province of Residence
in 1976) for Population 5 years and over * - Census and Immigrant Frames only

Mobility Status (Province of Residence in 1976)	Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)
Total	1.92	0.10
Canada within same province	1.53	0.09
Canada from a different province	5.35	0.74
From outside Canada (immigrants)	8.53	0.82

* Excluding Yukon and Northwest Territories

Table 16
Estimated Private Household Undercoverage in the 1981 Census by Urban Size Groups / Rural Area

Urban Size Groups/ Rural Area	Household Undercoverage	
	Estimated Rate (%)	Standard Error (%)
<i>Canada</i> (10 provinces only)	1.71	0.13
<i>Urban Area (Total)</i>	1.64	0.14
500,000 and over	1.80	0.25
100,000 to 499,999	1.28	0.41
Less than 100,000	1.52	0.27
<i>Rural Area</i>	1.97	0.28

Table 17
Estimated Private Household Undercoverage in the 1981 Census by Period of Construction*

Period of Construction	Household Undercoverage	
	Estimated Rate (%)	Standard Error (%)
<i>Total</i>	1.71	0.13
1920 or before	1.27	0.52
1921 to 1945	2.24	0.50
1946 to 1960	1.58	0.27
1961 to 1970	1.53	0.25
1971 to 1975	2.32	0.36
1976 to 1979	1.14	0.35
1980	0.35	0.35
1981	11.01	3.63

* Excluding Yukon and Northwest Territories

Table 18
Estimated Private Household Undercoverage in the 1981 Census by Length of Occupancy*

Length of Occupancy	Household Undercoverage	
	Estimated Rate (%)	Standard Error (%)
<i>Total</i>	1.71	0.13
Less than one year	6.12	0.53
One to two years	2.22	0.39
Three to five years	0.12	0.14
Six to nine years	0.41	0.20
Ten years or more	0.32	0.13

* Excluding Yukon and Northwest Territories

Table 19
Estimated Population Undercoverage in the 1981 Census by Northern and Southern Area*

Area	Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)
Canada	2.01	0.09
Northern	3.88	0.53
Southern	1.89	0.10

* Excluding Yukon and Northwest Territories

Of necessity the Northern and Southern areas have been defined in terms of FED boundaries and are not necessarily defined by latitude. To some extent the division made is arbitrary. The exact definition of "Northern" areas is as follows:

Province	FED's considered "Northern"
Newfoundland	004
Quebec	001, 031, 042, 058
Ontario	001, 009, 034, 079, 080, 081
Manitoba	002
Saskatchewan	004, 013
Alberta	001, 016
British Columbia	007, 021

All other areas are "Southern".

Table 20
Estimated Population Undercoverage in the 1981 Census by Sex, Work Activity in 1980 and Age Group for the Population 15 Years and Over*

Work Activity and Age	Total		Male		Female	
	Population Undercoverage		Population Undercoverage		Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)	Estimated Rate (%)	Standard Error (%)	Estimated Rate (%)	Standard Error (%)
<i>Total</i>	2.27	0.11	2.74	0.15	1.82	0.15
Less than 25 years	4.29	0.26	4.63	0.38	3.94	0.41
25 years and over	1.58	0.10	2.07	0.17	1.12	0.12
<i>Weeks worked is greater than zero</i>						
<i>Total</i>	2.22	0.13	2.56	0.20	1.74	0.16
Less than 25 years	4.48	0.27	4.90	0.44	3.99	0.40
25 years and over	1.42	0.14	1.82	0.19	0.80	0.17
<i>Weeks worked equals zero</i>						
<i>Total</i>	2.38	0.24	3.48	0.44	1.91	0.24
Less than 25 years	3.83	0.57	3.83	0.87	3.83	0.78
25 years and over	1.93	0.22	3.30	0.54	1.46	0.21

* Excludes Yukon and Northwest Territories

Table 21
Estimated Population Undercoverage in the 1981 Census by Sex, Work Activity in 1980
and Marital Status for the Population 15 Years and Over*

Work Activity and Marital Status	Total		Male		Female	
	Population Undercoverage	Standard Error	Population Undercoverage	Standard Error	Population Undercoverage	Standard Error
	Estimated Rate (%)	Error (%)	Estimated Rate (%)	Error (%)	Estimated Rate (%)	Standard Error (%)
<i>Total</i>	2.27	0.11	2.74	0.15	1.82	0.15
Now married or separated	1.23	0.11	1.35	0.17	1.11	0.15
Widowed or divorced	2.21	0.43	5.28	1.05	1.17	0.45
Never married (single)	4.60	0.28	5.18	0.37	3.89	0.48
<i>Weeks worked is greater than zero</i>						
<i>Total</i>	2.22	0.13	2.56	0.20	1.74	0.16
Now married or separated	0.97	0.13	1.10	0.18	0.77	0.21
Widowed or divorced	3.34	0.70	7.74	1.64	0.61	0.64
Never married (single)	4.86	0.32	5.39	0.49	4.12	0.46
<i>Weeks worked equals zero</i>						
<i>Total</i>	2.38	0.24	3.48	0.44	1.91	0.24
Now married or separated	1.86	0.20	2.81	0.63	1.55	0.23
Widowed or divorced	1.46	0.51	1.54	0.83	1.44	0.59
Never married (single)	4.02	0.63	4.59	0.78	3.47	0.90

* Excludes Yukon and Northwest Territories
 Excludes Inmates

Table 22
Estimated Population Undercoverage in the 1981 Census by School
Attendance for the Population 15 Years and Over*

School Attendance	Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)
<i>Total</i>	2.27	0.11
Attending Full-time	2.90	0.44
Attending Part-time or not attending	2.19	0.10

* Excludes Yukon and Northwest Territories
 Excludes Inmates

Table 23
Estimated Population Undercoverage in the 1981 Census by Total
Income Group in 1980 for the Population 15 Years and Over*

Total income in 1980	Population Undercoverage	
	Estimated Rate (%)	Standard Error (%)
Total	2.27	0.11
None	3.79	0.38
Less than \$3,000	2.31	0.32
\$3,000 - \$5,999	3.07	0.39
\$6,000 - \$9,999	2.36	0.36
\$10,000 - \$14,999	1.51	0.38
\$15,000 - \$24,999	1.47	0.25
\$25,000 and over	0.88	0.29

* Excludes Yukon and Northwest Territories
 Excludes Inmates

DESCRIPTION OF THE DANISH POPULATION AND HOUSING CENSUS 1981 (a)

1. DATA SOURCES

The 1981 census of population and housing is primarily based on data obtained from a number of administrative national registers, especially the Central Population Register ("Det centrale personregister", abbreviated CPR), the Central Register of Buildings and Dwellings, ("Bygnings- og boligregistret", abbreviated BBR), the Central Register of Enterprises and Establishments ("erhvervsregistret"), various registers of the withholding-tax system, especially the Salary Information Register ("Oplysningsseddelregistret"), the Central Register for Labour Market Statistics ("Det centrale register arbejdsmarkedets forhold", abbreviated CRAM), and registers of public pay transfer systems. In addition, some data have been compiled by Danmarks Statistik, especially data concerning education (1).

The census is based on the same material as some of the current annual statistics regarding population and housing matters. The census publications do not contain results which have already appeared in other statistical publications, notably in:

— Befolkningen i de enkelte kommuner (Populations of Municipalities), 1st January 1981 (Statistisk Tabelværk 1981:I)

and

— Boligtællingen (Housing Census), 1st January 1981 (Statistisk Tabelværk 1982:II).

(a) Report prepared by Danmarks Statistik.

2. ENUMERATION UNITS

For the 1981 census (which excludes the Faroe Islands and Greenland) the basic units of enumeration are:

- persons
- families
- households
- dwellings.

The census population consists of all *persons* who are registered as resident in Denmark at the beginning of the 1st January 1981 (the "de jure" population). This includes persons staying temporarily in Denmark if the stay exceeds three months or if they have their work or occupation in Denmark. Included are also Danish seamen in foreign waters, Danish diplomats (and their families) stationed in foreign countries, and Danish residents whose workplace is outside Denmark. Conversely, the census excludes foreign diplomats (and their families) stationed in Denmark and foreign residents whose workplace is in Denmark.

A *family* may consist of a single person or of a group of family members living at the same address. Such groups are ascertained in the Central Population Register by means of a so-called cross-reference number which is allocated to an individual in addition to his/her person number (CPR number). The cross-reference numbers provide links between 1) two legally married spouses and 2) parents and their children under 26 years old. Two consensually married persons are not linked to each other by cross-reference numbers, and for census purposes they are therefore not regarded as a single family unless they have a joint child, in which case a link is established via the cross-reference numbers to the child.

A *household* consists of all persons living in a single dwelling (whether or not members of the same family), according to address information in the Central Population Register.

A *dwelling* is defined as a room or suite of rooms and its accessories

- used for habitation (exclusively, or also for other purposes such as workplace or institution)
- with separate access to the street, direct or via a garden or grounds, or to a common space within the building (staircase, passage, etc.)
- situated in a permanent building.

For each dwelling a separate address is indicated in the Register of Buildings and Dwellings (BBR), and because each person's address is also found in the Central Population Register (CPR) in the form of an identical address identifier it is possible to match data in the two registers and consequently to obtain detailed information on the housing circumstances of Danish persons, families and households.

However, the number of households registered in the CPR is not exactly equal to the number of occupied dwellings registered in the BBR because some persons with address identifiers in the CPR do not figure at the same addresses on the BBR. This is so, partly because of inaccurate address designations, and partly because some people are registered in the CPR (but not in the BBR) without a permanent address, and partly because some people live in places which are not classified as dwellings, for example houseboats.

3. GEOGRAPHY

3.1. Address data

On the basis of the address data relating to 1st January 1981 it is possible to compile census data for any geographic area which can be described by means of road names and house numbers. The address data in question are the addresses of persons, of dwellings, of places of work (establishments) and of places of education. Items 3.2.–3.10. below mention the kinds of geographic divisions that have been applied to the census material and for which results may be found in the census publications.

In the publication "Danmarks administrative inddeling" figures are given for population numbers of certain administrative areas and for area size of municipalities, parishes and urban areas.

3.2. Municipalities and counties

The division into municipalities (in Danish: kommuner) and counties (in Danish: amtskommuner) relates to the Danish local government division at census date 1st January 1981.

3.3. Copenhagen region

The Copenhagen region comprises the municipalities of Copenhagen and Frederiksberg and the counties of Copenhagen, Roskilde and Frederiksborg.

3.4. Parishes

The parish boundaries are those existing at census date 1st January 1981. In cases where a parish is situated in more than one municipality it is subdivided, each part being indicated as "sogn, del af" (parish, part of). Parishes with under 50 inhabitants are allocated to neighbouring parishes.

3.5. Districts and sub-districts

Parishes are used as the smallest administrative areas in all Denmark, except in the municipality of Copenhagen, in which districts and sub-districts are used (those existing on the date of the census).

3.6. Postal code numbers

The postal code numbers are those in use at the census date. The information concerned has been obtained from the address register of the CPR.

3.7. Urban areas and rural districts

An urban area is a continuously built-up area with at least 200 inhabitants at the time of the census. The term continuously built-up is understood to mean that the distance between houses does not exceed 200 metres, except owing to public parks, churchyards, athletic grounds, industrial plants, etc.

The Copenhagen metropolitan area (Hovedstadsområdet), consists of the municipalities of Copenhagen and Frederiksberg, the county of Copenhagen, the municipalities of Allerød, Birkerød, Farum, Fredensborg-Humlebæk, Hørsholm and Karlebo (in the county of Frederiksborg) and the municipalities of Greve and Solrød (in the county of Roskilde).

3.8. Size-classes of urban areas and rural districts

For census purposes the localities are grouped as follows:

1. The Copenhagen metropolitan area
- 2-12. Other urban areas
 2. with 100,000 or more inhabitants
 3. with 50,000-99,999 inhabitants
 4. with 40,000-49,999 inhabitants
 5. with 30,000-39,999 inhabitants
 6. with 20,000-29,999 inhabitants
 7. with 10,000-19,999 inhabitants
 8. with 5,000- 9,999 inhabitants
 9. with 2,000- 4,999 inhabitants
 10. with 1,000- 1,999 inhabitants
 11. with 500- 999 inhabitants
 12. with 200- 499 inhabitants
13. Rural districts.

3.9. Geocode I

In Geocode I, the Danish municipalities (kommuner) are grouped by degree of urbanization (size-class of urban areas) in the following way:

1. The Copenhagen region ("Hovedstadsregionen")
 11. Central Copenhagen ("Hovedstaden")
 12. Suburban municipalities
 13. Other municipalities whose largest urban area has at least 10,000 inhabitants
 14. Other municipalities
2. Urban municipalities outside the Copenhagen region

Municipalities whose largest urban area has:

 21. at least 100,000 inhabitants
 22. 40,000-99,999 inhabitants
 23. 20,000-39,999 inhabitants
 24. 10,000-19,999 inhabitants
3. Other municipalities outside the Copenhagen region

Municipalities in which urban areas with at least 2,000 inhabitants account for:

 31. 50 per cent or more of the population
 32. 33.3-49.9 per cent of the population
 33. Under 33.3 per cent of the population
 34. Municipalities in which no urban area has more than 2,000 inhabitants.

3.10. Geocode II

In Geocode II the municipalities (kommuner) in each county are grouped by degree of urbanization (size-class of urban areas).

An urban municipality is a municipality whose largest urban area has at least 10,000 inhabitants (including municipalities in the Copenhagen region).

However, the municipalities of Frederiksberg, Copenhagen, Odense, Ålborg and Århus each constitute single undivided areas; and in the case of Copenhagen county a different classification is used:

1. Municipalities on the Island of Amager
2. Northern municipalities
3. Western municipalities.

4. PERSON CHARACTERISTICS

4.1. Demographic characteristics

4.1.1. Sex

A person's sex is indicated by the last digit of the 10-digit person number (CPR number), females having even numbers and males odd numbers.

4.1.2. Age

The age distribution of the population as at the census date 1st January 1981 refers to completed years of age. The age is calculated on the basis of the first six digits of the person number, which show the day, month and year of birth.

4.1.3. Marital status

The population can be analysed by legal marital status as at 1st January 1981. The categories are: single (i.e. never-married), married, divorced and widowed. Persons who are legally separated but not yet divorced are included in the group of married persons.

4.1.4. Date of latest change in marital status

This item is confined to changes during 1980.

4.1.5. Family status

A family consists of a single person or of a group of family members living at the same address (cf. section 2 above).

The family status indicates the family member's position in the family.

The status groups are:

1. Spouse, including parent living in a consensual union with joint child(ren);
2. Single person under 18 years old (never married and without children) not living at the parents' address;
3. Single person, other;
4. Person under 26 years old ("child") living at the parents' address.

Unless otherwise indicated, people in status groups 1, 2 and 3 are referred to as adults, and those in group 4 as children.

4.1.6. Place of birth

For persons born in the Kingdom of Denmark, including Greenland and the Faroe Islands, the CPR indicates the birth parish or the local population registration district. The information refers to the place where the birth took place.

For persons born elsewhere, the CPR indicates the country of birth.

4.1.7. Date of latest change of address

This item is confined to changes during 1980.

4.1.8. Municipality of residence at 1st January 1980

This item is included in the census material concerning those of the census population who were also found in the population registers one year before the census date 1st January 1981.

4.1.9. Citizenship

Census information concerning citizenship is obtained from the Central Population Register. In cases where citizenship is not indicated in the CPR, the persons concerned are, to the extent possible, allocated to the continent or part of the world that they come from. If this is not possible either, the persons in question are allocated to a separate group called citizenship not stated. Another separate group is formed by stateless persons.

For persons with dual nationality, only one citizenship is stated in the CPR, according to their own choice. However, irrespective of dual nationality, persons with Danish nationality always figure as Danish citizens.

4.2. Economic characteristics

4.2.1. Activity status for the year 1980

The population aged 16 years and over is analysed by economic activity status (type of activity). The following main groups are distinguished:

Economically active

1. Self-employed
2. Assisting spouses
3. Employees

Not economically active

4. Pensioners
5. Others not economically active

The data used for classifying persons by activity status are obtained from registers of the withholding-tax system and from the Register of Enterprises and Establishments. The main criterion is the size of personal income for the year 1980. The principal rule is that a person with an annual earned income of at least kr. 20,300 is considered economically active, provided that the earned income is higher than the amount of any public pension received.

Supplementary rules apply to self-employed persons, whose incomes may fluctuate substantially. The large majority of unemployed persons are also regarded as economically active, because benefits in lieu of earned income (such as sickness benefits and unemployment benefits) are added to the earned income for the purposes of the activity status classification.

Pensioners are persons who are not economically active and who receive a public pension, i.e. old-age, disablement or widow's pension. It must be pointed out that persons with a relatively high annual earned income in relation to any pension received are classified as economically active (self-employed, assisting spouses or employees).

Persons who receive private pensions without at the same time receiving public pension payments are not classified as pensioners.

Others not economically active is a residual group comprising:

- Students. This group is formed on the basis of information about education being received (See section 4.4.);
- Housewives. Married women who are not receiving education;
- Others.

Persons between the ages of 0 and 15 years old are not classified by activity status for the purpose of the census, as they are by definition economically inactive.

Please note that some students are classified as economically active.

4.2.2. Activity status at the end of 1980

Activity status data for the end of 1980 differ from those for the whole of 1980, partly in the time reference, and partly in that people who were unemployed for the whole of week 48, together with those receiving early retirement pay, are treated separately as an independent group. Activity status at the end of 1980 is based on information from the register system for business statistics, and on information concerning size of income in 1980, the latter obtained primarily from the annual pay declaration slips prepared by all employers. Information from the Central Register for Labour Market Statistics

(CRAM) has also been used. The end-year status is mainly used in connection with commuting statistics.

4.2.3. *Socio-economic groups*

The following socio-economic groups have been established on the basis of information about activity status and occupational designation:

1. Self-employed without employees
2. Self-employed with 1 to 10 employees
3. Self-employed with more than 10 employees
4. Salary earners I (upper levels)
5. Salary earners II (intermediate levels)
6. Salary earners III (other salary earners)
7. Skilled wage-earners
8. Unskilled wage-earners
9. Employees, not further specified.

Assisting wives are classified to groups 1–3.

The number of employees is calculated as the sum of compulsory supplementary pension contributions paid by the firm in 1980 divided by a year's contributions payable for one full-time employee.

Employees are classified into socio-economic group on the basis of occupational information from the public sector's pay transfer systems, from the seaman tax register and from income tax returns, each occupational designation being classed to one of the socio-economic groups.

Economically active employees whose occupational designation is not stated in the sources mentioned are placed as far as possible in socio-economic groups on the basis of information about their membership of certain unemployment insurance funds, or about education being received (apprenticeship training in particular), or they are classified as: Employees, not further specified.

When distinguishing between salary earning groups I, II and III, the criterion is the level of education and status at work normally implied by the occupational designation. When distinguishing between salary earners and wage earners, and between skilled and unskilled wage earners, the criterion is the employment status traditionally associated with the occupational designation.

4.2.4. *Danish Occupational Code*

Employees are classified according to the Danish Occupational Code, at the two-digit level (main groups). The Danish Occupational Code is published by the

Directorate of Labour with the title "Dansk Fagkode 1979 (DFK)".

Employees have been organised into DFK groups on the basis of occupational information from the public sector's pay transfer systems, from the seaman tax register and from income tax returns, each occupational designation being classed to a DFK group.

Economically active employees whose occupational designation is not stated in the sources mentioned are placed in DFK groups on the basis of information about their membership of certain unemployment insurance funds, about education being received (apprenticeship training in particular), or they are classified as: Employees, not further specified.

The DFK classification system builds on the International Standard Classification of Occupations (ISCO) 1968, but has been adapted to suit Danish requirements and corresponds therefore to ISCO at the one-digit level only.

4.2.5. Occupations

Employees analysed by occupations is a type of statistic combining the two-digit groups of the Danish Occupational Code with the socio-economic groups, see sections 4.2.3. and 4.2.4.

4.2.6. Kind of economic activity (industry)

Three different sorts of information about kind of activity are used in the 1981 census:

Establishment (local unit) activity referring to the economic activity during 1980 is the information normally used.

Establishment (local unit) activity referring to the economic activity at the end of 1980 is used in commuting surveys, etc.

Enterprise (legal unit) activity referring to the economic activity during 1980 is the principal activity of the enterprise. Classification by economic activity in the 1976 register-based census was based on the enterprise activity concept.

The information required for the industrial coding of the self-employed and of assisting wives is mainly obtained from the register system for business statistics.

