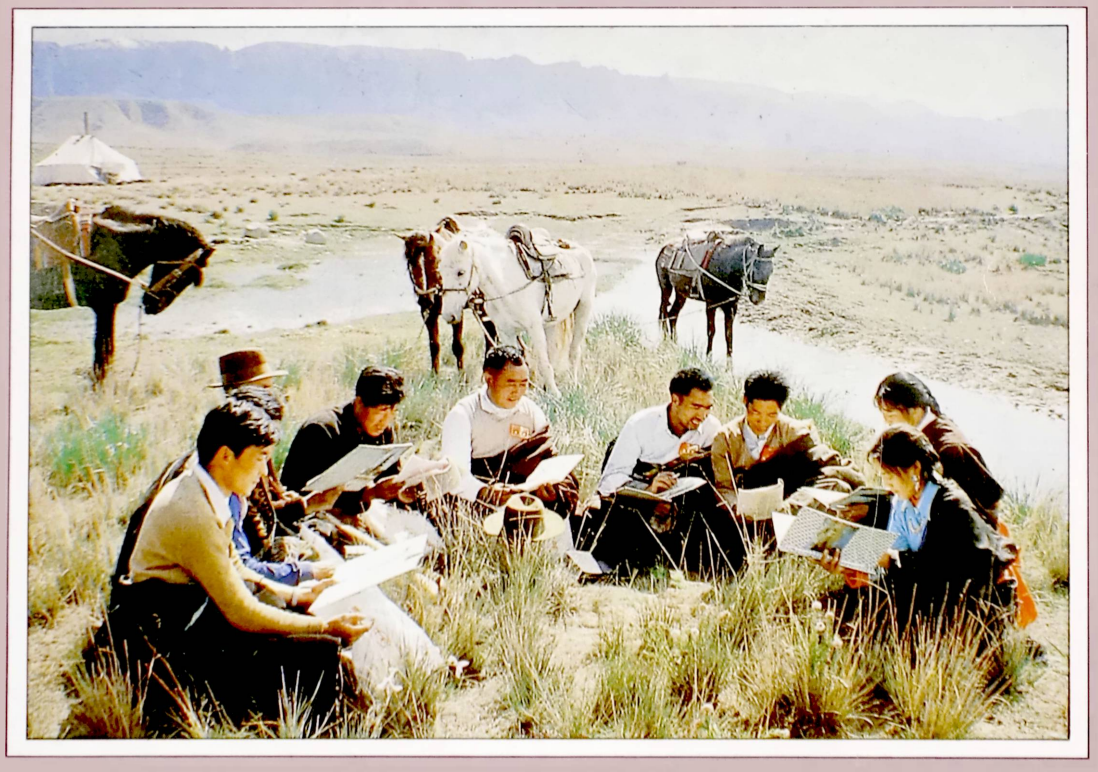
ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

CENSUSES OF POPULATION AND HOUSING IN ASIA AND THE PACIFIC: TOWARDS THE 1990 ROUND



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ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

CENSUSES OF POPULATION AND HOUSING IN ASIA AND THE PACIFIC: TOWARDS THE 1990 ROUND



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The reviews presented in this publication are based on papers submitted by the countries or areas of the two Working Group meetings. These papers have not been formally edited; the views in them are those of the countries or areas concerned and do not necessarily reflect those of the United Nations.

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The picture on the front cover, which shows a group of Tibetan enumerators, is reproduced from: *1982 Population Census of the People's Republic of China.* **Office of the population census of the People's Republic of China (1983).**

PREFACE

In 1985 the Statistical Commission at its twenty-third session, held at United Nations Headquarters from 25 February to 6 March 1985, began considering the 1990 World Population and Housing Census Programme and related preparations with a view to assisting countries to plan and implement improved national censuses. In November of the same year the United Nations Statistical Office in New York convened an expert group to consider some of the important global issues related to census-taking. At about that time the ESCAP Statistics Division was well advanced in its preparations for assisting regional countries towards the 1990 round of censuses.

To that end it planned and held, with the financial support of the United Nations Population Fund (UNFPA), two regional Working Groups, one in Asia and the other in the Pacific, on the 1990 World Population and Housing Census Programme. The Working Group meetings were intended to give countries the opportunity to share their experiences gained in the 1980 round of censuses and to look ahead in their planning for the 1990 round. Almost every country and territory in Asia and the Pacific attended and actively participated in one or the other of the two working groups which is a measure of the collective and strong commitment they have for census-taking.