Self-employed persons who are not entered in the Central Register of Enterprises and Establishments are coded according to their occupations as indicated on their income tax returns.

As regards employees, the relevant information can also be obtained from the register system for business statistics. All employers, including public authorities, are registered in the Central Register of Enterprises and Establishments by means of a CIR number, which is a code number allocated to each employer (enterprise) by the tax authorities. A kind-of-activity code for each

CIR number can also be found in the Central Register of Enterprises and Establishments.

This identification code thus indicates the enterprise's principal activity.

However, a CIR number may cover more than one kind of economic activity, and an enterprise which is registered with the tax authorities under one CIR number may have local units at various addresses.

In both cases a local unit code (a so-called workplace code) has been introduced so that the individual activities and local units can be recorded. The workplace code number is a sub-division of the CIR number and is agreed upon by Danmarks Statistik and the employer.

For each workplace code number there is an activity code number in the Central Register of Enterprises and Establishments. Data on employees can be linked to this information via the annual pay declaration slips, which are sent by employers to the tax authorities, and which state the employee's person number, the employer's CIR number, the workplace code number, if any, and information about the amount of wages, salaries, etc., paid to the employee.

If an employee has had more than one employer during the year, the economic activity is determined by the enterprise where the largest income has been earned.

The economic activity coding refers to the code numbers of Danmarks Statistik's industrial classification system. It builds on the 1968 version of the International Standard Industrial Classification of All Economic Activities and at the main group level it can be converted to the General Nomenclature of Economic Activities in the European Communities (NACE).

4.2.7. Type of Ownership - Enterprise

Economically active persons are grouped according to the ownership conditions of the enterprises by which they were employed during 1980. The information concerning ownership conditions is obtained from the register system for business statistics:

1. Sole proprietorship
2. Partnership
3. Limited partnership
4. Public limited company
5. Private limited company
6. Private co-operative
7. State (central government)
8. Municipality, county
9. Private non-profit institution, society
10. Others, data not available.

4.2.8. Insurance categories

Employed persons are classified to the following groups on the basis of data from the Central Register for Labour Market Statistics (CRAM), which contains information about members of unemployment insurance funds and also about uninsured job seekers who have been referred to the public employment offices by the municipal social security offices:

1. Full-time insured members of unemployment insurance funds
2. Part-time insured members of unemployment insurance funds
3. Uninsured.

The classification refers to the insurance category at the end of 1980. Anyone who is not a member of an unemployment insurance fund is regarded as uninsured.

4.2.9. Degree of unemployment for the year 1980

The degree of unemployment is based on information from the Central Register for Labour Market Statistics (CRAM).

For insured members of unemployment insurance funds, the degree of unemployment is calculated as a person's registered unemployment hours divided by the number of hours for which that person is insured. For full-time insured members of unemployment insurance funds that number is 40 hours per week and for part-time members it is 15-30 hours per week, depending on the average number of employed hours prior to the unemployment period.

For practical reasons, a normal working week of 40 hours has been set for uninsured persons. Only uninsured persons who are included in the Directorate of Labour's weekly counts of unemployment on Wednesdays are included in the unemployment statistics. They are regarded as being unemployed for the entire calendar week.

4.2.10. ATP contributions paid in 1980 as a percentage of the sum of ATP contributions payable for a full-time employee

Information about ATP contributions (labour market supplementary pension contributions) concerns, employees and is usually the amount of ATP contributions paid in 1980, as stated on the annual pay declaration slip. This amount is compared with a full-time employee's contribution of D.kr.432. The amount of ATP contributions paid depends on the number of hours worked during the year, i.e. both on the number of hours worked daily and on the whole period of employment during the year.

4.2.11. Full-time and part-time employees at the end of 1980

Information about full-time or part-time employment concerns only those who were employees at the end of 1980 and is based on data from the annual pay declaration slips about ATP contributions, period of employment, etc., and information from the Central Register for Labour Market Statistics (CRAM) about insurance category, etc.

4.3. Size of income

4.3.1. Gross income 1980

Gross income is calculated on the basis of information from the 1980 income tax return and consists of all taxable forms of income, including surplus and deficit on real property and self-employment, before deduction of any mortgage interest and other interest payments.

4.3.2. Taxable income 1980

Taxable income is gross income less various income deductions, i.e. all interest paid, including mortgage interest and interest on business debts, and general deductions such as personal relief, deductions for payments to pension funds and insurance schemes, and child maintenance payments, etc.

4.3.3. Family and household income

Family and household income comprises the income of all the members of the family or household, including children's income.

4.4. Education being received

4.4.1. Determination of education activity

For the purposes of the census, the population receiving education in 1980 consists of people who a) were receiving education on 1st October 1980 and b) are registered as having received education during six or more months of 1980. The word education is understood to comprise both general education and vocational training.

All data concerning education are based on Danmarks Statistik's education statistics register, for which information is collected annually from the institutions of education. The collected information contains data on all students

receiving State recognized education lasting more than 80 hours, ranging from the 8th class (lowest level of secondary education) to post-graduate studies at university level.

4.4.2. Level and kind of education

Persons receiving education on 1st October 1980 are grouped by level and kind of education, according to the Danish Nomenclature of Educations (DUN), which is a systematic classification of educations by kind (subject) and which can also be used for analysing the educations by level, i.e. by number of years required for completion.

4.4.3. Education with/without pay

On the basis of the information mentioned in section 4.4.2., a distinction is made between those who receive pay from their employers and those who do not. Partly paid education is regarded as education with pay. Those receiving pay are primarily apprentices. People who are partly paid during their education are the persons registered under vocational school educations who receive pay during periods when they are working as trainees outside the schools.

4.4.4. Full-time and part-time education

On the basis of the information mentioned in section 4.4.2., a distinction is made between persons receiving full-time education and persons receiving part-time education. Part-time students are mostly found at schools of economics and business administration.

4.5. Completed education

The population aged 16-59 years is analysed by educational qualifications with reference to both completed general education and completed vocational education. The basic information consists of education data used for the 1970 population and housing census and data for years after 1970 collected by Danmarks Statistik and the Ministry of Education from the institutions of education. For the 1970 census the education data were only processed and published for the population aged under 50 years, the data for the older population being of insufficient quality. Therefore the 1981 census has been confined to education data for the population under 60 years old.

The level of general education refers to the education most recently completed. In the case of more than one completed vocational education, the one with the highest level is selected, according to the level grading of the

Danish Nomenclature of Educations.

Please note that also persons receiving education are classified by level of completed education, which means that for instance a person attending the last year or grade of a study is allocated to the group having completed the last-but-one year or grade.

5. FAMILY CHARACTERISTICS

5.1. Family type

The following family types are distinguished:

1. A cohabiting couple, legally married, with or without (joint or separate) child(ren) under 26 years old living at the same address;
2. A cohabiting couple, living in consensual union, with joint child(ren) under 26 years old living at the same address (plus any separate child(ren) in addition to the joint child(ren));
3. A single person with or without child(ren) under 26 years old living at the same address.

A person is not regarded as a child in a family if he or she is married, previously married or has children in which case the person forms a separate family with or without spouse and with or without children.

The single-person family type includes a family formed by a single person under 26 years old living at an address other than that of his or her parents. A cohabiting couple living in consensual union without a joint child is regarded as two single-person families.

5.2. Other family characteristics

The families may also be analysed by composition, e.g. number of persons or number of children or with reference to the characteristics of a given person in the family e.g. age of youngest child or sex of oldest person.

6. HOUSEHOLD CHARACTERISTICS

6.1. Household type

Two household types are distinguished:

1. Private households
2. Institutional households, etc.

Institutional households are:

1. Households comprising 6 or more families;
2. Households comprising 4 or more families living at an address registered at the address of an institutional household, according to Danmarks Statistiks list of institutions;
3. Households living in a dwelling which in the Register of Buildings and Dwellings is recorded as the dwelling of an institutional household.

The term *institutional households, etc.* comprises institutional households as well as households recorded in a local population register without having a permanent residence in the local district concerned.

6.2. Households recorded without permanent residence

Certain households are recorded on the CPR without a permanent residence. Examples are Danish diplomats abroad and persons living in houseboats. These households are identified by special address codes on the CPR. Unless otherwise indicated in the census publications, this group of households is included in the category called institutional households, etc. (cf. 6.1. above).

6.3. Other household characteristics

The households may be analysed by composition, e.g. number of persons or number of children, or with reference to the characteristics of a given member of the households, e.g. age of oldest person.

7. HOUSING CHARACTERISTICS

7.1.

The Danish dwelling-type code used for the census has the following classification groups:

1. Ordinary dwelling (dwelling with own kitchen or cooking facilities);
2. Supplementary room (room which is part of an ordinary dwelling, but which has a different and separate address);
3. Single room (without kitchen or permanent cooking facilities, but possibly with access to a communal kitchen);

4. Institutional households;
5. Seasonal dwelling (e.g. weekend cabin).

Dwellings proper consist of dwelling categories 1–3 above. They are classified according to the principal use of the building in which the dwelling is located:

1. *Farm houses*. Dwellings in agricultural buildings;
2. *Detached one-dwelling houses*. A detached one-dwelling house is a detached building which is wholly or mainly residential and which normally holds one dwelling only;
3. *Semi-detached houses, row houses, etc.* Semidetached houses, row houses, etc. are buildings which either wholly or in part are attached to similar buildings, which are wholly or mainly residential, and which normally hold one dwelling only;
4. *Dwellings in multi-dwelling houses*. A typical multi-dwelling house (including two-dwelling houses) is a block of rented or owner-occupied flats containing 2 or more housing units designed either for habitation or for use as a workplace or institution;
5. *Living quarters in student hostels*. Living quarters in student hostels may be a single room or a dwelling with own kitchen or permanent cooking facilities;
6. *Other dwellings proper*. A residual group which mainly comprises dwellings in buildings primarily used as a workplace or institution.

The following categories are all termed *one-dwelling houses*:

- Farm houses
- Detached one-dwelling houses
- Semi-detached houses, row houses, etc.

The number of dwellings proper is smaller in these population and housing census statistics than the corresponding figures in the publication *Boligtællingen* (Housing census) 1st January 1981 because households consisting of many families — and consequently their dwellings — are counted as institutional households in the population and housing census, cf. 6.1.

7.2. Facilities

7.2.1. Toilet facilities

The dwellings are classified as follows by type of toilet facilities:

1. Flush toilet within the dwelling;

2. Flush toilet outside the dwelling;
3. Other type of toilet or none.

One-dwelling houses with flush toilets are classified to group 1, even in cases where the toilet is located outside the dwelling.

7.2.2. Bathing facilities

A bathroom is defined as a room with a fixed bath and/or shower with a fixed connection to a water supply and with waste-pipe in the floor. A shower cubicle with a waste-water outlet in the floor counts as a bathroom.

The dwellings are classified as follows by availability of bathing facilities:

1. Bathroom within the dwelling;
2. Bathroom available outside the dwelling;
3. No bathroom or none available.

One-dwelling houses with bathrooms are classified to group 1, even in cases where the bathroom is located outside the dwelling.

7.2.3. Type of heating

Information about the type of heating relates to the entire building and not to the individual dwelling. In consequence, dwellings in buildings with more than one type of heating are classified to the preponderant type of heating.

The following categories are used:

1. District heating (radiator or hot-air systems);
2. Own central heating system (radiator or hot-air systems);
3. Stoves (fireplaces, electric heaters, gas heaters, etc.);
4. No heating installation.

7.2.4. Type of energy used for heating

Information about the type of energy relates to the entire building and not to the individual dwelling. It has not been possible to gather details about the type of energy used for heating the dwellings in multi-dwelling houses with individual types of heating (stoves, etc.), because the information has been supplied by the owner of the building and not the holder of each dwelling. For the same reason there is no information about the type of energy used for heating buildings with district heating.

Type of energy used for heating one-dwelling houses

Full details about the type of energy used for heating are only available for one-dwelling houses.

The following categories are used:

1. Oil, kerosene
2. Solid fuel
3. Gasworks gas
4. Electricity
5. Other.

Type of energy used for heating multi-dwelling houses and other dwellings

Details about the type of energy used for heating are only available for dwellings with own central heating system.

The following categories are used:

1. Oil
2. Solid fuel
3. Other.

7.2.5. Availability of facilities

The dwellings are classified into 7 groups referring to the combined availability of toilet, bathing and heating facilities:

1. Dwellings with toilet, central heating and bath;
2. Dwellings with toilet and central heating, but without bath;
3. Dwellings with toilet and bath, but without central heating;
4. Dwellings with toilet, but without central heating or bath;
5. Dwellings without toilet, but with central heating;
6. Dwellings without toilet and central heating;
7. Data about facilities not available.

with toilet = Dwellings with flush toilet within the unit

without toilet = Dwellings with flush toilet outside the unit, or other type of toilet or no toilet

with central heating = Dwellings in buildings with district heating, own central heating system, and one-dwelling houses with electric heaters or electric radiators

- without central heating = Dwellings in buildings heated by stoves, etc., with the exception of one-dwelling houses with electric heaters or electric radiators or without heating installations
- with bath = Dwellings with bathroom within the unit
- without bath = Dwellings with no bath within the unit
- data not available = Dwellings which as a result of inadequate information about one or more of the facilities cannot be placed in any of the other groups

7.3. Size of dwelling

Two concepts are used to express the size of the dwelling: number of rooms and gross floor space.

7.3.1. Number of rooms

The rooms counted for this purpose are those which may be used for habitation (i.e. those which satisfy certain legal requirements regarding size, insulation, windows, floors and walls), even though their actual function may be as a hobby room, office or other business premises.

Places designed for a specific function such as kitchens, bathrooms, lobbies and corridors, sculleries, larders, store rooms in cellars or attics, etc., do not count as rooms.

7.3.2. Gross floor space

The floor space is measured to the outside of the outer walls (gross area of each storey).

The floor space comprises all rooms in the dwelling. For one-dwelling houses this means taking into account the area of utilized attic space as well as the area of basement space used for habitation, including space used for laundry rooms, boiler room, larder, or business purpose. Conversely, the floor space of multi-dwelling houses and other buildings excludes attic space detached from the individual dwelling.

Common areas, such as staircases, passages, etc., are included in the floor space of the dwellings in buildings containing several dwellings or business premises, the common areas are allocated equally to each dwelling.

Information about the gross floor space of each unit as well as its dwelling floorspace and business floor space is found in the BBR. The housing census uses the gross floor space as the criterion for the classification. Some 97% of the total number of dwellings proper have no business floor space.

7.4. Period of construction

The dwellings are classified into groups according to the period in which the building containing the dwelling was completed.

7.5. Kitchen facilities

The dwellings are classified as follows by availability of kitchen facilities:

1. Own kitchen with both cooking facilities and wastepipe;
2. Access to a communal kitchen outside the dwelling;
3. Permanent cooking facilities in dwelling or corridor;
4. No kitchen and no permanent cooking facilities.

One-dwelling houses with kitchen or permanent cooking facilities are classified to group 1, irrespective of the location of these facilities.

7.6. Ownership, tenure, etc.

7.6.1. Type of ownership

Information about each property includes the type of ownership. The following owner categories are used:

1. Private persons or partnerships;
2. Non-profit housing associations;
3. Public and private limited companies;
4. Private housing co-operatives;
5. Other associations, private foundations, etc.;
6. Municipality in which the property is located;
7. Other municipalities;
8. Counties;
9. State (central government);
10. Others, including buildings containing freehold flats.

7.6.2. Form of tenure

The dwellings are classified as follows by form of tenure:

1. Rented (occupied, but not by the owner)
2. Owner-occupied
3. Unoccupied.

Data from the BBR, from the joint municipal Central Property Register and from the local population registers are matched to produce information on form of tenure on the BBR. The matching reveals whether the owner of a property (or freehold flat) on the Central Property Register is entered at one of the property's (freehold flat's) addresses on the population register. This information is retrieved by means of the person number, which is used in both the Central Property Register and the Central Population Register (CPR). If the owner is recorded at the address of one of the dwellings of his property, the dwelling is coded "owner-occupied". If the owner is not recorded at an address of a dwelling owned by him, the dwelling is coded "rented", provided that any persons are entered at the address on the population register. Dwellings for which there are no persons registered are coded "unoccupied".

The form-of-tenure code is entered on the BBR before a BBR copy is made available to Denmark's Statistik. Specified reference periods were used in the matching of CPR and BBR data for the housing census, but not when matching the three registers in order to obtain information on form of tenure. Some occupied dwellings may therefore appear as "unoccupied" in the statistical material, thus causing certain minor discrepancies.

7.6.3. Freehold flats

A freehold flat is a flat owned as a separate legal entity. Only blocks of flats which in their entirety can be divided into freehold flats may be used for such flats. Each freehold flat is regarded as an independent piece of real property.

A freehold flat may be occupied by the owner or rented. When a block of rented flats is to be turned into a block of freehold flats, the tenants may continue as tenants, unless they wish to buy their flat freehold.

7.6.4. Rent

The census includes information about the annual rent as at 1st January 1981 for dwellings not occupied by the owner.

8. SUMMARY CHARACTERISTICS

8.1. Activity rates

An activity rate indicates the percentage of economically active people in a given population. The population in question may be either the total Danish population or sub-populations defined with reference to sex, age, etc.

8.2. Dwelling rates

For the compilation of these rates a reference person is selected from each private households occupying a dwelling proper. The reference person is the oldest person in the household. A dwelling rate is a percentage which indicates the incidence of household reference persons in a given population. The population in question may be analysed by sex and age, etc.

(1) Further information about register-based statistics in Denmark can be found in the following publications:

Statistical Journal of the United Nations Economic Commission for Europe, Vol. 1, No 3. Towards a Register-based Statistical System, some Danish experience. Personal Identification Numbers and Population Statistics in Denmark (Danmarks Statistik, February 1978).

ISI Bulletin, Vol. 50, (International Statistical Institute 1983), Methodological Problems Connected with a Socio-demographic Statistical System based on Administrative Records.

CONTROL STUDY IN CONNECTION WITH THE FINLAND 1980 POPULATION AND HOUSING CENSUS (a)

Introduction

In Finland direct population and housing censuses (PHC) have been carried out in the years 1950, 1960, 1970, 1975 and 1980. In the years 1949-1940, indirect censuses were carried out based on church registers.

Increased demands have been made in the last years for quality reports within statistics; accordingly, the Central Statistical Office decided in 1979 that the 1980 Population and Housing Census would be evaluated with respect to variable errors and coverage (1). In October 1979 the Central Statistical Office set up a project with the task of planning and carrying out this evaluation.

Methods

The quality of the 1980 PHC has been studied in part with the help of an interview survey, in part using a parallel coding procedure.

During the period 8 November 1980-28 February 1981, 3,620 persons in the ages 15-74 years were interviewed with respect to certain selected variables in the PHC. In addition, the owners of 1,835 buildings were interviewed concerning certain variables related to buildings and dwellings. These interviews were carried out in February-March 1981.

The parallel coding was performed in such a way that the coding entries which were done out in the local population census offices were covered up, after which the forms were copied and recoded.

Since this quality study is based on samples, it must be born in mind that all surveys based on sample taking are afflicted with sample errors, thus calling for a careful appraisal of results and a 95% confidence interval is observed when one is given.

(a) Report prepared by Central Statistical Office of Finland.

A. Errors occurring when filling in forms

The responses obtained in the interviews have been compared with the final results of the PHC.

Type of activity

The essential results are given in table 1. Since the entire population was defined on the basis of the Central Register of Population, all persons whose occupational activity could not be determined with the help of form inquiries had to be put in the group "unknown". When a comparison was made with the interview study, it was revealed that the economically active population was 112,900 persons too little, or 5,1% ($\pm 2,5\%$).

On the other hand, the economically inactive population according to the PHC was 49,096 persons too large (net error 3.8%). The group "unknown" in the PHC was 6,804 and according to the interview survey, this can be divided up into two groups: economically active persons numbering 47,395 (74% of the group) and economically inactive persons numbering 16,409 (26% of the group). According to table 1, 90.5% ($\pm 1.0\%$) of the population in the ages 15-74 years have been assigned the correct "type of activity" (see line D) in the PHC.

In the PHC 1980, information was lacking on the type of activity of 87,552 persons. Of this number, 20,139 persons were in institutional care and therefore could not belong to the economically active population. No form whatsoever was received from 39,752 persons; these persons have been divided according to group of industry on the assumption that they are distributed in the same way as those who gave information on the forms. Based on the interview survey, 28,855 or 72.6% have been assumed to be economically active.

The interview survey furthermore included a comparison of the new classification "economically active/economically inactive" with the corresponding items in the 1970 census. In the 1980 PHC a reference period of 12 months was used and all who were employed and/or unemployed for at least 6 months were included in the economically active group. In the 1970 PHC, the inquiry mainly concerned activity according to circumstances on the 1st of January; thus a 12 month reference period was appropriate only for those who during the year were active in several occupations one after the other.

The results of the interview study indicate that changes in the basis of classification did not noticeably affect comparability. The new division gave 29,000 more economically active persons than the old one would have given, this being an increase in the economically active population of 1.2% (15-74 years old).

Branch of industry

PHC 1980 gives somewhat too small figures for the totality of the branches of industry cited primarily owing to the fact that the economically active population was too small (112,900 persons). The largest net difference in absolute figures concerned the groups agriculture and forestry (26,631) and the group "unknown" (26,402), the corresponding net error being 9.6% and 53.0%. The group "unknown" is found again as such also in the interview survey because for people who were unemployed over 12 months, no branch of industry could be determined according to the PHC instructions. The average net error for all branches of industry was 4.0% (15-74 years old). On average the branch of industry (1 figure level) is correct in 90.0% of cases ($\pm 1.2\%$).

Occupation

The largest net error is shown by the group (3) agriculture and forestry work ($-14.2\% \pm 11.3\%$). The "occupation unknown" group of the 1980 PHC comprised 18,951 persons and was 40% too large. Those who remained unknown in the interview survey, too, had been unemployed over 12 months. The net error for all the occupational groups was on average 3.9% (15-74 year olds).

Occupational status

The largest net error is shown by the group "family workers" -24.7% . Here, too, there is an "unknown" group, since the figures included persons who had been unemployed over 12 months. The group was nevertheless reduced substantially in the interview survey, from the PHC figure of 45,632 to 24,661.

Educational data

The diploma register which was established on the basis of the 1970 PHC was used in the PHC 1980. At the same time, the register was supplemented in such a way that the computer wrote in the upper right corner of the individual form a code which indicated that the person in question had a diploma in the register. This code was compared with the information on education which the person in question then supplied on the form. In cases where it turned out that the person in question had an education which was not included in the diploma register, he/she got a special diploma form which was used to update the register. With the help of the diploma forms, the diploma register was updated with educational data for a total of 59,821 persons.

The diploma register which was supplemented in this way was then used in the 1980 PHC. The interview survey furnishes a basis for ascertaining the quality of this register. The same persons who were included in the above-mentioned sample, also answered questions concerning education. Of the 3,613 persons interviewed, 1,466 responded that they had passed the kind of diploma specified in the diploma register. This information was treated as "the true value".

According to this study, the diploma register lacked diploma information for about 78,000 persons, which implies an undercoverage of 5%. Most of the diplomas that are lacking in the register were taken prior to 1971, one third prior to 1951. Only 9% of the diplomas lacking had been taken during the years 1971-1980. The survey showed that the diploma overcoverage was 1.5% of the population who had taken diplomas (approx. 22,000 persons).

Accordingly, the net undercoverage of the diploma register is $78,000 - 22,000 = 56,000$ persons, i.e. 4% of the population who had taken a diploma. The undercoverage is derived 91% from the 1970 population census. Of the diplomas lacking, 92% belong to middle level lower education (level 3 in the education classification, see f. the volume "registers", supplement 5). The largest undercoverage concerned education in technical subjects and the natural sciences (31% of all diplomas lacking).

The interview survey also gives an idea of the errors in the content of the diploma register. 3.4% of the interviewees holding a diploma had an erroneous "highest diploma" in the diploma register. Both the level and the area of education were erroneous in 0.4% of cases. In 2% of cases, the area of education was correct but the level was incorrect. The reverse was true in 1.2% of cases: correct level but wrong area.

Mother tongue

Information on the mother tongue was taken from the Central Register of Population and therefore this information was not solicited on the PHC blank. In the interview survey, the respondent gave his/her mother tongue, main language and language group. The results were the following:

Language	PCH 1980 Mother language (register)	Interview survey		
		Mother tongue	Main language	Language group
Finnish	94,0	93,9	94,6	94,2
Swedish	5,9	6,0	5,3	5,7
Other language	0,1	0,1	0,1	0,1
Total	100	100	100	100

(3,620 interviews)

97,2% of those who gave Swedish as their mother tongue in the population register gave the same mother tongue also in the interview survey whereas 2.8% gave Finnish as their mother tongue.

Dwellings

The floor space of the dwelling was quoted correctly as 85.9% (± 1.2) of cases. The relative net error was minimal in the groups 50-69 m² and 79-89 m². There were too many small dwellings in the 1980 PHC whereas the number of large dwellings was too small in the population census. The statistics on number of rooms show the same tendency.

As regards type of dwelling, it happens that respondents in PHC in many cases report a kitchen as a kitchenette. PHC 1980 gave the number of dwellings with a kitchen as 4.7% too small and the number of dwellings with a kitchenette as 11.2% too large.

Tenure status was correctly classified for an average of 94.4% of the dwellings in the 1980 PHC. According to the interview survey, the group "unknown" was reduced significantly whilst, above all, the groups "own a house" and "rent a dwelling" received an increase without occasioning a substantive change in the relative distribution.

In the distribution of dwellings according to landlord, the largest error in the 1980 PHC occurred with respect to the group "housing corporations", where the net error was 27.0% ($\pm 20.7\%$). The group "banks and insurance companies" was too small in the 1980 PHC as was the possession of dwellings by the public sector.

On the PHC 198 form an inquiry was made concerning the rent in marks for October 1980. The result of the interview survey diverged from the PHC result in 40% of cases by a factor of at least 10 marks. In three quarters of cases the divergence was less than 10%. The interview survey can thus not be considered completely reliable since here, too, memory error affected responses.

Buildings

In the 1980 PHC the net error in the classification of dwellings according to main use was largest for the group "other buildings" (23.8%). Owing to the small amount of buildings in the groups "warehouses", "traffic buildings" and "other buildings" (7-9), these were combined. The net error in the group "residential buildings" was only -0.6%. This group includes about 90% of all the buildings which were taken into account in the PHC 1980.

The net error for the year of building varied between 21.4% and -13.7%. A cause of the error was the formulation used in the questionnaire, in which two

different things were confused. The PHC instructions called for giving the year of remodelling in cases in which thorough improvements that are comparable with remodelling were carried out on the buildings. The interview survey indicated that such improvements were carried out in 12% of the stock. In 40% of these cases, however, the original year of building had been erroneously given in the 1980 PHC. The net error was large for buildings which according to PHC 1980 had been completed in 1980 (21.4%). Here sufficiently precise instructions had not been supplied, since respondents did not know whether they were being asked for the year when the building was taken into use or the year it was completed in its entirety.

In cases in which several different fuels were used to heat the building, the PHC instructions were not always sufficiently detailed.

The net error varied between 4,5% and -6,0%. The group "unknown" showed up in the interview survey, too, though it was reduced from a good 20,000 buildings to about 3,500.

With respect to the number of stories, the net error was on average zero, but it was quite large for two-story buildings, reaching a whole -20%.

B. Errors in data processing (coding and punching)

Methods

In contrast to previous Population and Housing Censuses (1950, 1960, 1970 and 1975), the material in the PHC in 1980 was coded out in 356 local census offices (except for diplomas and certain data on commuting). On the other hand, the punching was carried out by different private data punching companies (in previous population and housing census this was done at the Central Statistical Office). The control punching was total.

The parallel coding was carried out on 3,686 individual forms, 3,955 housing forms, 1,742 forms for business premises and 1,874 building forms on which there were 2,756 different buildings.

In addition, a selection of individual forms from 8 municipalities was taken in order to ascertain regional variations.

The results of the parallel coding were compared with the final PHC results. The parallel coded information was given by the respondents in normal order and had nothing to do with the interview survey.

Occupation

This survey shows that 14.1% (± 1.3) of the occupation codes in PHC 80 were erroneous. Each error was then treated only once (e.g. if the one digit level was

erroneous, the following digits were not taken into account). This is thus a gross error which is 5.5% at the one digit level and 3.9% at the two digit level. The net error is considerably less at the one digit level, 1.9%.

Information concerning occupation belongs to the most difficult information to code. It appears as if the person doing the coding did not always make use of the information on work places but mechanically followed the alphabetic list of occupations.

Among the eight municipalities which were studied, the gross error varied at the one digit level between 7.4% (agricultural municipalities) and 19% (towns).

Work place (8.5.2.)

Each work place had previously been registered and given a running number which automatically gave its branch, legal form, location etc. If an employer (work place) given on the personal form was lacking in the work place register, the person doing the coding entered this into the register. So-called mobile work places were coded separately.

With respect to the distribution by branch of industry, the number of incorrectly coded cases at the one digit level was 3.5% and at the two digit level it was 1.5%, each error being treated only one time. The aggregate gross error at levels 1-5 was 8.7% and varied in the eight municipalities studied between 5.0 and 12.7%.

At the one digit level, the net error was 2.1%.

The gross error concerning the legal form of employer was 3.8%.

Buildings and dwellings

The gross error was calculated for the following variables:

Use of business premises	11.7% (levels 1-3)
Type of landlord	7.4%
Use of building	5.3% (levels 1-2)
Owner of building	2.8%

Punching error

The amount of punching errors was also studied by means of taking a sample. The number of these was very small, less than 1%.

(1) A study of coverage is not included in this connection. Of the population in the ages 15-64

years, forms were lacking for 39,752 persons (1.2%). For these persons, demographic data were obtained from the Central Register of Population CRP. All persons in the 0-14 year bracket were counted on the basis of the registers.

Table 1
Population of 15-74 year olds according to Type of Activity

Control study	PHC 80								Un- known	Total
	Economically active			Economically inactive						
	Employed	Un- employed	Total	Students	Home- makers	Pensioners, Un- employ- able	Other economically inactive	Total		
Economically active										
Employed	2069456	17680	2087144	12360	31980	32639	15894	92873	40216	2220233
Unemployed	20188	60488	80676	6020	5469	1919	9441	22848	7179	110704
Total	2099644	78168	2167820	18380	37449	34558	25335	115722	47395	2330937
Economically inactive										
Students	11283	1270	12553	389963	—	—	4119	394082	7309	413944
Home-makers	11327	9286	20613	3033	145498	10986	7321	166838	3841	191291
Pensioners, unemployables	10587	4473	15060	—	13397	561758	15795	590951	5259	611270
Other economically inactive	1991	—	1991	6612	4293	6044	17035	33984	—	33975
Total	35188	15029	50217	399608	162188	578788	44270	1185855	16409	1232481
Unknown	—	—	—	—	—	—	—	—	—	—
Total	2124832	93197	2218037	417989	200637	613346	69605	1301577	63804	3583418
A.Number according to 1980 PHC	2124832	93197	2218037	417989	200637	613346	69605	1301577	63804	3583418
B.Number according to Control study	2220233	110704	2330937	413944	191292	611270	35975	1252481	—	3583418
	±56140	±19032	±55137	±37254	±24824	±43188	±11578	±55137	—	—
C.Correctly classified	2069456	60488	2129952	389963	145498	561758	17035	1114254	—	3244206
	±14002	±9805	±97685	±9942	±13082	±13618	±7571	±25160	—	±37216
D.Proportion of cor- rectly classified (%)	97,4	64,9	96,0	93,3	72,5	91,6	24,5	85,6	—	90,5
	±0,7	±10,5	±0,8	±2,4	±6,5	±2,2	±10,9	±1,9	—	±1,2
E.Incorrectly included in the group	55376	32709	88085	28026	55139	51588	52570	187423	63804	339212
F.Incorrectly left out of the group	150777	50216	200985	23981	45794	49512	18940	138227	—	339222
G.Gross error (E-F)	206153	82925	289070	52007	100933	101100	71510	325650	63804	339212
H.Net error (A-B)	-95401	-17507	-112900	4045	9345	2076	33630	49096	63804	—
	±56140	±19032	±55137	±37254	±24824	±43188	±11578	±55137	—	—
I. Relative net error (%) (H/A)	-4,5	-18,8	-5,1	1,0	4,7	0,3	48,3	3,8	100,0	—
	±2,6	±20,4	±2,5	±8,9	±12,4	±7,0	±16,6	±4,2	—	—

THE EXPERIENCES OF THE GDR IN USING THE SAMPLING METHOD AT THE VARIOUS STAGES OF THE CENSUS OF POPULATION (a)

In the GDR sampling methods have been used in censuses of population, occupations, dwelling and buildings since 1964. In all censuses the use of sampling methods was based upon the total number of census questionnaires filled in by households, i.e. all households entirely completed the census questionnaires. A choice of households which would have had to complete special census questionnaires was not made.

In the calculation of census results, sampling methods were used with the following purposes in mind:

1. evaluation of samples intended to be used as preliminary results in order to reduce the period between census day and the date of publication of important structural results to a considerable extent;
2. evaluation of samples in case of evaluation complexes which, due to manual coding, would have been highly time-consuming in the phase between the collection of census questionnaires and computerized data processing;
3. evaluation of samples in case of evaluation complexes where the files of the originally separate results of the census of dwellings and buildings were to be linked with those of the census of population and occupations.

1. Evaluation of samples intended to be used as first results

In order to achieve a considerable reduction in the period between census day and the date of publication of important results on characteristics of the population and on the structure of households, a two per cent sample of households was processed in the 1964 census of population and occupations.

The sample was used to determine the frequency of certain characteristics

(a) Report prepared by Central Statistical Office, German Democratic Republic.

and combinations of characteristics with regard to persons living in private households and to the structure of households.

Total numbers of resident population and households were already available as good approximations, thanks to documents compiled as organizational means during the census to ensure exact selection of samples and precise calculation of overall estimates.

In order to make sure that the households (clusters) to be sampled could be determined, if possible, without big additional expenditure and above all without considerable delays in processing total census results, every 50th household questionnaire was selected in the regional census bureau. This was done on the basis of a systematic selection of every 12th and 62nd household questionnaire. In this connection, the internal arrangement of census questionnaires within a territory (district) by locality, census region and census district ensured a regional stratification within the totality of households, which favourably influenced the representativeness for the sample. Thus, each territorial unit was included with the same percentage; each household and each individual had the same chance of being included in the sample. The household, which is a cluster in respect of individual characteristics, was used as the sampling unit in order to simplify the method of selection and to reduce the expenditure of work. Besides, this made it possible to get not only preliminary results for certain individual characteristics, but also and above all data on the structure and size of households.

In order to calculate overall estimates on the basis of the sample valued, one used various territorial multipliers derived from the relation

$$\frac{\text{number of persons living in private households (preliminary manual result)}}{\text{number of persons covered by the sample}}$$

This approach, which was different between the various counties, was preferred to a free approach to calculation with one single factor, since the number of household questionnaires included in the samples within the territories could not always be divided by 50.

The overall results were determined by adding together the generalized territorial results.

The computerized processing of the 1964 census covered 132,600 household questionnaires with 332,500 individuals.

The sampling results were presented together with a table which included a list of the admissible absolute and relative errors of the estimates.

The data of the two per cent sample were processed to get the following preliminary results:

Resident population by — group of age
— marital status

	— economic activity	
	— termination of a university or college study	partly cross- classified
	— affiliation to a religious community	
Households by	— size of household	
	— number of children	partly cross- classified
	— number of income earners	

Processing samples to calculate preliminary results was only done in connection with the census of population and occupations as of December 31, 1964. New, effective computers used to calculate preliminary and final results in the later censuses of 1971 and 1981 no longer justified the expenditure involved in the processing of a sample to get preliminary results compared with the low gain of time regarding the presentation of data.

2. Evaluation of samples to reduce manual coding

In censuses of population and occupations, the processing of data on economically active persons by their occupational characteristics (occupation, activity, economic sector and form of ownership of the place of work etc.) is a special field of priority requiring much expenditure in terms of manual coding. This is due to the fact that the corresponding data of the population in the census questionnaires have to be coded manually on the basis of comparatively big nomenclatures.

Sampling methods intended to reduce this type of expenditure involved with the evaluation of the census were applied in the censuses of 1964 and 1971.

The relevant samples were selected by the computer on the basis of machine-readable data carriers. The method used was in all cases systematic random selection.

In the 1964 census, a 20 per cent sample was drawn, on the basis of which the data on every fifth economically active person were processed according to a specific evaluation program.

The evaluation program covered the following complexes:

Economically active persons by	— group of age	
	— social affiliation	
	— economic sector/branch of the place of work	partly cross-

	— form of ownership of the place of work	clas- sified
	— occupational groups	
	— university or college education by main field of specialisation	
Economically active women by	— group of age	partly cross- clas- sified
	— marital status	
	— number and age of their children living in the same household	

In the census as of January 1, 1971, a sampling fraction of 5% was used for an additional processing. In respect of economic activity, the main purpose of the additional processing was to define results for economically active persons by group of activity.

At the same time, with the sampling test made in 1971 decisive improvements were reached in the sense that it was possible for the first time to determine results on the internal structure of households by type of household and family nuclei as well. The necessary coding of interrelations between household members at that time required further expenditure in terms of manual coding, a problem which could be handled efficiently by the use of sampling techniques only.

For the said purpose a method of selection was chosen, according to which the computer systematically selected every 20th private household with all household members for the sample.

The evaluation of the sample taken during the 1971 census gave the following results:

Economically active persons by group of activity and		
	— completed levels of education	partly cross- classified
	— economic sector of the place of work	
	— form of ownership of the place of work	
Married couples by		partly cross- classified
	— economic activity of the spouses	
	— group of activity of the spouses	
	— social affiliation of the spouses	
	— group of age of the spouses	

Multi-person households by

- family nuclei
 - type of household
 - size of household
 - social structure
- partly
cross-
classified

In the same way as described under para. 1, the above-mentioned samples were processed to get generalized results both for the whole country and for large territorial units (counties).

Different raising factors were used for the various counties. Besides, the estimates were presented with data on admissible relative and absolute errors.

3. Evaluation of samples to link the results of the census of dwellings and buildings with those of the census of population and occupations

The censuses as of January 1, 1971, and December 31, 1981, were composed of two parts: the census of dwellings and buildings and the census of population and occupations, for which different census questionnaires were used and the results of which were separately processed on computers.

After the overall evaluations had been made, an additional post-census processing on the basis of samples was made to establish direct links between the individual and household data and the corresponding data on dwellings from the two parts of the census.

The aim was to improve the results of the overall evaluation on the basis of a refined picture of the interrelations between social and demographic structures and developments and the housing conditions of the population.

The evaluation of the sample was focussed on qualitative and quantitative housing characteristics, such as

- the size of dwellings
- is the dwelling equipped with a modern type of heating, hot water, bathroom/shower and WC inside the dwelling
- living-rooms per household and individual
- rental status;

with regard to households, on various socio-demographic characteristics, such as

- married couples
- young married couples
- households with children
- households with adult unmarried children

- households in which a child was born in the year of the census
- households in which a child was born in the year of the census
- households which share an apartment with others.

In 1971 a five per cent sample and in 1981 a ten per cent sample were processed and evaluated for the purpose mentioned.

The sampling frame was in both cases the files of the censuses of dwellings and buildings. A one-stage systematic random selection was used to select every 20th or 10th dwelling on the computer, and the household and individual data referring to that dwelling were selected by the computer from the censuses of population and occupations and correspondingly matched.

In the sample processed in 1971, the matching of data on dwellings and buildings with data from the population census, which was done by the computer during the selection of the sample, was connected with the sample on questions of the internal household structure as mentioned under para. 2.

The method which had proved good in the evaluation of preceding samples was used also in 1971 and 1981 — the sample values were raised to the general results by different territorial raising factors. In doing so, one did not only use multipliers according to the sample fraction of the total households, but also sample fractions according to the various socio-demographic groups.

With the size of the sample increased to 10% in the 1981 census as compared with 5% in the 1971 census, allowance was made, above all, for the increased need of information about the housing conditions of the population also for territorial levels.

Thus, the relative sampling error of the estimates could be reduced by about 30%, so that valid results could be made available also for all large cities and industrial agglomerations.

THE POPULATION AND HOUSING CENSUS IN THE GERMAN DEMOCRATIC REPUBLIC 1981 (a)

Organization and conduct of the census

On 7 July 1977 the GDR Council of Ministers adopted a resolution to conduct a population and housing census, the date set being 31 December 1981. The purpose of the census is to provide information to assist in further improving economic management and planning in accordance with the resolutions adopted by the 10th SED Congress. The census was considered necessary because, among other things, material, intellectual and cultural standards had risen markedly since the previous one conducted early in 1971 in line with the resolutions of the 8th and 9th SED Congresses. This development had taken place at many levels and in different ways within and between social classes and strata as well as between the various social groups and individual households. Thus, during this period some

— 1.4 million dwellings were newly built or modernized, which brought

(a) Report prepared by Central Statistical Office, German Democratic Republic.

an improvement in housing conditions for some 4.25 million people,

— 2.5 million skilled workers and 700,000 university and college graduates were trained. The labour force grew by 460,000.