At the two Working Group meetings, participants underlined the importance of censuses of population and housing as the pre-eminent statistical source used by planners and decision makers in government, industry and commerce. The country papers, which form the core of this report, gave excellent expositions of the many issues and difficulties that had been confronted during the 1980 round, as well as explaining how challenges were met and difficulties resolved. They also gave voice to their preliminary thoughts with respect to the next round of censuses. It is hoped that through this publication a much wider audience will benefit from learning about the census-taking experiences of these countries and territories.

The secretariat would like to express gratitude to UNFPA for not only funding the Working Groups but also for its continued support for the population statistics work of the ESCAP secretariat. In this connection, the UNFPA funded Regional Advisors on the census and data processing have visited and provided technical assistance to almost every country in Asia and the Pacific over the past years.

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INTRODUCTION AND BACKGROUND

Value of censuses

The census of population and housing is the most costly, most important and largest statistical activity carried out by national statistical offices. Large sums of money are spent on planning and implementing a census and important fiscal decisions are made on the basis of its results.

Virtually every country and territory in the world conducts a periodic census. In most it is the primary source of statistical information about the size, composition and characteristics of the population. The census is of utmost value to national and sub-national planners and policy makers in and outside of government. It also provides a statistical data base that has uses for a wide spectrum of social scientists. Census results are used for the allocation of funds and resources by Governments to States/provinces/local authorities; for electoral purposes; for choosing the citing of roads or water works; for assessing the socio-economic conditions of minority groups and so on.

Because of the vast costs and burdens in taking censuses they are generally held only once every 10 years (in some countries every five years) and hence the results of each new census are awaited with great eagerness. The longer the length of time that has elapsed since the previous census the more outdated and fragile is the statistical foundation with which planners and policy makers must work with and the greater becomes the demand for census data.

What are the factors that make censuses of population and housing of such great value? One factor is that censuses yield information on the entire population. It follows that they provide statistics about subgroups, minority populations and small geographic areas for which comparisons can be made. Not only do censuses provide statistics for national and standard administrative levels, but by using enumeration district data as building bricks they can be aggregated to form profiles of non-standard geographical areas. Another factor is that a census provides a stocktaking which allows an assessment to be made of how the population, or sub-sections of it, has changed since the last stocktaking. In other words censuses provide a continuity of statistics. A third factor is that a census allows, albeit in a rather limited sense, the possibility of inter-relating the demographic, socio-economic and housing characteristics of the entire population, or sub-groups of it.

In any country there is an important sense of continuity between one census and the next. A census is not an *ad hoc* exercise that can be rushed. It has to be carefully planned through consultations to establish what users' needs are; tests of methods of enumeration; demarcation of enumeration areas; understanding and response to different questions; recruitment and training of staff and the setting up of methods and procedures for checking and processing completed questionnaires. Countries learn not only from their own past experiences but also from what has happened in other countries.

It is with such considerations in mind that ESCAP convened two Regional Working Groups on the 1990 World Population and Housing Census Programme. The first of these Working Groups was held at Bangkok between 18 and 24 November 1986 and covered the Asian region.[1] It was attended by participants from 25 members and associate members of ESCAP. The second was held at Rarotonga in the Cook Islands between 9 and 15 June 1987 and covered the Pacific region.[2] It was attended by participants from 18 member and associate members of ESCAP. In addition, at both Working Groups there were several participants from non-member countries and institutes as well as representatives of various United Nations agencies. A list of the documents tabled at those two Working Groups is shown in annex 1.

Prior to the Working Groups, ESCAP sent out two documents to members and associate member countries. The first was a survey questionnaire which sought information about a wide range of details relating to the 1980 round of censuses. The aim was to use the results for strengthening the factual basis for improving recommendations and national census capabilities. Some 33 countries and territories (19 in Asia and 14 in the Pacific) responded and sent completed questionnaires without the need for follow-up. Two summary reviews based on the results of the survey, one highlighting the Asian experiences and the other the Pacific experiences, were prepared by the secretariat; the latter paper is reproduced as annex 2 to this report. A summary of the survey with respect to the data processing experiences of countries was made by the United Nations Statistical Office and is given in annex 3.

Scope of this report

The second document sent out to countries by the secretariat suggested an outline and provided direction for the focus of country papers to be presented by participants

[1] "Report of the Regional Working Group on the 1990 World Population and Housing Census Programme" STAT/WPHCP/14 (Bangkok, ESCAP, 1986).

[2] "Report of the ESCAP/SPC Pacific Working Group on the 1990 World Population and Housing Census Programme" STAT/PWG/WPHCP/7 (Bangkok, ESCAP, 1987).

from each country to the two Working Groups. Altogether 39 countries and territories presented country statements, in most cases along the lines outlined by the secretariat. These country papers contained a good deal of fresh, interesting and instructive material. So much so that both Working Groups recommended that consideration be given to their publication. Indeed at a meeting at Bangkok in November 1987 the Committee on Statistics at its seventh session recommended the publication of the country papers.[3]

This report contains the 39 country papers. Because of space considerations many of them have been streamlined and edited without, it is hoped, impairing their main messages. Some of the papers, particularly those from the very small Pacific island countries lack detail. However, given the general lack of resources of these countries, their limited experience in census-taking and the small numbers of staff in the statistical offices, it was a measure of the importance that they attached to censuses that they were able to attend the Working Groups. For some countries, additional information, on certain topics, to that given in the country papers in this report is contained in an East-West Center publication.[4]

Chapter one of the present report gives a review and analytic commentary of some of the key issues raised in the country papers. It focuses on some of the problems, issues, and alternatives that will need to be considered in planning and implementing the 1990 round of censuses. It does not consider the pros and cons of the different census topics since these are considered in some detail in a revision to the Asian and Pacific Recommendations for the 1980 Population and Housing Censuses.[5] This revision is currently being prepared and will be published in 1989.

[3] "Report of the Committee on Statistics on its Seventh Session", 24-30 November 1987, E/ESCAP/595 (Bangkok, ESCAP, 1988).

[4] Lee-Jay Cho and Robert L. Hearn, ed., *Censuses of Asia and the Pacific*, East-West Population Institute, East-West Center Honolulu, (Hawaii, 1984); see also, Lee-Jay Cho, ed., *Introduction to Censuses of Asia and Pacific 1970-74*, East-West Population Institute, East-West Center, Honolulu (Hawaii, 1976).

[5] *Asian and Pacific Recommendations for the 1980 Population and Housing Censuses*, ST/ESCAP/52 (Bangkok, ESCAP, 1978).

I. ISSUES IN CENSUS TAKING IN ASIA AND THE PACIFIC

Introduction

Three countries in the Asian and Pacific region – Afghanistan, Bhutan and the Lao People's Democratic Republic, conducted modern censuses of population and housing for the first time in the past decade. For the others, even the least developed and small island countries, census taking has become an important periodic exercise in data collection. Their censuses have evolved from simple head counts, in some cases confined to just part of the country, to detailed national enquiries covering demographic, social and economic items in addition to the basic enumeration.

Most countries now take population censuses decennially; in some countries such as Australia, Japan, New Zealand, the Republic of Korea and some of the Pacific island countries they are held every five years. Ideally censuses should be taken regularly so as to take into account significant changes in the population and its socio-economic structure coupled with the needs and demands for statistical data which cannot be met from other data sources. In practice the lack of availability of human and financial resources weigh heavily against more frequent census taking, particularly in developing countries. Further, because the work-load is so highly peaked around the time of census fieldwork it tends to create considerable strains on the regular activities of national statistical and census offices.

Criteria for selecting topics

Many countries in the Asian and the Pacific region included a greater number of topics in the 1980 round of censuses than in the 1970 round. Not all of the topics yielded robust data. Additional questions add to the cost of a census at every stage, from collection through processing to tabulation and dissemination. For the 1990 round, countries will more than ever before have to assess the balance between the potential importance of a topic to users and the costs of including it. A good method of developing a census schedule which has wide acceptability is to make an open and objective assessment of topics submitted by users and the public. Census takers should ask whether users' needs can be met from other data sources, more cheaply, more fully or more acceptably. There may be a case for excluding topics which do not have to be analysed for sub-groups or at a disaggregated geographic level on the ground that they are better covered in surveys. For many reasons sample surveys can go into more detail, and probe at greater depth than censuses, as is the case with income, family planning and physical disabilities.