The population and housing census of 1981 enabled the great social and demographic changes to be ascertained, thus providing the essential information to serve as a basis for management and planning in the eighties.

The census provided accurate and detailed data on the GDR and its regions with respect to:

- the number of households, their size and composition,
- the social composition of the population (working-class families, families of cooperative farmers, intellectuals and the other working people),
- the employment of the total labour force region by region, e.g. ascertaining the proportion of the population in employment,
- women's involvement in the work process (data, for example, on their level of training, jobs and duties at work, age and number of children in the household),
- changes in the educational level of the individual social groups, among women and young people,
- data on the correlation between the type and level of training received and the work performed,
- number of dwellings and number of occupants,
- number and condition of residential buildings and quality of the dwellings contained therein.

The Central Statistical Office is the body responsible for preparing, conducting and evaluating the census. In the counties and districts these duties have been assumed by the county and district branches of the Central Statistical Office and the census offices which have been set up under their aegis.

The Central Census Bureau and County Census Bureaus are permanent institutions set up by the Central Statistical Office. They are responsible for maintaining population data on a local basis and carrying out other population surveys in the intervals between the national censuses.

District Census Bureaus are formed by the district branches of the Central Statistical Office five months before the census date. They remain in existence until all the census data have been coded (about 9 months after the census date). The heads of the District Census Bureaus and their deputies come from among the local council officials.

In accordance with the Census Act the Central Statistical Office, in preparing and conducting the census, relies on the cooperation of the county, district, urban district, town, urban borough and village councils as well as places of work and institutions.

In close collaboration with the agencies belonging to the Central Statistical Office, the local government bodies ensure broad involvement of the general public and mass organizations in preparing and conducting the census.

The branches of the Central Statistical Office at county and district level provided continued expert guidance to all bodies responsible for conducting the census at every stage. In the districts, towns and villages they also made selected checks to ensure that the legal and technical stipulations were observed.

The 1981 population and housing census was preceded by long and systematic preparatory work in order to ensure that all tasks involved were executed in a uniform and coordinated manner.

The GDR Census Act stipulates the conduct of test censuses for the purpose of making thorough preparations for the national census proper. The basic objective of these test censuses is to find out how the theoretically elaborated scientific and organizational principles of census work in practice, taking into account both urban and rural conditions.

The purpose of a test census conducted in a rural district with a population of 132,000 was, apart from the usual objectives, the replacement of the punched card procedure used during census processing by optical sensing devices in order to reduce manual work and speed up the census evaluation.

The inhabitants of the area chosen for the test received census forms of varying design with the aim of developing a form equally suited to the public and automatic reading techniques.

It proved impossible to reach this objective on the basis of just one test census, so that another five series of tests were carried out with different objectives in mind.

The census organization was geared to the requirements of using cards without holes, the forms which were to be completed by the public and read automatically were developed and the employment of census supervisors for the main part of the evaluation work tried out in practice. A number of less extensive tests led to the production of suitable paper for the census forms and to their design in terms of colour and layout.

On 4 December 1980 the Director of the Central Statistical Office had an Instruction on the Preparation and Conduct of the Population and Housing Census on 31 December 1981 published in *Gesetzblatt der DDR* (Official Gazette of the GDR).

This instruction laid down in particular the main principles on which the census was to be organized, the responsibilities of the various parties involved and the deadlines. A great number of steps were taken to ensure that the census was organized in a proper manner: The county and district councils set up their own *census commissions* to prepare and conduct the census. They were chaired by the respective deputy council chairman with the head of the County or District Statistical Office as his assistant.

The census commissions were the local council bodies which bore the main

responsibility for the political preparation and conduct of the census. They assessed and monitored the effectiveness of the mass political work carried out in connection with the census and the stage of preparations for and the conduct of the census. One of their principal tasks was to control, support and monitor the recruitment and training of the voluntary enumerators and supervisors.

The census commissions held discussions at regular intervals (about 3 to 4 weeks), listening to reports and organizing an exchange of experiences. They worked on the basis of a written instruction issued by the Director of the Central Statistical Office.

For the purpose of the census the town, urban borough and village councils formed their own organizing offices headed by full-time council staff who were relieved of their normal duties for the period in question.

In medium and large towns and cities back-up centres were set up in residential areas, if necessary (one for every 10,000 inhabitants on average). The organizing offices and their back-up centres divided the territory of the towns and cities, urban boroughs and villages into census areas and zones. The census zones — the responsibility of the voluntary enumerators — normally covered 18 to 22 dwellings, depending on regional conditions. A census area was, as a rule, composed of up to five census zones and the responsibility of a census supervisor.

The organizing offices and their back-up centres had to draw up a control sheet for each census zone containing the addresses of the buildings and dwellings to be included in the census which were recorded separately according to their location in the respective building. They greatly helped to ensure proper registration.

All the voluntary enumerators and supervisors were recruited from among publicly active people from every walk of life who were familiar with the region in question and enjoyed the confidence and respect of the public. The voluntary supervisors were mainly recruited from among the staff of government agencies and institutions and industrial administrators. Apart from offering guidance to the five enumerators in their charge, they carried out the initial coding operations and compiling work. They were released from their normal duties for up to two working days on full pay.

Other important tasks carried out by the organizing offices included instructing the enumerators and supervisors, ensuring that all completed census forms were returned, clarifying queries to the public in the case of insufficiently completed census forms and speedily establishing a preliminary return.

All training was based on manuals and written instructions issued by the Central Statistical Office such as the

- Manual for enumerators
- Guidelines for census supervisors

— Guidelines for heads of organizing offices.

These instructions formulated all tasks, how to fulfil them and at what deadlines. In addition, they contained examples of how to complete census forms as well as advice on special cases.

All instructions and other written census material were drawn up by the Central Census Bureau and printed centrally.

A successful census presupposes a fixed *system of supervision and information* on the degree to which the tasks are fulfilled. The following methods were used to obtain and pass on information:

- Field work including on-the spot guidance and supervision;
- Progress reports delivered by those responsible for the census to the administrations of statistical boards and to census commissions;
- Written interim reports on the fulfilment of major tasks delivered to the new higher statistical board;
- Information on actual or expected deviations from the planned course of the census.

Census forms were handed out between 28 and 31 December 1981, were to be completed individually, and collected by 4 January 1982.

All citizens who would not be at their place of residence on the census date were called upon to complete their forms in advance and hand them in at organizing offices or leave them with their neighbours.

The population and employment census covered all GDR citizens permanently residing on GDR territory as well as all persons who are not GDR subjects but permanently reside here.

The dwelling and housing census covered all residential buildings and all dwellings in them as well as all occupied dwellings in non-residential buildings.

The questions asked in the 1981 population, employment and housing census were essentially the same as in the previous one. In order to minimize expenditure, the range of questions was limited to what was absolutely necessary. No questions were asked which could meet with reservations on the part of those completing the forms. All questions were formulated in a simple and unambiguous way so that in general people were able to answer them without the support of enumerators.

In drawing up the questions to be put and the evaluation schemes, it was necessary to draw on the experience gathered in previous censuses and to coordinate work with the ministries, central and local government bodies and academic institutions responsible.

Additionally, similar censuses in other socialist countries and some non-socialist countries were reviewed and recommendations issued by the Permanent CMEA Statistics Commission as well as recommendations for population and housing censuses in the ECE region in 1980 were taken into account. When procedures had been agreed upon and studies completed, the question and

evaluation scheme was approved by the Council of Ministers of the GDR.

The field work in the population and housing census was carried out exclusively by the voluntary enumerators. They handed over the different census forms to the households and collected them a few days after the census date.

Having fulfilled their tasks, the enumerators then passed on the forms they had collected in their enumeration zones in the right order to the census supervisor responsible. The latter immediately checked on their completeness and then discharged the enumerators. After that, he made sure that all forms had been filled in completely and were free from contradictions.

The data obtained were prepared for computing in the following way: census forms consisted of two sections, and data obtained in one section in the form of figures or crosses appeared again in the other in coded form. In cases where nomenclatures or systems were needed to code the questions, this was done later in the District Census Bureaux set up by the Central Statistical Office. All census material was collected by the organizing offices and mailed to the District Census Bureaux of the Central Statistical Office.

One essential condition for a successful census is the work carried out among the public to explain the significance of the census, the tasks and methods of organization involved and to recruit voluntary enumerators of which hundreds of thousands are needed. For this purpose, mass organizations had to cooperate closely with the press, radio and television. They were supported by the Central Statistical Office which published information containing a multitude of examples, answers to possible questions, etc.

The most important materials issued under the auspices of the Central Statistical Office were

- information for the press including articles on virtually all important questions regarding the census, these articles being adapted to the needs of the daily newspapers;
- illustrated wall newspapers;
- one educational film on the organization of the census and two short films (each of three minutes' duration) designed for TV and cinema.

This work among the public had the aim of making all people realize that the census was necessary for management and planning and thus for the continuation of an economic and social policy which lies in the interests of all GDR citizens.

In the period between one and two months before the census date, work among the public was mainly directed at finding voluntary enumerators.

Between one and a half and one month before the census date, individual important matters were explained.

One month before the census date, a publicity campaign was started using wall newspapers etc.

Half a month before the census date, the organization of the census was explained as far as it affected the population.

On the eve of the census date, all mass media again pointed out the responsibility which citizens bear for filling in the forms correctly and completely.

The 1981 population and housing census was conducted on the basis of a new technology which eliminates the use of punched cards.

In accordance with international trends in large-scale data processing the 17 million census forms containing personal data and the 6.8 million census forms containing housing data were directly gathered on marker documents and then transferred to magnetic tape with the help of mark readers. The system used was the Soviet-made Blank P.

The use of this new technology in the 1981 population and housing census entailed a reduction in the manpower needed and in processing time, leading to a major rise in efficiency.

All processes were planned in such a manner that every day 200,000 census forms containing housing data and 190,000 forms containing personal data were transferred to magnetic tape and subsequently processed.

Checks and correction measures were carried out in three stages.

In the *first stage*, the reading in of census forms was accompanied by quality checks to verify the correct coding of some important basic features and the completeness of census forms in the given census area. All census forms in a given area which met these requirements were included in an interim data bank for logical checking.

The *second stage* took place in the Statistical Data Processing Centre. An algorithm was established for the logical checking of census forms and necessary corrections carried out automatically. Sets of data which defied automatic correction were included in fault dictionaries and passed on to the checkers employed at the District Census Office for manual correction.

The programme consisted of a total of 236 checks which partly allowed for a considerable number of different variants. While 159 out of these 236 (i.e. 67%) led to automatic correction, the rest had to be corrected manually on the basis of the census forms.

The *third stage* of census form checking consisted in the manual correction of incorrectly completed census forms by the checkers group employed at the County Census Office.

Some tables were turned into diagrams or cartograms with the help of computers. On the basis of about 600 million items of input information about 2,300 million items of output information were obtained.

After the comprehensive evaluation of the population and housing census had been completed, the two component parts of the census — population plus employment census on the other — were studied in combination. Random

surveys were carried out serving as the basis of a thoroughgoing analysis of combined features.

The return of the population and housing census was published both in the form of written texts and tables. Important data are contained in Statistical Yearbooks and Pocket Books.

LE RECENSEMENT DE LA POPULATION ET DES HABITATIONS DE 1981 DANS L'ESPAGNE: METHODOLOGIE DE LA CORRECTION DES ERREURS DES BULLETINS INDIVIDUELS (a)

Les deux premiers chapitres expliquent la méthode de la correction des caractéristiques d'identification géographique des unités de dénombrement utilisées dans les recensements de la population et des habitations. On expose séparément le traitement des bulletins adressés aux ménages privés et des bulletins que doivent remplir les personnes vivant dans les ménages institutionnels ou autres établissements collectifs. Le dernier chapitre explique la manière de corriger les erreurs détectées dans les autres caractéristiques demandées lors des recensements.

Des copies des bulletins utilisés dans les recensements de la population et des habitations de 1981 sont disponibles sur demande.

Le bulletin modèle (Mod. CP-1C) a été utilisé pour la saisie des renseignements des personnes vivant dans les ménages privés. Le modèle (Mod. CP-2C) a été adressé aux établissements collectifs.

I - DETECTION ET CORRECTION DES ERREURS DES CARACTERISTIQUES D'IDENTIFICATION ET LOCALISATION GEOGRAPHIQUES

I.1. - Formulaire adressés aux ménages privés

On entend par caractéristiques d'identification géographique les suivantes.
(On indique sa dénomination symbolique)

(a) Rapport présenté par l'Office Central de Statistique d'Espagne.

Caractéristiques	Symbole
Province	PROV
Commune	MUN
District	DIS
Section	SEC
Local d'habitation	VIV
Zone	ZON
Nombre de familles	N° F
Personnes de 1 ^e famille	1 ^e F
Personnes de 2 ^{ème} famille	2 ^{ème} F

Dans le but de n'étendre pas exagérément l'exposition on a supprimé les questions "Núcleo o diseminado" (relative à la situation d'immeuble dans un conjoint de bâtiments ou isolée) et "Manzana" (Pâté de Maisons).

La détection et correction des erreurs des variables qui sont exposées antérieurement a été réalisée dans quatre étapes du recensement:

- 1^a. - Lors de la saisie des renseignements
- 2^a. - Le codage
- 3^a. - L'enregistrement
- 4^a. - Traitement par ordinateur.

Pendant la saisie des renseignements les recenseurs remplirent ces variables appliquant le codage. Leur travail a été vérifié, théoriquement au moins, par les recenseurs chefs de groupe.

Dans l'étape de codage les codeurs doivent vérifier le cent pour cent (100%) des formulaires de recensement (seulement de ces caractéristiques).

L'enregistrement des données sur bande magnétique a été effectué sous programme. Dans cette étape pratiquement ont été détectées et corrigées les erreurs provenant des étapes antérieures des variables suivantes: Province et Commune.

Enfin, sur la base de la bande originale d'enregistrement l'ordinateur détecte des erreurs dues au codage, les erreurs d'enregistrement, les lacunes d'information, les identificateurs des unités d'habitation dupliquées, etc.

Sauf dans les cas de zone, dont la correction a été essentiellement automatique, pour les autres variables (Prov, Mun, Dis, Sec, N° F, personnes de 1° F, 2° F, etc.) les erreurs signalées dans les listes provenant de l'ordinateur ont été corrigées, dans la plupart des occasions, à la main; à cet effet le contrôleur note le numéro de code exact sur une feuille d'ordinateur.

Cependant les contrôles effectués dans les étapes de vérification de codage et d'enregistrement, ont eu l'avantage de réduire considérablement le numéro d'annotations "à la main" par rapport au recensement antérieur.

I.2. - Correction des variables d'identification dans les cas des formulaires des ménages collectifs

Pour ces variables (PROV, MUN, DIS et SEC) la détection et correction des erreurs ont été, essentiellement, identiques à la procédure pour les bulletins du recensement des ménages privés exposés dans I.1.

II. - CORRECTION AUTOMATIQUE DE LA ZONE

Dans le chapitre antérieur on a exposé que la correction des erreurs de zone a été essentiellement automatique et suivant les mêmes instructions pour le bulletin des ménages privés et pour le bulletin des ménages collectifs.

L'unité de classification pour distinguer les zones urbaines, semi-urbaines et rurales, a été une unité plus petite que la moindre circonscription administrative, c'est-à-dire, la commune. Le critère de classification est basé uniquement sur la population de ces unités plus petites que la commune. Dans l'Espagne le numéro des celles-là est environ de 70.000.

Cependant les instructions pour la correction automatique des erreurs de "zone" ont exigé quelques simplifications. Celles-ci ne sont pas significatives aux niveaux suffisamment agrégés.

L'ordinateur dresse une liste des erreurs et des données relevées. De plus, toutes les modifications mécaniques sont automatiquement comptées. Dans certaines erreurs la correction automatique a été complétée par des corrections effectuées "à la main".

III. - DETECTION ET CORRECTION DES ERREURS DES CARACTERISTIQUES NON COMPRISES DANS LES CHAPITRES I ET II

III.1. - Bulletin des ménages privés

III.1.1. - Caractéristiques des unités d'habitation

Les caractéristiques des unités d'habitation demandées dans le bulletin du recensement sont: données du bâtiment; classification (logements classiques et autres unités d'habitation); régime d'occupation; régime de propriété; nombre de pièces; eau courante; lieux d'aisances; chauffage; réfrigération; gaz; téléphone; surface utile.

Dans toutes ces caractéristiques la réponse n'exige pas de codage.

La détection et correction des erreurs ont été réalisées, seulement, dans

l'étape de la saisie des renseignements par les chefs de groupe des recenseurs et automatiquement dans l'étape de traitement par ordinateur.

Dans l'étape de la saisie les instructions de correction des erreurs ont été très légères.

Avant la correction automatique l'ordinateur dresse des tableaux avec le nombre des erreurs pour le total d'unités d'habitation, avec expression séparée — d'après le type d'unité d'habitation (logements qui constituent des résidences principales, secondaires, vacantes et les autres unités d'habitation). Tenant compte de cette information certaines classes d'unités d'habitations (logements vacants et les logements mobiles, semi-permanents ou improvisés) ont été exclues de certaines parties du programme d'exploitation. De plus, l'information dressée par l'ordinateur a suggéré quelques instructions déterministes pour corriger les erreurs systématiques préalablement au programme de correction automatique proprement dit.

Ce programme constitue une application de la méthodologie de Correction automatique des erreurs dénommée AERO développée par l'Office de Statistique de Hongrie.

Le cadre ci-après comprend pour les logements classiques, qui constituent la résidence principale d'une famille, au sens du recensement, le pourcentage d'erreurs dû à la faute d'information ou aux erreurs d'enregistrement, c'est-à-dire, exclues les erreurs dues aux réponses incompatibles.

Variables	Pourcentage d'erreurs de non réponse ou réponse non valide
Régime de propriété	0,5
Nombre de pièces	0,8
Eau courante	0,4
Chauffage	0,6
Réfrigération	1,7
Téléphone	0,8

III.1.2. - Caractéristiques individuelles des habitants

La détection et correction des erreurs a été très différente dans chaque phase du recensement. De plus, il faut faire la distinction entre les questions pour lesquelles la réponse est obligatoire et les autres.

Dans la phase de la saisie d'information les chefs de groupe avaient reçu des instructions sur la manière de compléter le manque d'information dans les formulaires des recensements pour certaines caractéristiques de réponse obligatoire:

- Situation de résidence (présents, absents ou personnes de passage)
- Situation dans le ménage
- Sexe
- Etat civil.

Dans cette étape, il n'existait aucune instruction relative aux erreurs dues aux réponses incompatibles. De la même manière il n'y avait pas d'instruction générale pour les questions dont la réponse n'est pas obligatoire ou pour lesquelles (par exemple, la date de naissance) il n'est pas possible d'établir les informations qui manquent.

Dans la phase de codage les contrôleurs des codeurs ont vérifié un échantillon de 10 à 20 pour cent, environ, des formulaires pour les questions qui posent des problèmes. C'est-à-dire:

- Type du noyau familial
- Degré d'enseignement
- Branche d'activité économique
- Profession.

Des contrôleurs ont corrigé certaines incompatibilités et complété les lacunes d'information très concrètes (par exemple le sexe, la situation dans le ménage, etc.).

Dans la phase d'entrée des données (enregistrement sur bande magnétique) les instructions ont été très larges dans le but de ne pas allonger le travail des opérateurs.

Avant la correction automatique l'ordinateur dresse des tableaux avec le nombre d'erreurs pour les variables très significatives.

Le cadre ci-après comprend quelques variables et les pourcentages d'erreurs, de non-réponse ou de réponse non valide.

Variable	Pourcentage
Type du noyau	0,2
Sexe	0,5
Etat civil	1,2
Date de naissance	0,5
Degré d'enseignement réalisé	11,8
Branche d'activité	1,9
Profession	2,2
Situation professionnelle	4,0

Par rapport au haut pourcentage (11%) de la caractéristique "Degré d'enseignement terminé" il a été possible de détecter:

1. - Que la plupart des habitants réalisant des études remplissent la

question "Degré en cours" mais non la question "Degré d'enseignement réalisé".

2. - De plus, quelques personnes "sans études" n'avaient pas rempli cette question.

Donc, préalablement au programme de correction automatique, ce pourcentage a été réduit, avec instructions logiques de type déterministe, à 4-5 pour cent. Cependant dans les tableaux du recensement ne figure pas "no consta" parce que ce pourcentage (4-6) a été classifié dans la rubrique "sans études".

Pour le reste des caractéristiques quelques systématiques au niveau provincial ont été corrigées avant le programme de Correction Automatique proprement dit (méthodologie suivie AERO-HONGRIE).

III.2. - Bulletin des ménages collectifs

III.2.1. - Caractéristiques des ménages collectifs

Seulement ont été demandées dans le bulletin du recensement: la capacité de l'établissement et l'activité principale.

Les deux ont été corrigés "à la main" sur des listes dressées par ordinateur. Dans la plupart des cas la correction a exigé du formulaire original.

III.2.1. - Caractéristiques des habitants vivant dans les ménages collectifs

La détection et correction des erreurs dans ce cas ont été séparées du traitement des ménages privés. Pour la plupart, des programmes "ad hoc" ont été réalisés sur la base de corrections par "HOT DECK".

EVALUATION DES RÉSULTATS DANS LES RECENSEMENTS DE LA POPULATION-LOGEMENT 1981 (a)

1. Généralités

Le programme d'évaluation des recensements de la population-logement 1981, comprenait l'application de deux procédés fondamentaux d'évaluation:

- a) Enquête d'évaluation par ré-énumération des sections de recensement.
- b) Evaluation au moyen de sources extérieures.

Plus bas on résumera la méthodologie suivie.

2. Enquête d'évaluation

L'enquête d'évaluation se propose de mesurer la correction des résultats des recensements en déterminant deux grands types d'erreurs:

- a) Erreurs de couverture touchant les unités omises ou comprises erronément dans le recensement.
- b) Erreurs de contenu touchant les caractéristiques observées dans les unités correctement comprises dans le recensement.

Comme opérations essentielles de la méthodologie appliquée dans la réalisation de l'enquête, on peut mentionner les suivantes:

- 1) En ce qui concerne le plan d'échantillonnage:
 - Sélection aléatoire d'un nombre déterminé de sections des recensements.
 - Parcours de la section pour déterminer la couverture de logements.
- Sélection d'un sous-échantillon de logements dans les sections sélectionnées.

(a) Rapport présenté par l'Office Central de Statistique d'Espagne.

— Entrevue répétée dans les logements sélectionnés pour déterminer la couverture de la population et les erreurs de contenu.

2) En ce qui concerne le travail sur le terrain:

— Meilleure qualité et entraînement des enquêteurs de l'enquête d'évaluation que de ceux de l'entrevue originale.

— Utilisation de toute documentation et information additionnelles susceptibles de faciliter le travail des agents de l'enquête.

Ceux-ci avaient été pourvus de croquis et de répertoires de rues, mis à jour, de la section qu'ils devaient visiter; ils disposaient également du cahier de l'agent de recensement contenant toutes les unités énumérées dans le recensement.

2.1. Dimension, sélection de l'échantillon

Pour déterminer et sélectionner l'échantillon, on a divisé la population en groupes selon la province et la dimension de la municipalité. On a pris en considération les 50 provinces espagnoles et, à l'intérieur de chaque province, les dimensions suivantes des municipalités:

Groupe 1:	Municipalités > 250.000	habitants
Groupe 2:	Municipalités > 50.000 et ≤ 250.000	habitants
Groupe 3:	Municipalités > 5.000 et ≤ 50.000	habitants
Groupe 4:	Municipalités ≤ 5.000	habitants

On a fixé la dimension de l'échantillon à 500 sections de recensement (sur 32.000 environ qui constituent tout le territoire national). Pour évaluer les erreurs de contenu, on a étudié un sous-échantillon de ces sections d'en moyenne 10 logements par section. Ceci a donné un échantillon global de 5.000 logements qui, sur un total escompté de quelque 10 millions de logements habités dans tout le territoire national, a mené à fixer une fraction d'échantillonnage globale de 1/2.000.

La division en strates a été effectuée proportionnellement à la population, avec un minimum d'une section par strate.

La sélection des sections a été effectuée avec des probabilités égales pour chaque strate. L'élection des logements a été effectuée par un échantillonnage systématique avec départ aléatoire et pour une période déterminée de telle façon qu'on ait pu obtenir un échantillon auto-pondérable à fraction d'échantillonnage global de 1/2.000.

2.2. Evaluation des erreurs de couverture

Une fois terminés les travaux de recensement les sections de l'échantillon

de l'enquête d'évaluation ont été visitées d'une manière exhaustive en énumérant de nouveau tous les logements situés dans ses limites. En faisant son parcours, l'agent d'évaluation efficace notait dans un cahier spécialement créé à cet effet tous les cas de divergence entre ses propres observations et les listes des recensements.

Les tableaux 1 à 4 (voir Annexe) recueillent les principaux résultats de l'évaluation de la couverture du recensement des logements et qui accusent une sur-énumération de logements, surtout dans les petites municipalités.

2.3. Evaluation des erreurs de contenu

La technique utilisée consistait en une répétition des entrevues, réalisées par des agents spécialement entraînés, dans un sous-échantillon de logements sélectionnés aléatoirement parmi les sections qui ont fait l'objet d'une étude dans l'enquête d'évaluation.

Les résultats de cette évaluation se trouvent en ce moment dans une phase d'exploitation et d'étude.

3. Evaluation au moyen de sources extérieures

Indépendamment de l'enquête spéciale d'évaluation dont il est question plus haut, on a évalué la qualité de la couverture et du contenu du recensement de la population en comparant l'information du recensement et celle qui a été obtenue par l'Enquête sur la Population Active (E.P.A.), enquête permanente trimestrielle réalisée par l'Institut National de Statistique, sur un échantillon de 60.000 logements, qui réunit diverses caractéristiques de la population occupant les logements familiaux.

Les 20.000 questionnaires d'un sous-échantillon de l'E.P.A. recueillis en mars 1981 (la période d'enquête la plus proche de la date du recensement) ont été comparés avec les questionnaires du recensement obtenus pour les mêmes logements. Cette comparaison a servi à évaluer la couverture de personnes résidant dans les logements familiaux, ainsi que la qualité de certaines caractéristiques de la population enquêtée dans les Recensements et l'E.P.A. telles que: le niveau d'instruction, le rapport avec l'activité économique, la branche d'activité de la population active, la profession ou l'occupation principale et la situation professionnelle.

Tabla 1
Errores de cobertura en viviendas por estratos

Viviendas	Total Nacional		Municipios > 250.000 habit.		Municipios > 50.000 y ≤ 250.000 habit.		Municipios > 5.000 habit. ≤ 50.000 habit.		Municipios ≤ 5.000 habit.	
	Total	%	Total	%	Total	%	Total	%	Total	%
Viviendas Censadas	14.694.860	100	3.618.299	100	3.169.031	100	4.716.651	100	3.190.879	100
Correctamente censadas	14.531.757	98,89	3.598.776	99,46	3.139.998	99,08	4.668.505	98,98	3.124.478	97,92
Erroneamente censadas	163.103	1,11	19.523	0,54	29.033	0,91	48.146	1,02	66.401	2,08
Censables seg. encuesta	14.618.394	99,48	3.608.098	99,72	3.168.835	99,99	4.689.496	99,42	3.151.965	98,78
Omitidas en censo	86.637	0,59	9.322	0,26	28.837	0,91	20.991	0,44	27.487	0,86
Diferencia neta entre Censo y Encuesta	76.466	0,52	10.201	0,28	196	0,00	27.155	0,57	38.914	1,22
Diferencia bruta entre Censo y Encuesta	249.740	1,69	28.845	0,79	57.870	1,82	69.137	1,46	93.888	2,94

Tabla 2
Causas de inclusión errónea por estratos

Viviendas	Total Nacional		Municipios > 250.000 habit.		Municipios > 50.000 y ≤ 250.000 habit.		Municipios > 5.000 habit. ≤ 50.000 habit.		Municipios ≤ 5.000 habit.	
	Total	%	Total	%	Total	%	Total	%	Total	%
Erroneamente incluidas	163.103	100	19.523	100	29.033	100	48.146	100	66.401	100
Inexistentes	59.318	36,36	6.894	35,31	13.301	45,81	20.279	42,12	18.844	28,38
No censables	103.786	63,63	12.629	64,69	15.733	54,19	27.867	57,88	47.557	71,62
No destinadas a vivienda ni habitada	66.391	40,70	9.844	50,42	9.889	34,06	13.028	27,06	33.630	50,65
En construc. o ruinas	37.395	22,93	2.785	14,27	5.044	20,13	14.839	30,82	13.927	20,97

Tabla 3
Viviendas omitidas según su situación en la Encuesta

Viviendas	Total Nacional		Municipios > 250.000 habit.		Municipios > 50.000 y ≤ 250.000 habit.		Municipios > 5.000 habit. ≤ 50.000 habit.		Municipios ≤ 5.000 habit.	
	Total	%	Total	%	Total	%	Total	%	Total	%
Omitidas en Censo	86.637	100	9.322	100	28.837	100	20.991	100	27.487	100
Vacias en Encuesta	65.652	75,78	7.373	79,09	22.592	78,34	13.135	62,57	22.552	82,05
Ocupadas en Encuesta	20.985	24,22	1.949	20,91	6.245	21,66	7.856	37,43	4.935	17,95

Tabla 4
Viviendas omitidas según situación censal de la familia

Viviendas	Total Nacional		Municipios > 250.000 habit.		Municipios > 50.000 y ≤ 250.000 habit.		Municipios > 5.000 habit. ≤ 50.000 habit.		Municipios ≤ 5.000 habit.	
	Total	%	Total	%	Total	%	Total	%	Total	%
Ocupadas en Encuesta	20.985	100	1.949	100	6.245	100	7.856	100	4.935	100
La familia se había censado	11.733	55,91	1.250	64,14	3.657	58,56	3.739	47,59	3.087	62,55
La familia no se había censado	9.080	43,27	699	35,86	2.434	39,97	4.099	52,17	1.848	37,45
No Consta	172	0,82	—	—	154	2,47	18	0,23	—	—

THE CENSUS BUREAU LOOKS TO 1990 (a)

Census Day 1990. It seems so far away, yet at the Census Bureau the countdown has already begun. Even as information from the 1980 census is still being analyzed and disseminated, the bureau is looking to 1990. Funding for the 1990 census begins this fiscal year, which starts October 1. From October 1, 1983 to April 1, 1990 is only 2,373 days, or 78 months. That is not much time.

We in the bureau are making a searching examination of the 1980 census. We are also gathering suggestions for improving the census process. With this information as background, we will take a fresh look at all aspects of the next decennial census. This article presents some of the bureau's current thinking on plans for the 1990 census.

The problems the bureau faced in 1980 included a shortage of funds, which resulted in layoffs and disruption of data entry and processing efforts at a critical time; delays and inaccuracies in the preparation of geographic materials; public concern about the accuracy of the 1980 census count; recruitment, training, retention, and productivity problems with the temporary work force; legal challenges concerning the use of imputation, the question of adjusting for the undercount, and the presence of a significant but unknown number of illegal aliens; and emergencies in several district offices, including a fire in a New York City office that made it necessary to recount the Bedford-Stuyvesant district.

Bureau planners will design a 1990 census program that addresses these problems. We will give more attention to personnel management; legal precedents should help clarify the bureau's responsibilities; and efforts are being made to automate the preparation of geographic materials. We also want to build a process that can provide a foundation for future efforts. In our planning for 1990 we intend to keep one eye on the future so that equipment, training, and methods do not become immediately obsolete.

(a) Report prepared by Peter A. Bounpane, Assistant-director for Demographic Censuses at the US Bureau of the Census.

Many people, both inside and outside the bureau, are concerned about the potential cost of the 1990 census. With so many major decisions still to be made, however, it is difficult to predict its cost reliably. And one cannot judge the census based on cost alone. The benefits of the decennial census are spread widely and reach deeply into all parts of American life.

Given its varied and important uses, the 1980 census was not out of line in its cost. For each American counted in the 1980 census, the cost was \$4.73 — or 47 cents per year per person for the ten-year period. Of course the bureau is working to keep 1990 census costs as low as possible.

Another objective for the 1990 census is to produce a solid and reliable program that will not break down. Although the 1980 census was successful and accomplished its constitutional and statutory purposes on time, we had to cope with unexpected administrative and political difficulties in addition to fires, floods, and even the Mount St. Helens eruption. It is difficult to predict which emergencies might confront us in 1990, but there must be a safety margin for unanticipated difficulties. Like the Apollo or space shuttle flights, the census will contain contingency plans and backup systems to meet the unexpected.

In order to plan a 1990 census that will meet these objectives the bureau is conducting its planning on four levels simultaneously:

- An examination of changes to the basic census methodology used in 1980, the mail-out/mail-back method.
- The improvement of the census process to make it more effective and efficient.
- Continuing research on adjusting population figures for the undercount.
- A general review of the meaning of enumeration.

These four issues are interrelated, but because so much time is needed to prepare for the 1990 census, we cannot wait for a resolution of the undercount adjustment issue or an agreement on the meaning of enumeration before choosing a basic census methodology; likewise, we cannot wait until a methodology is picked before developing techniques to improve effectiveness and efficiency.

Basic Census Methodology

For the initial contact with the population in the actual enumeration, the bureau is considering three basic approaches. Although they are not mutually exclusive, it is useful to describe each individually. One is to conduct the 1990 census by the same methods used in 1980. The 1980 census was the second

conducted using a mail-out/mail-back, self-enumeration process. Both the sample and short forms were distributed simultaneously. Although coverage with this technique was greater than had been achieved during prior censuses, possible refinements exist.

One potential refinement is a two-stage census. In a two-stage census the initial questionnaire (the first stage) is delivered to every housing unit. It would include only the "short form" questions (also known as the 100-percent questions) needed to gather those basic population and housing data required to meet the statutory deadlines for redistricting and reapportionment.

A second questionnaire (the second stage) is then distributed to a selected sample of the population to gather the additional population and housing information. The two-stage census would allow a quick count of people and such basic characteristics as age, race, and sex. Redistricting, reapportionment, and some formula grant program needs could be quickly satisfied. However, public cooperation and the coverage of individuals in the second stage may decrease in a two-stage process. Accuracy and comparability with the basic population data obtained in the first stage might also be lessened.

Another potential refinement is the list/leave census. In this alternative, census employees, instead of mail carriers, would distribute the questionnaires. Respondents would be asked to mail the form back. The list/leave method might reduce problems with the mailing list and thereby improve the accuracy initial and follow-up enumeration. It may, however, increase the costs and work-force demands on the bureau.

The bureau will study and test these different approaches, delaying the selection of the basic census methodology until about mid-1986. This timing is different from that used in advance of the 1980 census. Because the mail-out/mail-back format was so successful in the 1970 census, it already had been chosen as the basic collection methodology for the 1980 census by mid-1973.

Improving the Census

The plans for improving the technical efficiency and effectiveness of the census can be grouped into five categories: increasing community outreach and publicity; automating more of the data handling; improving the management of the temporary work force; developing and maintaining a more accurate and less costly address list of housing units; and improving census coverage through a higher response rate and better follow-up procedures.

The cooperation of the people, which is essential to the census, rests on two types of efforts — outreach to various population groups and a general publicity campaign. An outreach and publicity program will be directed at both the general public and particular hard-to-enumerate minority groups.

The people's cooperation is important not only for the efficiency of the census process but also for the acceptance of its results. This cooperation cannot be taken for granted. For instance, a census-taker's nightmare has occurred in West Germany. The census planned for April 27, 1983 was postponed at least until December, the fourth postponement in two years. It is possible the census will be cancelled. A public outcry arose over a lack of confidence in the confidentiality of the census process; and the courts stepped in and stopped the census.

Though there are fundamental differences between the censuses of the United States and West Germany, we must recognize the underlying warning. We place the highest priority on ensuring that the public is aware of the purposes of the census and the importance of being counted. Further, we must assure the absolute confidentiality of census responses, and the accuracy, reliability, and fairness of the data.

"Fairness" depends on the bureau's efforts to improve its coverage of all groups of our society. While a perfect census — one that counts every person — is not possible in our free and mobile society, the bureau must continue to improve the percentage of minority-group members that it counts. This percentage should more closely approximate the percentage of the total population that is counted. The bureau will expand its outreach efforts to minorities. It will provide assistance to those who have difficulty with English-language questionnaires. The bureau will sponsor research to determine if the 1980 questions were culturally biased or unnecessarily difficult to complete. We will examine all the minority outreach efforts used in 1980; we will repeat the successful ones and supplement them with new efforts.

The bureau will continue to allow local government officials a chance to review preliminary census results and will consider increasing the scope of this program. We are looking for ways to improve the relationship between census staff and local officials so that problems can be resolved during the census process instead of becoming cause for disagreement. As a first step we are considering suggestions that local governments or community-based volunteer groups provide more assistance in the actual field work.

Research shows that better publicity can increase the response rate to the original mailing of census questionnaires. An increased initial response rate significantly lowers costs and improves accuracy. The role of media advertising can be crucial to achieving public cooperation. The 1980 public service advertising campaign provided by the Advertising Council was successful, our studies show, and we hope to build on this experience for 1990.

The bureau will consider a paid advertising campaign directed specifically at hard-to-enumerate areas and population groups. Of course the costs of such a campaign could be substantial, and it cannot be undertaken without close scrutiny. The bureau also will explore non-traditional publicity techniques, such as flyers sent home with school children. Whatever publicity techniques

are used, 1990, the bicentennial census year, will be a good year to demonstrate the importance of the census in 200 years of American economic, social, and political growth.

Automation

With the vast advances in the electronic information industry, many possibilities exist for further automating the census to save time and money and increase accuracy. In the past the census has required a small army of people moving tons of paper to get the job done. Hiring, training, and finding space for all the people who perform the many clerical jobs of the census (labeling, checking in following up, reviewing, editing, coding, and microfilming, to name only the major operations) take time and cost money.

Several automation techniques are being considered. One of the most promising is the automation of the geographic information base (see "Automating Census Geography", *American Demographics*, June 1983, p. 30). Experience in 1980 demonstrated that improvements need to be made in the geographic program, and the investment in automation may help, not only in 1990 but for future censuses as well.

Other organizations besides the bureau, such as the U.S. Geological Survey, the Defense Mapping Agency, and commercial map-making organizations also are working on automated mapping systems. Already, first-generation, digital mapping systems are available. The present needs of the bureau center on new computer software. The bureau's planned «TIGER» system, for Topologically Integrated Geographic Encoding and Referencing, will combine maps, addresses, and census geographical areas into one data base. This should reduce the errors, inconsistencies, and difficulties that plagued the 1980 census.

We also are examining the possibilities for automating more of the data capture process — in particular, methods of capturing data on machine at the district office level or elsewhere in the field. The earlier that data are captured by the computer, the more computers can help with other processes like editing. If the burdens of manual work imposed on the district offices are eased, more time can be spent on other activities like following up on non-respondents. Earlier data capture also would make the process less vulnerable to fires and other catastrophes.

We are looking at computer-assisted telephone interviewing to follow up incomplete or inconsistent forms or perhaps even to enumerate non-respondents. In the latter case, the complete absence of an original paper record poses reliability and control problems. For follow-up enumeration efforts, we are thinking of having the enumerators in the field use hand-held devices to record

and enter responses directly into the computer. While this direct-entry technique is technically possible, our planning has to consider administration and quality control. No original paper record would exist to double-check the enumerator's results. Additional problems are posed by potential equipment theft, or a respondent's reticence to answer questions that would immediately be entered into a computer.

This reticence is part of a larger fear — the "Big Brother" or "1984" phobia. As people see computers playing an even larger role in the census, they may fear for the confidentiality of the census data. While automation and computers have real benefits, the bureau must take care to ensure that the confidentiality of its data is maintained not only in fact — which has always been the case — but in appearance as well.

A promising technique for data entry is computer coding software that automatically converts handwritten responses to a computer code. Software that assigns code numbers to key words already is available. The difficult problem is to capture handwritten data and convert them into a form the computer can process. No known technique exists to machine-read the wide variety of penmanship used by millions of respondents, so some type of conversion process must be developed.

The bureau also will automate more fully its progress and cost-reporting systems to increase control over the massive logistical effort required to take a census. It is a staggering task for an organization with 200,000 to 300,000 temporary employees in several hundred field offices to keep close tabs on the status of its operations and finances.

We in the bureau are excited about these automation possibilities, but they require caution. Any systems we install will be operated by a temporary work force with minimal training, so the systems must be simple. They must be "fail safe" and not unreasonably expensive. Because the bureau must plan conservatively to avoid a crippling breakdown in any essential automated system, we may not be able to use the newest technology in 1990.