Users' immediate needs are important but they are by no means the only consideration. Census takers will increasingly have to take cognizance of the fact that there are important limitations on the range of topics that can be included. Topics must be factual and capable of being easily asked and readily answered. The educational level of both enumerators and the general population have thus to be considered. Topics should be acceptable and not deemed to be an intrusion on privacy. The results of field tests will provide some feedback to these issues, as well as indicating the potential costs of including additional topics. They can also help identify questions which could prove unacceptable or inappropriate for a wider public. Countries will also need to consider the topics asked in previous censuses so as to maintain comparability over time. Comparability enhances the potential uses of the data. Further, wherever practicable international guidelines should be followed to ensure that the resulting data conform to high statistical standards.

Population coverage

There are differences between countries in the definition and scope of the population counted in the census. Virtually all countries in the Pacific and many of those in Asia used the *de facto* criterion. That is, all persons who spent census night in the country were included in the count, whereas all persons who were out of the country, irrespective of length of time, were excluded. Countries that adopted the *de facto* approach sometimes excluded some special categories of people, such as the foreign military or diplomats.

Countries where the *de jure* approach was adopted specified differing periods of time in their criterion of usual residence, for example, three months in Japan and six months in Indonesia. With the *de Jure* approach all persons who usually lived in the country during the reference period were counted. Thus persons temporarily overseas were included where this definition was employed, provided of course that other persons present at the time of enumeration were able to provide information. A departure from a strict distinction between these two approaches was made in several countries, such as in the 1980 census of Papua New Guinea.

Where the period of enumeration was lengthy some countries adopted a shifting reference period to enhance recall. Although the shifting reference period makes it

possible for people who move around during the enumeration period to be counted more than once, or not at all, the method assumes that population mobility is uniform over time. Therefore it assumes that enumeration error in either direction will be equal. In any event these problems are small: when the field work takes place over several weeks a shifting census moment is likely to improve coverage in so far as it lessens the period of recall.

In determining what the population coverage should be, most countries try to maintain continuity with the past, or follow the practice that suits their situation best so that as far as possible the census statistics are maintained on a comparable basis. For the analysis of subnational population data planners may be more interested in the size and characteristics of the usually resident population of an area than in the population that happens to be there on census night. The former may be more stable and less affected by the timing of the census moment. In some circumstances the differences may be substantial. Of course, for some people there are difficulties and uncertainties in determining usual residence, particularly those people who live in two residences such as workers living part of the week (year) away from their families. Urban planners may be more interested in *de facto* populations to gauge demand for electricity, water, transport or other services.

If the census asks information about: (i) all persons who spent census night in their household of usual residence; (ii) visitors not normally part of the household; and (iii) persons usually living in the household but staying elsewhere on census night, it becomes possible to tabulate the population of an area in both ways: that is the *de facto* population present in the area at the time of enumeration [(i) + (ii)], and the *de jure* population according to information given on persons usually resident in the area [(i) + (iii)]. In addition, where the *de facto* approach is adopted, most countries ask a question on place of usual residence. This enables a tabulation to be generated showing, at least for enumerated persons usually resident in the country, geographic area of usual residence. This basis of classification, though not strictly *de jure,* provides, for example, a more useful way of presenting and analysing household composition.

Sampling in collection and processing

Several countries in Asia and the Pacific, continued or used sampling in the 1980 round of censuses. Sampling was adopted either at the time of enumeration and/or at the time of processing. The rationale for sampling at enumeration was as a means of reducing field and processing costs and enhancing data quality, or providing an opportunity for asking more questions of selected respondents. It also meant a lessening of the response burden for households not included in the sample. Sampling at the processing stage was a means of getting tabulations as quickly as possible after the census date and, in some countries, as a way of reducing costs.

Ten of the countries or territories in Asia and the Pacific reporting to the Working Groups adopted sampling at the enumeration stage in the 1980 census round: many are contemplating doing so in the 1990 round. The procedure most commonly adopted was that two schedules were used. A long form (containing core topics and additional sample topics on the social, economic and demographic characteristics of the population) was canvassed for a representative sample of households and a short form (containing just the core topics) for all other households. In a few countries all households were canvassed with a short schedule and then a sub-sample was selected for more intensive interviewing sometime after the census, such as in Bangladesh. In all countries using sampling the enumeration was through face-to-face interview

The size of sample ranged from 1 per cent in larger countries to 20 per cent in some of the smaller countries. In general, care was taken to ensure that the sample size was sufficiently large to enable reasonably precise estimates to be made of characteristics of subpopulations and major geographic divisions. There is, of course, always some trade off between precision and cost. In Hong Kong a cost-precision analysis was made before it was decided that a 20 per cent sample would be best in achieving the desired level of accuracy at a reasonable cost.