The lead times for obtaining new Automated Data Processing (ADP) equipment are such that decisions must be made several years before 1990. In many instances, the bureau may have to base its plans on something that is less than the latest technology — even though reliable, better equipment may exist by 1990. Because we have only one chance every ten years, the bureau cannot make the census dependent on untested automated techniques and devices. New technology must be fully tested and proved to be reliable.

One challenge the bureau faces in planning automation for the 1990 census is to minimize its investment in equipment for the 1990 census that will no longer be useful in the year 2000. It makes no sense to have a junkyard of specialized but outmoded ADP equipment. Equipment used in 1990 should either continue to have value to the bureau or be marketable to someone else upon completion of the census.

Counting on People

Even with automation the bureau will have to hire many temporary workers for 1990. In 1980 we had significant problems recruiting and training the temporary work force because the pay was low, and for most the jobs lasts only a few months. While these constraints will still exist in 1990, bureau staff believe opportunities exist for improving labor productivity. The bureau's ability to provide monetary motivation will always be limited, but we will be examining different methods of payment such as hourly rates, piece rates, performance bonuses, and cost reimbursement. In addition non-monetary motivation must be provided.

One way to make the jobs more interesting would be to allow temporary workers to see and participate in more tasks. By being aware of the progress of the questionnaires from preparation through distribution, collection, data capture, and editing, workers may better understand the need for accurate and timely work. One benefit of automation is that it can lessen the time employees spend doing boring and repetitive tasks, freeing them to participate in more interesting work.

The bureau needs to find more capable temporary employees. One option would be to use local government employees, such as school teachers, fire fighters, or transit workers on a temporary and perhaps part-time basis. India, for example, declares a national school holiday of several weeks and conscripts its public school teachers to conduct the census.

Whether this approach is feasible in the United States or not, the bureau could enlist the cooperation of various local government work forces. This effort would improve the bureau's ability to cooperate with local government officials. On the other hand, it could raise confidentiality concerns even though local government employees involved in the census would have to take the same confidentiality oath administered to all bureau employees.

A second recruitment strategy would be to solicit more active support from community non-profit, civic, and volunteer groups. Recruiting from these sources might provide a more dedicated and capable work force.

The bureau is also considering using Postal Service employees more extensively. In the 1980 census they participated by delivering the questionnaires and adding or deleting addresses as necessary. The bureau will test the effectiveness and cost of having the Postal Service develop mailing lists initially instead of purchasing them commercially or developing them through bureau canvassing.

There are problems with the use of Postal Service employees in actual enumeration. Postal Service employees could not be expected to stop delivering the mail for several weeks during census time, and the constant conflict between their regular duties and census-taking responsibilities — as well as the large differential in pay — might preclude their effective use.

None of these recruitment strategies, of course, would completely eliminate the need to continue a large amount of hiring through more traditional procedures. Whatever the source of the bureau's temporary workers, we face a tremendous challenge in training and supervising them. Automation demands specialized training, and the more automation is spread to the district offices the more training needs will increase. Based on our experience in 1980, we believe we can do a better job, particularly with better instruction and reference materials. Audiovisual aids and microcomputers will help, and reference materials can be simplified. We are also working to see if our basic training methods can be improved.

Address Lists

The coverage achieved by the census depends on the thorough performance of two tasks: the delivery of questionnaires to all housing units and the counting of all persons who reside in each occupied unit.

An accurate address list or control list is critical. Even the proposed list/leave technique would use an address list as the basis for assigning routes to census personnel and monitoring their progress in distributing questionnaires. The 1980 experience in developing a complete control list was mixed. Although the bureau ultimately achieved its objective of reaching almost all occupied units, we should be able to achieve the same results more efficiently the next time around.

Address lists can be developed in one of five ways, or in a combination of them. The bureau can develop its own list through canvassing efforts; it can update the 1980 list; it can buy new lists from commercial sources where available; it may be able to buy lists from the Postal Service; or it can obtain lists from other sources, such as utility companies, Social Security records, or local tax rolls.

One of the problems facing the bureau if it is to use the 1980 list again for 1990 is that no useful automated mailing list exists from the 1980 census. Additions and corrections to the list were made manually and not entered into any automated data base. The cost of entering this information would be high.

The cost of buying a commercial list is, by comparison, inexpensive. Some, however, believe commercial lists may not be complete, especially for low income and minority groups. Next year the bureau plans to conduct a pretest on the costs and effectiveness of initial address-list development by the Postal Service as well as development of an updated 1980 list using temporary census personnel.

In particular the bureau will try to measure the costs and benefits of Postal Service address lists in both rural and urban settings. To allow the Postal Service to provide these lists for the pretests, legislation is necessary to change

the law. Both the Census Bureau and the Postal Service support this legislation, and steps are being taken to introduce such a bill in Congress.

Most likely, any lists available for the 1990 census — whether updates of the 1980 lists, lists provided by the Postal Service or commercial firms, or lists developed by the bureau itself — will be checked again by census personnel in an effort similar to the 1980 prec canvass, a very successful operation.

Whatever happens in 1990, the bureau will examine the establishment of a permanent, automated address data base so that the 1990 census list can be more useful in future activities.

Improving Coverage

The census depends upon self-enumeration. Once the questionnaires are delivered, by whatever method, someone in each household must answer all the questions accurately and return the questionnaire.

The initial response rate in 1980 was excellent. Eighty-five percent of all occupied dwellings responded. We cannot reasonably expect to do much better in 1990 — but the more self-response and public cooperation, the better. Responses that are mailed back as requested are fast, cheap to handle, and accurate, since they avoid the errors that enumerators make in following up at those households that did not return the questionnaire. To the extent that personal follow-up visits by enumerators may intimidate respondents and reduce accuracy, more self-enumeration improves coverage.

We also are examining new ways to improve our follow-up efforts to enumerate those who do not respond by mail. Telephone follow-ups face the obvious difficulty that a non-responding housing unit provides no telephone number. Criss-cross directories that match telephone numbers with addresses work well for single-family residences, but not very well for multiple-unit dwellings. The advent of 9-digit zip codes may open new follow-up possibilities. The use of reminder cards to encourage people to mail back their questionnaires is being considered again, though pretests before the 1980 census yielded inconclusive results as to their effectiveness.

To be sure that everyone was counted by the 1980 census, the bureau conducted several follow-up programs. For example, enumerators conducted a vacant unit check to be sure units initially classified as vacant were not in fact occupied. The bureau conducted a "casual count" to see if people found in places frequented by the homeless and by transients had been counted. All follow-up coverage programs will be re-examined to see how effective they were and how much they cost. Some, like local review and the vacant unit check, proved effective at reasonable cost and will probably be retained and improved. Others may be dropped in favor of more promising new approaches.

Adjustment for Undercount

The extent to which the Census Bureau pursues coverage improvement programs will depend on decisions about adjustment for the undercount. If a decision is made before 1990 to adjust census data, some resources earmarked for coverage improvement may be shifted to the adjustment program. Adjustment by demographic analysis, matching samples, or statistical analysis would be expensive. It would make little sense to spend a lot of money trying to reduce the undercount to negligible levels by improving coverage, if adjustment could achieve greater precision. If, on the other hand, there is to be no adjustment of the census count, the burden on the bureau to reduce the undercount to negligible levels will be correspondingly higher.

Adjusting for the undercount is a political as well as statistical issue, that will be considered ultimately by the legislature and judiciary as well as by the Census Bureau. The bureau, however, has much to contribute to the resolution of this issue. The bureau's position on the matter will be a major influence in the eventual outcome. We have built a comprehensive research program to develop and evaluate better techniques to measure the undercount. Indeed, the bureau plans to establish a special staff unit to coordinate our studies of the adjustment issue.

Adjustment of the 1990 census to compensate for an undercount can be viewed as two distinct problems.

First the bureau must become able to measure the undercount more accurately than is possible now. Preliminary estimates show that overall coverage in the 1980 census was quite good. In this situation, considerable accuracy is demanded of the undercount estimate if it is to be used for adjustment. The issue revolves on what criteria should be satisfied to establish that the estimate of the undercount is sufficiently accurate to use in adjusting the census.

Second, even if the Census Bureau can measure the undercount adequately at the national or regional level, there are doubts about the accuracy of techniques available for adjusting population counts for smaller areas. A common technique proposed for adjusting census figures for small areas is "synthetic estimation". In this technique the estimates of the undercount for national, aggregate figures are used to estimate undercounts for smaller areas — states, counties, cities, townships, and basic enumeration districts. For example, if 4 percent of blacks nationally were missed by the census according to the bureau's best estimate, black population counts for all units of census geography would be adjusted upward by 4 percent.

More sophisticated statistical and matching techniques exist, of course, and the bureau is intently studying them. The practicality and accuracy of adjusting for the undercount diminish, however, as the size of the area in question becomes smaller. There are some 39,000 sub-state units that need to be

measured for the purpose of distributing revenue-sharing funds. The magnitude of this task, and the bureau's ability to deal with it, are much more demanding problems than adjustment on a state-by-state basis or on the national level.

The Revenue Sharing Act calls for adjusting when practicable the intercensal estimates of the population that are used for distributing revenue-sharing funds. The bureau's decision on adjustment for revenue-sharing purposes may be influential in determining the issue for 1990, but it will not be final. Adjusting for congressional reapportionment and redistricting purposes is different from adjusting for revenue sharing or other formula grant programs. For instance, the deadlines established by law to provide data for these purposes impose difficult time constraints. Alternatively, research between now and 1990 might yield better adjustment techniques that make adjustment feasible.

The Meaning of Enumeration

An underlying issue facing the Census Bureau as it plans for 1990 is to reach some working definition of the meaning of enumeration. Traditionally, censuses have been thought of as an accounting rather than a statistical procedure. This is an important, if subtle, distinction. The bureau has always attempted to count every person living in the United States on Census Day.

Even so, the census has always been more than pure head-counting. In the first census, an enumerator visited each residence, listed the name of the head of the family, and tallied the household's members by age and sex. Recent censuses have used self-enumeration. In the last census, for 95 percent of the population each housing unit received a form in the mail, and in most cases, one person filled it out and mailed it back.

For each housing unit that did not respond, the bureau made an effort personally to contact someone who could provide the necessary information. Sometimes, in spite of the enumerator's best efforts, however, no information could be gathered about a housing unit. Sometimes, questionnaires were incomplete or inconsistent. The bureau designed computer editing procedures to "clean up" missing or incomplete data in a statistically reliable way. Imputation procedures were used to supply missing information by having the computer select a matching housing unit or person and substitute its characteristics for the missing or inconsistent information. The census process has thus evolved into an accounting procedure with statistical "estimation" to achieve a more accurate result.

We are examining the extension of statistical estimation in the census process. More estimation would involve sampling and the use of administrative records to obtain the basic census counts.

There are several ways the census could use sampling more extensively in 1990. At one extreme, sampling could be used as a substitute for counting, but

accurate numbers for small geographical areas would be difficult to construct without a massive sample. And current law prohibits sampling for producing congressional reapportionment data. Sampling could be used to supplement a head-count by sampling those who did not respond to the questionnaires. Problems arise with this use of sampling, though, because it may be less accurate and timely than actual follow-up efforts to count all non-respondents.

Sampling could be used in a limited fashion for some of the coverage improvement activities that were done on a complete-count basis in the 1980 census. For instance, only a sample of vacant units might be checked to see if they have been incorrectly classified. Finally, the Census Bureau could use sampling to adjust the head-count by matching a sample of people from an independent list with the results of the census. Estimates of a net undercount or overcount then could be used to adjust the census numbers.

Administrative records such as Internal Revenue Service or Social Security records offer other non-traditional methods of deriving population figures. Administrative records could be used to help compile an address list for the census mailing. The Census Bureau might improve coverage, for example, by checking to see if persons listed as having driver's licenses were indeed counted. These records could also be valuable in estimating overcounts and undercounts. Administrative records already are used to estimate the national undercount rate, but this technique could be extended to state or sub-state areas. Conceptually, administrative lists could be used exclusively to compile the census figures.

The use of administrative records in the census poses several potential problems. The accuracy and coverage of administrative records are questionable; the perception of confidentiality would be damaged by increasing suspicions that the bureau is sharing its information with other agencies; the ability to estimate population and housing characteristics by small areas is limited, since lists do not locate individuals precisely; the time needed to compile data may increase; and the legal and bureaucratic problems of arranging to obtain these lists may be considerable.

Probably the next census will start with an attempt to count everyone. That does not, however, preclude the use of some sampling or administrative lists to supplement our initial head-count estimates, although the governing statute may have to be changed. Beyond 1990 the working definition of the meaning of enumeration could change further. Nevertheless, one must remember that counting every person individually, while administratively difficult, is understood better by more people than statistical estimating techniques based on sampling or administrative record checks.

A head-count is simple and clear: it gives the census legitimacy and encourages public acceptance. These attributes should not be undervalued. Without them, the utility of the census process itself could be extremely limited, and eventually the public's support of a periodic census could disappear.

Asking Questions

What questions should be asked in the census and what means should be used to distribute data products are also important to 1990 census planning. Since other issues must be resolved first, there is somewhat less time pressure to resolve content and distribution issues, so the bureau has not addressed them yet to the same extent as some of the other issues discussed here.

The Census Bureau will consider several questions in determining the content of the 1990 questionnaire. What data are needed to meet statutory requirements? What reporting burden can reasonably be placed upon the public? Is the census, or a sample survey, more appropriate for collecting particular data? Can the data be reliably collected at the required geographic level? What items can be asked on a sample basis in the census?

The bureau will face conflicting demands in determining the length and content of the questionnaire. The appetite of data users for more information is insatiable, yet we must keep the reporting burden on the public — and the processing burden on the bureau — within reason. The bureau will try to strike a balance between these pressures. One possible technique would be to use several different sample forms — so called “interpenetrating” samples — that permit a large number of questions without increasing the reporting burden. One disadvantage to this technique is that same data availability for small geographic areas is lost because of decreased sample size.

The bureau will also examine the concepts used in classifying the characteristics of the population. For instance, the distinction between “urban” and “rural” will be examined to see if past classifications still make sense. The disadvantage to such changes is that continuity with past census data is lost. The need to adjust the questions to the realities of 1990, however, may call for some changes.

Public Meetings

To determine the public's data needs, we will again engage in extensive consultations with other federal agencies, local and state governments, private concerns, and the general public. Beginning early in 1984 the bureau will hold a series of local meetings across the nation. The first 50 meetings will be in state capitals. These meetings will include state government officials, commercial and civic organizations, and the general public. Meetings with interest groups, professional associations, political officials, and minority groups will also be held.

The U.S. Office of Management and Budget will convene the Federal Agency Council in which all interested federal agencies will discuss their program needs for data collected by the census. The council will be convening a year earlier

than it did in preparation for the last census, to study more thoroughly the content of the 1990 census questionnaire and the needs of federal agencies.

Distributing Data

The bureau is considering changes in the way data products are prepared for distribution. The data distributed in past censuses have taken the form of hundreds of printed reports, supplemented by summary computer tapes and microfiche. With the increased availability and use of microcomputers and the growing need for customized tabulations, the past focus on printed reports may be inappropriate for 1990.

Several programs, including one through the state data centers, will be conducted to learn how people used the 1980 data. This information will assist the bureau in developing the 1990 dissemination methods. Proposals will be circulated to a broad spectrum of organizations and individuals that use data, for their review and comments. While every effort will be made to meet the needs of users who require detailed data, the presentation of census data must maintain the confidentiality of each individual respondent. The bureau will investigate various ways to prevent the identification of individuals and still satisfy user needs for detailed data.

We at the bureau want to receive the opinions and ideas of the users of census data, not only in regard to questionnaire content and data presentation and distribution, but also in regard to the techniques and methods used in collecting census data. We invite you to attend bureau-sponsored activities. Also you may provide your comments to the author, Peter A. Bounpane, Assistant Director for Demographic Censuses, Bureau of the Census, Room 3049-3, Washington, DC 20233.

OVERVIEW OF ISRAEL'S 1983 CENSUS OF POPULATION AND HOUSING (a)

1. Israel's fourth Census of Population and Housing was carried out in June, 1983. Preparation of the basic census tapes is nearing completion, and they should be available by the summer of 1984. This report will describe most of the major components of census planning and operation. It is divided into ten sections:

1. Legal and historical background.
2. Enumeration procedures in the 1983 Census.
3. The Population Registry and the Census.
4. Census geography and field organization.
5. Questionnaire design and content.
6. Manual editing and coding of questionnaires.
7. Automatic data-processing.
8. Evaluation of census operations.
9. Dissemination of census data.
10. Special problems encountered during the census operations.

I. LEGAL AND HISTORICAL BACKGROUND

2. There is no formal requirement that a census be taken in Israel at regular intervals. The legal basis for the Israeli census is provided by the Statistics Ordinance (1972) which permits carrying out of a census and requires a special Order signed by the Prime Minister. The Order defines the area to be covered by the census, and grants to the Government Statistician the power to implement such operations as may be necessary for the carrying out of the census. The need

(a) Report by the Israel Central Bureau of Statistics.

to obtain special financing for each census has prevented adherence to a strict decennial schedule. Following two censuses carried out in Palestine by the Mandatory Government (in 1922 and in 1931), Israel's first census was held in November, 1948, six months after the establishment of the State. This first census formed the basis for the Population Registry, and as will be described below (Section III), subsequent censuses made extensive use of information from the Population Registry. The additional censuses were held, in 1961 and in 1972.

"Census Night" for the 1983 Census of Population and Housing was set for June 4, 1983. The population to be enumerated was estimated to include slightly more than 4 million persons.

II. ENUMERATION PROCEDURES IN THE 1983 CENSUS

3. Field-work for the 1983 Census was divided into two stages. Beginning ten days before Census Night enumerators canvassed the enumeration districts (ED) which they had been assigned, distributed questionnaires to every dwelling unit and asked the families to complete them. They were aided in this stage by detailed maps of each ED, showing each structure, the streets, street names and codes, and house numbers. The enumerators proceeded in their canvass according to a pre-determined route which had been drawn on the map before they received it, in such a way that it passed through every structure to be covered.

4. There were two basic questionnaires, a short-form and a long-form. The long-form was delivered to every fifth household, according to sampling digits which were specified for each ED, based on the serial order of dwelling units encountered by the enumerator in his canvass. In addition to distributing the questionnaires, the enumerator recorded in a listing book each dwelling unit, including name of occupant, and each structure which he encountered, as well as entering the serial number of the questionnaire left at each dwelling. The enumerator was instructed to maximize coverage of households by leaving questionnaires at every possible dwelling unit, unless he was told unambiguously that a particular structure or apartment was uninhabited. (The census was not planned as a complete census of structures, but only as a census of structures which served as dwellings for members of the census population). Thus, at the end of the "drop-off" stage the enumerator was to have delivered the appropriate (short- or long-form) questionnaire to each dwelling unit, and to have prepared a complete record of the dwelling units, unidentified by occupants and unoccupied units in his ED.

5. Following Census Night the enumerator returned for the "pick-up" stage of collecting the questionnaires which were in the interim to have been completed by the households. In addition to the ED map and the listing book

which he prepared during the drop-off stage, each enumerator was provided with a list of the persons who, according to information in the Population Registry, lived at an address in his ED. When the enumerator returned to a household to collect the questionnaire he compared the names of household members who had been listed in the questionnaire with the names of persons who according to the Population Registry lived at that address. If the enumerator located a household member on the Population Registry list he removed a self-adhesive gummed label on which the person's name was printed and stuck it on the questionnaire adjacent to the information which had been entered for that person. (The use of the Population Registry in the census is described in more detail in Section III). If the household members had failed to complete the questionnaire prior to the enumerator's return to collect it, he or she was instructed to attempt to complete it on the spot. The pick-up stage lasted four weeks, and enumerators were to make up to three call-backs in order to obtain completed questionnaires from households whose members had not been at home during previous visits.

6. A final effort was made to obtain completed questionnaires from households who had been visited three times during the pick-up stage but from whom questionnaires had not been received. Enumerators returned for three more visits to most of the households to obtain incompleted questionnaires, and tried at least to obtain information on their size, either from the household members themselves or from neighbours. This final stage lasted up to a week, and with its conclusion field-work ended in all but a few ED's.

7. The basic drop-off/pick-up enumeration procedure was adapted for use with special populations whose living arrangements or geographical distribution made its implementation difficult or unnecessary. These special population included residents of institutions (collective dwellings), residents of kibbutzim (collective settlements) and households living outside the boundaries of settlements of municipalities (primarily Bedouin).

III. THE POPULATION REGISTRY AND THE CENSUS

8. The procedures of the 1983 Census, like those of the two previous Israeli censuses, made extensive use of information from the national Population Registry administered by the Ministry of Interior. The utilization by the census of information in the Population Registry has three main purposes. First, the list provided to the enumerator of persons presumably resident in his ED serves as an independent check on the completeness of his coverage of persons; if a name on the list does not appear on any questionnaire he is instructed to inquire regarding the whereabouts of that person, and such inquiry on the enumerator's part may lead to correction of an oversight by the household and inclusion of the person in the questionnaire. Second, the pre-printed self-adhesive table which

was stuck on the questionnaire by the enumerator contained a unique identification number (including a check-digit) which became part of the person's computer census record. This identification number made possible record linkage between the individual's questionnaire data and the demographic information contained in the Population Registry, and thus provided a valuable tool for resolving response inconsistencies in individual questionnaires as well as providing information which may inadvertently have been omitted by the household. Third, the census provides a basis for updating the addresses in the population registry, which in many cases do not reflect the actual residence of the population because of delay by the residents in notification of their address changes. Since the census enumerates the vast majority of the population at what they would consider to be their "permanent" address, a considerable portion of the delay in the reporting of address changes could be overcome, at least for the period of the census. Additional uses of the Population Registry include evaluation of coverage and quality of response.

IV. CENSUS GEOGRAPHY AND FIELD ORGANIZATION

9. The basic geographical unit of census is the enumeration district which in 1983 contained an average of 225 households. The link between the census and the Population Registry, the need to provide enumerators with lists of persons by ED, and the desire to reduce as much as possible the preparatory work necessary to divide the names of persons in the Population Registry into lists for each ED, led to the decision to utilize insofar as possible the existing division of the Population Registry into election precinct lists. In most cases, an ED was to be identical with an election precinct. Since each person in the Population Registry was already assigned, by means of his address, an election precinct code, these could be used to form the basis of the ED network. Only when the population of an election precinct exceeded 1,200-1,400 persons was its area divided and its residents assigned, in a procedure which combined field-mapping and subdivision of Population Registry computer files into component ED's. More than 6,000 regular ED's, some 1,500 collective-dwelling ED's, and approximately 160 ED's located outside localities were finally delineated.

10. The network of ED's was the base of the hierarchical division of Israel into geo-statistical areas, and a cardinal principle adhered to in creating the network was that existing boundaries should not be crossed. Thus, each larger geo-statistical unit is composed of undivided component units: ED; election precinct; statistical area (in towns having at least 10,000 inhabitants); sub-quarter (in towns having at least 40,000 inhabitants); quarter (in towns having at least 100,000 inhabitants); locality; natural region; sub-district; district. In addition, in all but a few cases comparability was preserved

between statistical area boundaries as they were defined for the 1972 Census and the corresponding 1983 Census tract boundaries.

11. The field organization of the census paralleled the geo-statistical division of the country. Thirteen census administrative regions were created, and each was subdivided into local census offices responsible for enumerating an area containing some 40,000 persons. Each local office supervised 50-60 enumerators, divided into 8-10 crews. Most of the organizational, training and enumeration tasks were located in the local offices, while the regional office staff provided support services, especially with respect to recruitment of more than 7,000 temporary field workers, paying them, and overseeing local office operations. National census headquarters were established at the Central Bureau of Statistics offices in Jerusalem.

12. Three field tests were carried out in various parts of the country, beginning in 1980, to test components of the planned enumeration procedures, questionnaire design, and organizational apparatus. The third field trial was the census "dress rehearsal", held fifteen months before Census Night, designed to simulate on a small scale the census field organization, questionnaire handling (including receipt, coding and key entry), and automatic editing procedures.

V. QUESTIONNAIRE DESIGN AND CONTENT

13. Two basic questionnaire forms were designed for the enumeration of the vast majority of the population, and these were adapted for use in enumerating the special populations (cf. par. 7). Special attention was devoted to the graphic design of the questionnaire, in order to make it attractive to the population and thus maximize the desired self-enumeration, and in order to make data-capture direct from the questionnaires as trouble-free as possible. Both the short-form and the long-form questionnaires were designed as booklets with space for responses of all household members. Official census forms were printed in Hebrew and in Arabic, translations of the questionnaire into other languages were made available to the enumerators to assist them in the field work.

14. As noted above (par. 4), there were two basic questionnaires. The short-form contained ten demographic questions addressed to each household member. The long-form, delivered to a sample of one-fifth of the households, contained additional questions addressed to household members aged 15 or over. Topics covered included geographical mobility, marriage and fertility, education, languages spoken, labor force characteristics, journey-to-work, occupational mobility and income from work. The long-form also included questions about the dwelling quarters, possession of durable goods and income of household members from sources other than gainful employment.

15. Questionnaire content was decided during a four-year program of consultations and testing involving experts in subject areas from the staff of the Bureau, and representatives of government agencies, public bodies, universities and research institutes organized under the auspices of the Public Advisory Council on Statistics. A balance had to be struck among often competing demands: insuring comparability with prior censuses; adherence to United Nations recommendations; meeting new data needs; and preventing undue respondent burden. The 1983 Census questionnaire contained a number of items which had not appeared previously: information on employment five years ago; additional items on household energy use; course of study for those whose last school attendance was in a vocational training program. On the other hand, items which had been asked in previous censuses were eliminated when data needs no longer justified their inclusion (direct questions on literacy; basic household sanitary facilities), or when experience in prior censuses indicated that the quality of responses was too poor to permit reporting of results (respondent estimate of the value of his dwelling).

16. Four surveys using the census as a sampling frame are planned, and these had also to be taken into consideration when determining questionnaire content. One of these, a survey of elderly persons, required no special adaptations to the questionnaire; two others, a survey of travel behaviour in the three major urban areas (Jerusalem, Tel-Aviv, Haifa) and a survey of graduates of post-secondary education, required adaptation of categories of already-existing questions; the fourth, a survey of graduates of vocational training, required the inclusion of a special question. (An additional post-censal survey of vacant dwelling units was carried out immediately following the termination of field work, based on information recorded in the enumerators' listing books).

VI. MANUAL EDITING AND CODING OF QUESTIONNAIRES

17. Two coding centers were established to receive the completed questionnaires after they had been checked and cleared in the local census offices. The flow of questionnaires to the coding centers began while field operations were still underway; the short-forms (80 percent of the total) were edited and coded in Tel-Aviv, and the long-forms (20 percent of the total) were edited and coded in Jerusalem. Editing and coding were carried out by temporary staff most of whom were high-school students on summer vacation. While a minimum of coding was required for the short-form (country of birth for persons born abroad; religious adherence for those unable to assign themselves to one of the pre-coded categories; tribal affiliation for Bedouin), coding of the long-form was a major undertaking. Separate frameworks were established for coding occupation and economic branch (current and former), and for coding

address of workplace. The manual editing, as well as the geographic and economic coding was subject to ongoing quality control, and batches which failed were reprocessed.

VII. AUTOMATIC DATA-PROCESSING

18. Automatic data-processing for the 1983 Census can roughly be divided into four topics: (1) organizational preparations for field-work, including dividing the Population Registry into separate lists for each enumerator, preparing the pre-printed lists and self-adhesive labels, and monitoring of field activities; (2) data capture; (3) automatic editing and imputation procedures carried out in order to prepare the basic census tapes; (4) data dissemination once the clean census files are available.

Data-processing is carried out at the Bureau's computing facility, on an IBM 4331; the largest runs are handled by the computer at the central government computing installation, on an IBM 370.

19. An automated list of enumeration districts was prepared as the basis for census fieldwork organization and subsequently for census geography in tabulations and publications. Much effort was devoted to maintaining the currency of this list, adding and deleting units according to the reports from the field. This list formed the basis for the organizational materials provided to regional and local census offices which detailed the enumeration districts by type of population, defined the enumeration crews and served as the basic framework for the field operation. The geographical division used for the field work was maintained through subsequent stages of processing - coding and will be finally put aside only after the preparation of the clean basic data tapes.

20. The progress of field work was monitored and daily reports were prepared automatically showing the status of questionnaire distribution and collection. The shipment of completed questionnaires from field offices and their progress through the stages of manual coding and key entry to the census archive for final storage was also followed with the aid of specially prepared computer programs to insure that all material passed through all the stages.

21. Data capture of the questionnaire responses was carried out following manual editing and coding, by means of Direct Data Entry (DDE). The work was carried out by commercial firms. Each batch of questionnaires was subjected to logical checks during key-entry, to minimize keying errors, and to a quality control check after keying evaluated automatically by Bureau personnel; batches which failed were returned for re-keying.

22. Plans for the 1983 Census called for all data record editing and imputation to be done automatically. The program was divided into two sections — "procedural" cleaning and editing, whose purpose was to insure that the framework of persons and households was correct, particularly

regarding the geographical assignment of persons and household, identification of persons who had been enumerated more than once, etc.; and content cleaning and editing, whose purpose was to resolve response inconsistencies and impute missing values. The desire to eliminate the need to return to the physical questionnaires necessitated the development of a set of algorithms which were applied automatically in the case of errors or inconsistencies.

23. As will be described below (Section IX), census results will be disseminated in a variety of forms. Special computer programs have been developed to permit the preparation of census tabulations which are camera-ready, thus eliminating the need for an intervening stage of *montage* prior to printing. The form of the basic census file is being kept as simple as possible in order to facilitate access by a wide range of users within and outside the Bureau.

VIII. EVALUATION OF CENSUS OPERATIONS

24. Only part of the planned evaluations of census operations have thus far been carried out, and results of these are not yet available. The following list enumerates the main topics which we hope to cover following the 1983 Census:

- Coverage of households, based on two post-censal evaluation surveys carried out in August, 1983.
- Coverage of population, based on comparisons with Population Registry and other files.
- Quality of response, based on comparison of census responses to those from the Current Labor Force Survey and from other sources.
- Quality of coding, based on quality-control operation.
- Quality of key-entry, based on quality-control operation.
- Automatic editing and imputation results and their effects on the data.

IX. DISSEMINATION OF CENSUS RESULTS

25. Census results will be made available to the public in a variety of ways. A series of "official" census publications will appear in the next three years (the first, reporting preliminary tabulations based on enumerator listing books, was published in January, 1984). Three basic types of publications are planned for this series. Main results from the short-form and from the long-form will be presented for the country as a whole and for the main geographic divisions, and profiles of localities and statistical areas will be prepared. A set of publications will summarize in greater detail results from each of the main content areas covered by the long-form. A third set of "special" publications will treat in even

greater detail special topics, such as women workers, the elderly, etc.

26. In addition to the official census publications, the Bureau is preparing to make available to users census data files which will permit them to carry out tabulations as they require. In order to preserve confidentiality of responses alternative files are being prepared, one with greater geographic and less content detail, and another with greater content and less geographic detail. The user will select the file most appropriate to his needs. A special summary file, containing an expanded profile of localities and statistical areas (compared to the information planned for publication) will also be prepared, and will permit detailed analysis of many population characteristics at the local level. As was done following the two previous censuses, a set of data files will be deposited in existing university data banks, for the use of researchers, teachers and students.

27. Users whose data needs are not met by the official publications, and who are unable to take advantage of the tape files that the Bureau will make available, can request special tabulations which will be prepared on order.

X. SPECIAL PROBLEMS ENCOUNTERED DURING THE CENSUS OPERATIONS

28. Although, as noted above, results of the planned evaluations of census operations are not yet available, it is possible to specify a number of problems which arose during census planning and implementation. These were primarily organizational, and while they caused difficulties at the time it is not felt that most of them damaged in any serious way the quality of the results.

29. Unexpected delays occurred in the preparation of material for the field workers, particularly ED maps, some training materials, and other printed matter. As a result the original timetable for field preparations could not strictly be adhered to, and the burden fell unequally during the pre-enumeration period. There were also unforeseen shortages of some fieldwork materials, which had to be filled at short notice.

30. Problems were discovered in some ED's regarding the definition of the boundaries as defined by the map and as defined by the addresses in the Population Registry list provided to the enumerator. Since the enumeration and data capture procedures did not allow for exchanging lists between ED's, some of the enumerators were unable to make full use of the Population Registry list as an aid to coverage, and the quality of the link to the Registry in subsequent stages of data processing was reduced. It should be noted that this problem occurred in a relatively small number of ED's.

31. As in previous censuses, portions of the Jewish orthodox religious population refused to cooperate with the census. Thus, in some areas very high non-response rates were obtained, and special measures had to be subsequently taken in order to impute the missing information.

32. One of the basic demographic questions in the short-form, that dealing with national-religious self-identification, aroused a certain degree of opposition in the field, and preliminary results indicated that the quality of the responses suffered. Though the problems were not widespread, it was nevertheless decided to utilize the information on the person's religion found in the Population Registry in place of the response obtained in the questionnaire, except in cases where the information from the registry was unavailable.

33. Keying of questionnaires lagged behind schedule because of organizational difficulties in one of the commercial installations which undertook the work. This led to a delay of several weeks in the preparation of the final census tapes and the initiation of the tabulation and publication program.

QUALITY CONTROL OF DATA CAPTURE AND CODING (a)

I. QUALITY CONTROL OF DATA CAPTURE

1. The data of the questionnaires in the 1983 Israel Census of Population and Housing was keyed by means of a data-entry system. Data capture was accompanied by an independent quality control operation designed to insure that the transfer of questionnaire responses to magnetic tape reflect as much as possible the information originally appearing in the questionnaire. A trial of the quality control operation which was made as part of the census dress rehearsal, the inclusion in the questionnaire of elements designed to reduce the probability of keying errors, and the system of checks implemented during keying, combined to give a level of incoming quality (error rate before quality control) which made it possible to reduce the demands which might otherwise have to have been made on the final quality control operation. The criteria finally adopted represented a compromise between receiving records whose quality was extremely high, and not burdening unduly the data entry system during data capture by repeated rejection of keyed batches.

2. The following criteria were established for the data quality operation:

2.1 An average outgoing quality limit of 5 errors per 1,000 key-strokes.

2.2 A consumer risk lower than 10 percent for a lot tolerance of 1 percent. In other words, the probability of receiving a batch containing 10 errors per thousand key-strokes will be less than 10 percent.

2.3 A producer risk of 14 percent given an acceptable quality level of 5 key-strokes in error per 1,000. Roughly speaking, this demand means that no more than 14 percent of the batches keyed at the quality level specified in Section 2.1 will be erroneously rejected and rekeyed.

3. Although the details of the quality control of key entry had to take into account the constraints imposed by the organization of questionnaire flow to the keying centers, it was possible during planning of the organization of

(a) Prepared by Mr. Ya'acov Hite, Israel Central Bureau of Statistics.

questionnaire flow to introduce elements designed to permit a more effective quality control operation. Questionnaires arrived at the keying centers in batches which usually contained 12 binders. The modal binder contained 40 short-form questionnaires, all from the same enumeration district (ED). A binder never contained questionnaires from more than a single ED, and contained questionnaires of one type only, the short-form or the long-form (completed by a sample of 20 percent of the households). The long-form binders typically contained 20 questionnaires. The number of questionnaires in the binder was determined by considerations of quality control, the goal being to sample an entire binder. Thus, it was necessary to design the binders so that each contained a number of questionnaire types. As a result, binders containing questionnaires from kibbutzim (collective settlements) or from collective dwellings held more than 40 short-forms or 20 long-forms, since each of these questionnaires had fewer pages and thus contained fewer potential keystrokes.

Estimates of the average number of key-strokes for each type of questionnaire were obtained in the dress rehearsal. The quality control operation required 5,500 key-strokes, which led to the decision to include the equivalent of 40 short-form questionnaires in a single binder. The number of binders in a batch represented a compromise between the desire to reduce the sampling fraction, and the desire to maintain the batches (each of which was packed in a separate carton) at a manageable size and weight for ease of handling. All the binders containing questionnaires from a particular ED were included in the same batch, and ED's were never divided among different batches. It was important that as many batches as possible contained the full complement of 12 binders. Because of the fact that the ED's were heterogeneous in size (and hence in the number of questionnaires received), the vast majority of the binders and the batches contained the maximum number of units as planned, since this heterogeneity gave field workers a certain flexibility in arranging the materials.

4. The quality control of data capture (which was carried out under contract to commercial firms) was not designed to evaluate the work of individual keying operators, in order to identify the better operators and stop employing the poorer ones. The goal was to receive batches of a predetermined quality.

The quality control operation was carried out in two main stages: in the first stage a batch could be accepted or could be sent again for sample rekeying; in the second stage the batch which had been sent for sample rekeying could be accepted or it could be rejected. In the latter case the entire batch was rekeyed. One binder was randomly selected from each keyed batch, and the questionnaires it contained were rekeyed by an operator other than the one who keyed the batch. An automatic comparison was carried out between the original material keyed and the rekeyed material. If the rate of inconsistencies was less than 7.5 keystrokes per 1,000, the batch was accepted. If the rate of inconsisten-

cies was higher, the sampled binder was rekeyed by a third operator. An automatic comparison of the three keyings provided and overestimate of the error rate in the original keying of the batch. If this estimate exceeded 6.5 keying errors per 1,000 key-strokes the entire batch was rejected and rekeyed. Otherwise, the batch was accepted.

5. The quality control of census data capture operated as planned. The sampling fraction of binders was in fact slightly more than 8.5 percent. Only in rare cases was a batch keyed more than twice. The quality control of data capture was carried out in conjunction with control of batch and binder flow to insure that all batches, binders, questionnaires and individual data records were in fact captured.

II. QUALITY CONTROL OF CODING

6. Quality control was carried out separately on the coding of economic branch, occupation and geographic topics (place of residence five years ago, and workplace address). Samples were drawn and independently coded; batches which were rejected were recoded, but not independently, since the recoding was done from the questionnaire on which the original code was still recorded. The principal difference between the quality control of coding and the quality control of data capture was the possibility of completely independent rekeying and checking of failed batches in the case of data capture. It was not possible independently to recode batches which had failed the coding check, and were thus of lower quality. This difference determined that the two quality control procedures also differ. While in the case of data capture it was possible to set a predetermined average outgoing quality limit which had to be attained, quality control of coding was organized to provide continuous information on outgoing quality levels so that the proportion of errors could be reduced by recoding failed batches. It was not possible to set an initial average outgoing quality limit.

7. Quality control of coding was organized according to the following procedures:

7.1 Prior to the entry of the questionnaire batch into the particular coding section (economic branch; occupation; geography) a single binder was randomly sampled and the first thirty responses to be coded in that section were pre-coded on separate coding sheets. The binder was then returned to the batch which was moved into the regular coding operation.

7.2 After the entire batch had been coded in the particular section, the two sets of codes were compared manually. If the number of inconsistencies was fewer than 6, the batch was accepted.

7.3 If the number of inconsistencies was 6 or more, the batch was

examined by an "expert" who determined how many coding errors appeared in the sample of responses drawn from the original questionnaires for the precoding operation. If the number of coding errors in this sample was fewer than 4, the batch was accepted.

7.4 If the number of coding errors was determined by the "expert" to be 4 or more, the batch was returned for (dependent) recoding by selected coders. Following recoding the batch was accepted without further checking.

7.5 The results of the comparison between the pre-coding and the regular coding of the sampled responses were used to identify coders whose work was below standard and who were fired, and coders who were given the job of recoding failed batches.

7.6 Every week two batches which failed were sampled in order to obtain an estimate of the average outgoing quality level and to evaluate the quality of the coders who were employed in recoding the failed batches. A special experiment was carried out which provided a "supremum" to the average outgoing quality level of batches which had been recoded.

7.7 The overall average outgoing quality level was a weighted average of the quality of the accepted batches and the quality of the batches which failed and were recoded.

8. The design of the quality control of coding was based mainly on estimates of parameters obtained in the dress rehearsal:

8.1 The quality control operation would lead to recoding of 50 percent of the batches.

8.2 The gain anticipated from the comparison of precodes with the regularly coded responses was that 10 percent of the batches would be accepted at this stage, and not have to be examined by the "expert".

8.3 It was estimated that 1 percent of the batches which were accepted because there were fewer than 6 inconsistencies between the precoding and the regular coding of the sampled responses would have failed the "expert's" coding review of a sample of questionnaires from the entire batch.

8.4 It was estimated that recoding of failed batches reduced coding errors in these batches by 30 percent (although their final quality was still not high because their initial quality had been so low and recoded batches were not subject to repeated quality control).

8.5 The estimate of the 'supremum' for average outgoing quality of occupation coding was 12 percent coding errors, while the average incoming quality level was 17 percent coding errors.

8.6 The estimate of the 'supremum' for average outgoing quality of economic branch and geographic coding was 10 percent coding errors, while the average incoming quality level was 13 percent coding errors.