Typically either of two forms of sampling design were used: compact cluster sampling of enumeration areas or systematic random sampling of households. The former, which was the approach used by Sri Lanka, for example, involved the selection of enumeration blocks/districts and included in the sample all households in the selected blocks/districts. The latter, in the Philippines for example, involved selecting every nth household from listings of all households in every block/district. Although the second approach is more efficient from a theoretical sampling perspective it can (and did) give rise to substantial selection biases.

For example, in the Philippines enumerators were instructed to select every fifth household for a longer form from a listing of all households in the enumeration districts. However, there was a tendency for enumerators to select smaller than average sized households for the long questionnaire. While this lessened their own workload it introduced biases into the sample selection. This type of problem is by no means unique to developing countries. Thus in the 1961 census of England and Wales the sampling was left to the enumerators who were given instructions, which they did not always follow, for issuing long and short forms to households. Of course, such problems can be overcome if the sample selection is made before the field work. However, that requires a reliable and up-to-date sampling frame which in many countries is not available until after census field work has been completed.

Many countries resorted to sampling at the processing stage so as to facilitate the early release of information and

cut costs, particularly of coding, data input and editing. The size of the sample differed; it was, for example, 10 per cent in China, 5 per cent in Malaysia, and 1 per cent in Japan. Although in most cases the sampling was of entire questionnaires another approach was to merely sample particular topics. Either way sampling at the processing stage avoids many of the operational difficulties of sampling in the field and it is easier to ensure a representative sample. Moreover, it is still possible to go back to the questionnaires at a later stage and process them entirely. However, some countries after releasing early sample results either failed to process the remaining questionnaires or did so after considerable delay. The important lesson is that the release of sample results should not lower the priority for full processing. Where sampling is used it requires that users must understand that the results are subject to sampling errors. That is, sampling errors will be present and these will be proportionately larger for small subgroups in the population. In some instances data for small geographic areas may be highly unreliable – defeating one of main purposes of a census. Thus while sampling saves costs (and burden on the population) it introduces errors in estimation and may place limits on the types of analysis that are possible.

Field staff and training

The recruitment, training and management of a large and temporary field force of census supervisors and enumerators is a major task requiring careful planning. The 1982 census of China required 1.1 million supervisors and 5.2 million enumerators. Not all countries had such a favourable ratio of supervisors to enumerators, a factor that in some cases had an adverse effect on efficiency. Pakistan was among those countries who reported that it was difficult to recruit a field force of sufficient calibre and motivation. In that country the difficulties may be partly attributed to the fact that local officials and teachers who were recruited for census duties were also expected to maintain their usual work. The problems of recruitment of field staff are often exacerbated by low pay, long hours and difficult working conditions.

In many countries the field staff are recruited from local government but released for census work. Another expedient is to use teachers and students. When this source was used for field work education ministries sometimes called for special school holidays during enumeration.

Proper and sufficient training of the field force are crucial to the success of a census. Most countries adopt a relay approach to the training of the field force whereby training starts at census headquarters, usually for relatively senior permanent officials. After that the training of middle level census staff takes place at the provincial or state level. Finally, supervisors and enumerators are trained. As far as possible training instruction manuals should be used and methods and materials should be uniform across the country. A few countries now use video tapes as a medium of instruction to ensure uniformity. In the lesser developed countries it may be more useful where possible to retain (or re-recruit) those staff used in the pilot census. For newcomers it is essential that their training is not too brief and that they are thoroughly versed in interviewing techniques, the meaning and relevance of questions, filling-in of questionnaires and fieldwork procedures.

Data processing

Computer technology has led to a continuing revolution in the processing of census information. This in turn has had important implications for questionnaire design and the extent and nature of producing and disseminating census results. In the 1980 censuses tabulations were both more timely and abundant than ever before. Countries became more conscious that the planning and management of data processing were the key factors in determining the speed with which census results can be produced.

In the 1980 census round, computers were used more extensively and more imaginatively for producing tabulations; several countries used computers for the first time. The largest task was in the 1982 census of China where more than one billion records had to be processed. Using computers for the first time the Chinese opted for decentralized processing at 26 municipal and provincial centres. India too was able to exploit computer technology to decentralize the processing of data collected in its 1981 census. Many Pacific countries also took advantage of developments in microcomputers: more recently the smaller countries have made greater use of integrated data entry, processing and tabulation software packages. For the first time, several countries in the Pacific, including Samoa, Tonga and Vanuata processed their own census returns.