8.7 At an acceptable quality error rate of 7 percent the producer risk is 5 percent (that is, a batch with an incoming quality level of 7 percent coding errors will be unnecessarily rejected and recoded with a probability of 5 percent).

8.8 When the lot tolerance percent defective is 30 percent, the consumer risk is 5 percent (that is, a 5 percent probability exists of accepting batches with a 30 percent rate of coding errors).

9. The evaluation of census coding quality is currently underway, and preliminary results indicate that the above-mentioned estimated obtained from the dress rehearsal are similar to the parameters obtained in the census coding operation.

THE USE OF SAMPLING IN THE 1983 CENSUS OF POPULATION AND HOUSING (a)

1. The 1983 Israel Census of Population and Housing made extensive use of sampling methods in connection with preparations for the census, during data collection, and immediately following the completion of field-work. The description which follows emphasizes the aims which sampling was intended to fulfill in each stage of the census. Specific sampling procedures will be described only when these are of particular interest.

2. Two principal forms of sampling were used: judgemental sampling, and sampling based on statistical principles and prior estimates of parameters which enabled decisions to be made concerning sample size. Most of the statistical samples were cluster samples, because the organizational structure of census operations was based on groupings of individual units into larger agglomerations: enumeration districts (ED) in the case of individuals and households, questionnaire batches in the case of the separate forms, and so on. Thus, simple random sampling would have been extremely difficult and costly.

I SAMPLING DURING THE STAGE OF CENSUS PLANNING

3. *Two Field Tests* - In the early stages of planning two pre-tests were carried out, in March 1980 and in January 1981. The first was held in Kiryat Gat, a town in South-central Israel having some 24,000 inhabitants. The second pre-test was carried out on 700 households in three Jerusalem neighbourhoods. Kiryat Gat was chosen for budgetary reasons: the costs of field-work were underwritten by the local municipality. The Jerusalem neighbourhoods were chosen because of their proximity to census planning headquarters. An attempt was made to choose three neighbourhoods differing one from the other in age and type of housing, but without extreme population characteristics. Both

(a) Prepared by Mr Ya'acov Hite of the Israel Central Bureau of Statistics.

pre-tests were aimed at examining proposed changes in census field procedures compared with those used in the 1972 Census, to train census planning staff, and to test questionnaire content, design and wording.

4. *Data-entry* - Following the decision to capture questionnaire responses by means of direct data-entry techniques, an experiment was held to determine what logical checks would be carried out during census data capture operations. A simple cluster sample was drawn randomly, containing ten percent of the questionnaires collected in the Kiryat Gat pre-test. On the basis of the experiment it was decided to keep logical checks during data capture to a minimum, and to aim for accurate entry of the responses appearing in the questionnaires without attempting to resolve response inconsistencies at this stage. Thus, only keying errors were to be prevented, and logical checks carried out at later stages of processing.

5. *Additional uses of sampling for evaluation purposes* - Questionnaires received from the Kiryat Gat pre-test were also sampled in order to evaluate specific procedural components of the field-work (such as self-enumeration) and to evaluate content aspects (such as wording of specific questions). Extensive sampling was done to evaluate rules for automatic logical checks and imputation of missing data. Usually, simple one or two-stage cluster samples were drawn, with the cluster defined as a binder containing questionnaires from a single ED; sometimes an ED (stratum) was sampled and from it a single binder was then selected.

6. *The census dress rehearsal* - A general dress rehearsal for the 1983 census was held in March, 1982, in order to test changes in procedures and content introduced in the wake of the evaluations previously carried out, and to field-test procedures which had not been tried in the earlier trials. The dress rehearsal had seven principal aims:

1. Testing of yet-untried enumeration procedures, and of changes introduced into existing procedures.
2. Testing of administrative and organizational procedures, and training of the staff responsible for them.
3. Evaluation of the rates of pay for field staff, and training in the operation of a payment scheme based on enumerators working as independent "contractors".
4. Evaluation of manual editing and coding operations, and the quality control of these operations.
5. Evaluation of data capture by means of direct data entry, according to the quality control specifications which were developed.
6. Evaluation of the quality control of data capture.

7. Provision of data for establishment of parameters to be used in planning pay rates and in planning various quality control operations and evaluations to be carried out during and after the enumeration (editing, coding, data capture, post-enumeration coverage surveys, etc.)

The area in which the dress rehearsal was held was selected to contain one percent of the total population (some 40,000 persons in 10,500 households, and 2,600 inmates of institutions). Considerations governing the selection of the area included:

1. A population no larger than the minimum necessary to enable testing of the principal enumeration procedures, in a geographically continuous area.
2. A population no larger than the minimum necessary to permit implementation of the basic hierarchy of field work organization.
3. Proximity to census planning headquarters in Jerusalem.
4. The population of the area should not contain special groups in proportions exceeding the national average.

7. *Planning of enumerator pay rates* - During the dress rehearsal ED's were sampled on different days and at different times during the day, and their enumerators accompanied by field technicians of the Institute for Labor Productivity, which was responsible for carrying out a survey to provide the basis for the establishment of enumerator pay rates. The aim was to obtain estimates of output (such as collection of completed questionnaires) and to construct profiles of ED's according to the degree of difficulty experienced by the enumerator in the various stages of the enumeration, so as to set differential pay rates according to the expected difficulty of the ED.

8. *Samples used for estimating parameters, based on data from the dress rehearsal* - The questionnaires collected in the dress rehearsal were edited, coded, key-entered, and the data subjected to logical checks and imputation of missing information. Samples were drawn to serve three major purposes:

1. Obtaining estimates of coding error rates, in order to enable design of sample sizes and quality control procedures for the coding operation in the census.
2. Obtaining estimates of key-entry error rates, in order to enable design of sample sizes and quality control procedures for the data capture operation in the census.

The sample designs used for these operations will be described below (Section III). Since the samples were clustered it was important to estimate at this stage the intraclass correlations, in addition to estimating the parameters of error-rates.

3. Samples used to evaluate the rules developed for automated logic checks and imputation procedures.

9. *Evaluation of coverage after the dress rehearsal* - Immediately following the completion of field-work in the dress rehearsal two post enumeration surveys were carried out to evaluate coverage of the population. These two surveys were used as trials for similar surveys which were carried out after the full census. (The surveys are described in Section III). The surveys were intended to:

1. Test the procedures to be used in the large-scale post enumeration surveys to be carried out following the census itself.
2. Evaluate the success of the enumeration procedures insofar as coverage of the population was concerned.
3. Obtaining estimates of parameters to be used in designing the post-census evaluation surveys. Here too the cluster design of the surveys necessitated estimation of the intraclass correlations.

II. SAMPLING DURING FIELD WORK

10. *The long-form, sample questionnaire* - Twenty percent of the households enumerated in the census received a long-form containing questions addressed to persons 15 years and older, in addition to the basic demographic information obtained from the entire population. The long form also contained questions regarding housing conditions. A systematic sample was drawn in each ED of every fifth apartment in which there were persons to be enumerated. All households in the apartment and all persons aged 15 or older in these households, completed the long-form questionnaire.

Sampling of the households to receive the long-form was carried out by the enumerators in the field during the stage of questionnaire distribution prior to Census Night. Each apartment which appeared to the enumerator to be used for dwelling purposes was entered in his listing book and assigned a serial number beginning with 001 within the ED. Each enumerator was given two sampling digits with a difference of 5 between them (e.g. 1,6; 2,7; etc.), which were a simple function of the ED identification code. Apartments whose serial number ended in one of the two sample digits received the long-form. Thus, the sampling of dwelling units was a systematic stratified sample with a fixed sampling fraction — 20 percent — in all strata, with the stratum defined as the ED. The sample of households was clustered within the dwelling unit (each dwelling unit forming a separate cluster, though very few dwelling units contained more than one household), and the sampling of persons was clustered within households.

Since the enumerator selected the sample before he had knowledge of characteristics of the household or of its members, there was little danger of his introducing bias in the selection of the sample. In fact, the pre-tests did not

show any such bias in sample selection. Additional measures to reduce the possibility of bias included strict controls over the route followed by the enumerator.

In collective dwellings and in kibbutzim (collective settlements) sampling was based on central lists of inmates or of households obtained from the administrative offices. In kibbutzim, every fifth household was sampled from the list; in collective dwellings, after a separate listing of inmates aged 15 or over had been prepared, the sample was drawn from among them. In both cases the enumerator used the sampling digits which had been specified.

11. *Sampling to improve the quality of the enumeration* - The burden of quality control during the enumeration fell on the crew leader, who supervised six enumerators. He carried out sample checks of the enumerators' work: completeness of responses in the questionnaires, coverage of dwelling units compared to a pre-enumeration sample which he himself drew, etc. The crew leader sampled dwelling units from which questionnaires were not obtained and visited them to verify that the enumerator had not erred in determining that they contained no persons to be enumerated. Crew leaders received detailed instructions regarding the obligation of enumerators to return to the households to obtain missing information. In addition to the crew leaders, additional quality control was provided by teams of quality control technicians who checked the completeness of responses after the enumerators had returned the leaders questionnaires from the field, in order to insure that the crew leaders were carrying out the checks required of them.

12. *Insuring the correct organization of questionnaires for shipment to coding centers, and preventing losses* - Standards were developed for the organization of questionnaires for shipment from the local field offices to the coding and data-capture operations, and it was crucial that these standards were adhered to in order to prevent disruption of the quality checks in the post-field operations. Prior to the sealing of cartons containing questionnaires the local office director sampled their contents in order to insure that they had been properly packed.

III. SAMPLING FOLLOWING FIELD WORK

13. *Manual editing of the questionnaires* - Dependent quality control of questionnaire editing operations was carried out on a sample basis. Ten percent of the questionnaires in each batch were examined, and if they failed the criteria the entire batch was returned for reprocessing.

14. *Quality control of coding operations* - Quality control of the coding of

economic branch, occupation, address five years ago and workplace address on the long-forms was carried out on a sample basis. An independent check was made to establish the average incoming quality level of the coding. Each batch of questionnaires contained 12 binders; one of these was randomly selected and the first thirty responses in the questionnaires it contained were coded on separate forms prior to the entry of the batch into the regular coding operation. Following the regular coding the two codes were compared, and if the result did not meet the criteria established, the entire batch was returned to be recoded. This procedure was carried out separately for each of the three coding frameworks.

A second check was made to establish average outgoing quality level of each of the three coding operations. Two batches were selected each week from among those which had been rejected and reprocessed during that week, and the average outgoing quality level of those batches established. On the basis of the estimates of the average incoming quality level of the batches which had been accepted and of the average outgoing quality level of batches which had been rejected and recoded, it was possible to estimate the overall average outgoing quality level.

The estimate of the average incoming quality level was based on a cluster sample of about 13 percent (the figure was determined by considerations of quality control) of the total number of codes assigned within each batch of questionnaires. The estimate of the average outgoing quality level based on rejected batches was based on a simple random sample of about two percent from among the batches that had been rejected. The latter sample was limited by budgetary considerations and by lack of time.

The results of the quality control of coding were also used to identify coders whose performance was too far below acceptable standards. Firing these coders also contributed to raising the overall level of coding quality.

15. *Quality control of data capture* - Quality control of data capture was carried out on a sample basis, in order that the average outgoing quality limit will be 5 per 1,000 key-strokes. A single questionnaire binder was selected from each batch following keying with the aid of a table of random numbers. The questionnaires in this binder were rekeyed by a different operator. The rate of non-identical digits served as the criterion for deciding to accept the entire batch, or to re-key the sample binder by a third operator. As noted above, a batch contained 12 binders, and most binders normally contained the same number of questionnaires, an additional binder was sampled from the batch and the check carried out on both of them. Sampling was thus clustered (the binder) within strata (the batches). The average sample fraction was 8.5 percent, and was determined by quality control considerations. As in the case of quality control of coding, the sampling of data-capture operations enabled maintenance of desired quality levels and evaluation of outgoing quality level.

16. *Evaluation of coverage* - Two surveys to evaluate coverage were carried out immediately after the completion of census fieldwork. In the first survey census crew leaders returned to a sample of ED's, and in each ED to a pre-specified sample of the route that the enumerator was to have followed in his canvass of the ED. All the dwelling units in the sampled segment of the route were listed, and the survey list will be compared with the original listing made by the enumerator during the census. This comparison will enable estimation of the component of undercoverage due to missed dwelling units. Sampling was carried out within two strata: ED's with a predominantly Jewish population, and ED's with a predominantly non-Jewish population. (There were two reasons for the stratification. First, results of the trial post enumeration surveys carried out following the dress rehearsal indicated that the rate of undercoverage was different in the two populations. Second, the non-Jewish ED's sampled in this survey were also used for the second post-enumeration coverage survey; the number of Jewish ED's required for the second survey was much greater than that required for the first). In the second stage of the sampling ten percent of the dwelling units lying contiguously on the enumerator's route were selected. This was accomplished by dividing by ten the total number of dwelling units enumerated in a particular ED, and randomly selecting one of the blocks of ten. Sampling was carried out so that the relative standard deviation of the estimate of undercoverage of this type does not exceed fifteen percent. A total of 164 ED's with predominantly Jewish population (3.5 percent of all such ED's) and 26 ED's with predominantly non-Jewish population (5.5 percent of all such ED's) were selected.

The second post-census evaluation survey was designed to estimate undercoverage due to incorrect classification by the enumerators of dwelling units from which questionnaires were not received, and undercoverage in dwellings known to be occupied, but regarding which information about the number of inhabitants could not be obtained. Since the imputation procedures require that a questionnaire exist for a household, misclassification of a dwelling unit as uninhabited by persons belonging to the census population means that no questionnaire is received for that dwelling unit. Similarly, receipt of a questionnaire lacking information on the number of persons in the household leads to the possibility of imputing an incorrect number of persons. This second post-censal survey was carried out in conjunction with a larger survey of the characteristics of dwelling units found by the census enumerators to be vacant, and the sample was designed to meet the needs of this larger survey. The sample contained only urban ED's whose population was predominantly Jewish. Sampling was stratified, with the frame of ED's divided into 33 strata, in each of which ED's were selected in proportion to the size of the stratum. Census crew leaders returned to all the dwelling units from which questionnaires had not been obtained, and to all the inhabited dwelling units from which information of household size was lacking, reclassified them and

obtained information on the characteristics of the unit and the number of persons in the household if the unit was inhabited. The sample contained 516 ED's, 11.5 percent of the ED's in the frame. The sample was designed so that the relative standard deviation of the estimate of undercoverage of this type does not exceed 10 percent.

17. *Return to ED's containing a high proportion of persons who refused to be enumerated* - There were certain ED's in which a high proportion of the Jewish orthodox population refused to be enumerated for religious reasons. ED's in which more than 25 percent of the household questionnaires lacked information even on the number of persons they contained were defined as "refusals". Ordinarily, the missing number of persons would be imputed, along with their characteristics, on the basis of information from other questionnaires from the same geographical area. Since the refusals were mostly concentrated in certain neighbourhoods in two cities, the standard imputation procedure would have been inappropriate. Following the census, enumerators returned to those households in refusal ED's which should have returned a long-form but had not done so, and attempted to obtain basic information. Sampling was based on the entries in the census enumerators' listing books. (There was less opposition in these groups to participation in sample surveys).

18. *Evaluation of logic checks and imputation during data processing* - These have not yet been carried out, but plans include evaluation of the results of the logical checks and the imputation procedures carried out during the operations necessary to create the clean data files. It may be possible to draw samples which can be compared with information from non-census data files, such as the Current Labor Force Survey carried out by the Bureau, the Population Registry, the border control files, etc. These comparisons will permit evaluation of coverage error and of response error.

LIST OF PARTICIPANTS
Chairman: Mr. L. Pinto (Italy)

AUSTRIA

Mr. J. LADSTATTER
Chief of Sub-Department of «Population
Census», Central Statistical Office

BELGIUM

Ms. H. EKIERMAN-HELLER
Directeur d'administration Service des
recensements

BULGARIA

Mr. K. DONCOV
Chef du groupe «Méthodologie du recen-
sement de la population en 1985», CSIS

CANADA

Mr. G. J. BRACKSTONE
Director-General, Methods Development,
Statistics Canada
Mr. R. BURGESS
Chief, Data Quality and Analysis Section,
Statistics Canada

CZECHOSLOVAKIA

Mr. V. CAP
Vice-President, Federal Statistical Office
of Czechoslovakia

DENMARK

Ms G. HØJBERG
Ekspeditionssekretar, Danmarks Stati-
stik

FINLAND

Mr. G. STRENGELL
Deputy Head of Department, Central Sta-
tistical Office

FRANCE

Mr. J. BOUDOUL
Chef du service de la démographie,
INSEE
Mr. J-L. BELLIER
Chef de Division de l'INSEE

GERMAN DEMOCRATIC REPUBLIC

Mr. M. EBERT
Head of Division, Central Statistical Of-
fice

GERMANY, FEDERAL REPUBLIC OF

Mr. P.B. WURZBERGER
Chief of Subdivision, Statistisches Bunde-
samt
Mr. A. SCHROETER
Ministère Fédéral de l'Amenagement du
territoire, de la Construction et de l'Ur-
banisme
Mr. H. STEIGER
Referent, Statistisches Bundesamt

HUNGARY

Mr. J. KEPECS
Deputy Head of Division, Central Stati-
stical Office
Mr. A. POLYANSZKY
Head of Group, Central Statistical office

IRELAND

Mr. P. McDONALD
Statistician, Central Statistical Office

ITALY

Mr. G.M. REY
President, ISTAT

Mr. L. PINTO
Directeur Général, ISTAT

Mr. A. CORTESE
Chief of Division, ISTAT

Mr. G. CARIANI
Chief of Section, ISTAT

Mr. E. FORTUNATO
Senior Advisor, ISTAT

Mr. M. MASSELLI
Senior Advisor, ISTAT

Mr. B. COLOMBO
Professor, University of Padua

Mr. G. LETI
Professor, University of Rome

Mr. I.F. MARIANI
Member, High Council for Statistics

NETHERLANDS

Mr. J. SCHMITZ
Head of the Department of Social Accounts, Central Bureau of Statistics

NORWAY

Mr. J.-K. TONDER
Deputy Assistant Director, Central Bureau of Statistics

POLAND

Mr. R. ZASEPA
Professor, Consultant of the Central Statistical Office

Ms. H. ZAREMBA
Chief, Population Census Section, Central Statistical Office

PORTUGAL

Mr. F. CASIMIRO
Chef de Division, INE - Censos E Inquéritos

SPAIN

Ms. T. GOMEZ CASTANO
Jefe del Servicio de Censos Generales, INE

Mr. J. PARADA
Sample Design and Evaluation Service, INE

SWEDEN

Mr. K. WALLBERG
Director, Department of Statistics on Individuals, Statistics Sweden

Mr. C. NILSSON
Head of Population Unit, Statistics Sweden

SWITZERLAND

Mr. J.-E. NEURY
Chef de la Division des Statistiques de la population, Office fédéral de la statistique

TURKEY

Mr. T.N. GUNER
President, State Institute of Statistics

Ms. M. DINAR
Urban Planning Expert, Ministry of Public Works and Settlement, General Directorate of Housing

UNITED KINGDOM

Mr. F.E. WHITEHEAD
Deputy Director, Office of Population Censuses and Surveys

Mr. R. BARNES
Head of Social Survey Division, OPCS

UNITED STATES

Mr. P. BOUNPANE
Assistant Director - Demographic Census, Census Bureau

PRESENT UNDER ARTICLE VIII OF
THE TERMS OF REFERENCE OF THE
ECONOMIC COMMISSION FOR EUROPE

HOLY SEE**Mgr P. SILVI**

Statistical Expert, Central Statistics Office of the Holy See

Mr. E. NENNA

Statistical Expert, Central Statistical Office of the Holy See

PRESENT UNDER ARTICLE XI OF THE TERMS OF REFERENCE OF THE ECONOMIC COMMISSION FOR EUROPE**ISRAEL****Mr. B. LASMAN**

In charge of Population and Housing Census, Central Bureau of Statistics

UNITED NATIONS SPECIALIZED AGENCY*Food and Agriculture Organization of the United Nations***Mr. O.Z. AVRALIOGLU**
Senior Statistical Officer**NON GOVERNMENTAL ORGANIZATION***Inter-American Statistical Institute***Mr. E.O. FABBRONI**

Secretary General

MEMBERS OF THE SECRETARIAT PRESENT*ECE Statistical Division***Mr. W. HAEDER****Mr. R. GENTILE****Mr. J. KELLY***ECE General Economic and Analysis Division Population Unit***Mr. B. MIRKIN**

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