Data processing begins with preliminary checking and counting of questionnaires/population totals immediately after the completion of enumeration. Early checking involves enumerators/supervisors ensuring that all relevant fields in questionnaires have been filled-in; that enumerators field book and questionnaire totals agree; that the batches are properly labelled to provide control information for later processing and sometimes the coding of basic fields. Manual counting should start at the lowest which is then aggregated to give in turn village, sub-district, district and various other subnational and national summaries. While speed is important there are risks of errors in this process as the summaries pass through many hands in national hierarchies; built-in checks at every level are essential.

Major data processing tasks involve preparing the census information for data entry, reading data to computer files and editing records in preparation for computer tabulation. A particular bottle-neck in census processing is coding. Sound questionnaire design improves the effectiveness of coding of census data, especially where

the census data are entered directly from the schedules. Some countries preferred data transcription to code sheets; this was particularly efficient where census forms were complex or where it was expected that key punch errors would be high. While OMR largely eliminated the need for coding, often it too required a data transcription stage to prepare special mark sense forms for entry.

Some of the more advanced countries in Asia and the Pacific adopted computer-assisted coding (CAC), particularly for difficult-to-code items such as occupation and industry. CAC attempts to match question responses with a computer dictionary or reference file of codes. In New Zealand, for example, CAC replaced the clerically intensive method used previously for coding. It was found to be more efficient, involving considerable reductions in processing staff, improved data quality and greater timeliness of results.

For almost all countries in the Asian and Pacific region the data entry strategies used were either key to disk/tape or optical mark/character reading (OMR). A few Pacific countries, whose census questionnaires were processed in the United States by the Bureau of the Census had their returns processed using FOSDIC (Film Optical Sensing Device for Input to Computers) which reads micro-filmed copies of the census forms directly into the computer.

Most countries entered data through the key to disc/tape method. In spite of inevitable key punching errors and its labour intensiveness, this data input strategy was generally preferred to OMR. In the Australian census of 1986, for example, it was used in place of OMR which had gained favour in earlier censuses. Similarly, in Hong Kong, it was established that the key to disc method was more cost effective than the mark-sensing system used in an earlier census. It meant the census questionnaires did not require special treatment during fieldwork and it eliminated the need for a complex mark sensing transcription operation at the data preparation stage. But some countries did use OMR for data entry. It was used, for example, by Japan, Bangladesh and Malaysia. Apart from speed, OMR has an additional advantage of avoiding the need to code information. However, OMR gives rise to problems in marking responses (whether questionnaires completed by respondents as in Japan or forms completed by clerks as in Malaysia) for accurate sensing by the document readers.

There is as yet no "best" approach to the task of data entry. As computer technology continues to evolve so do views as to the most suitable approach for entering census data. Further experimentation and research is required and decisions need to be taken with sufficient lead time to ensure that the system is fully tested and operationally reliable. Many countries, including Australia, China, Malaysia and the Republic of Korea are contemplating use of OMR data entry for their next censuses; the United States is reassessing its data capture strategy for the 1990 census.

While extensive checking of questionnaires must be done in the field, further editing is essential to eliminate obvious errors, particularly to prevent the introduction of errors during processing. Debate continues on how much editing of census data is necessary and on how and when editing should be done. Most countries insist on some clerical editing during data processing, particularly to ensure completeness of batches, properly filled-in indicative data and that records are legible or otherwise acceptable for data entry.

With the extensive use of computers, machine editing and validation plays an increasingly important role. Most often some editing was introduced at the data entry stage. However, many countries experienced problems where specifications were too detailed or complex; this could result in delay in data entry if operators, inexperienced in resolving errors, needed to consult with supervisors. While some editing at the data entry stage, restricted to valid code tests on pre-coded items, might be useful, the greater task of editing is undertaken after data entry. Some countries adopted the method of "batch" editing, which usually involved the listing or printing of errors for manual correction. In the mid-1980s several countries introduced "on line" editing facilities which allowed the operator direct access to computer files to correct records in error.

Most of these methods involve the use of manual intervention to resolve errors, most often through recourse to the source questionnaires. There is an increasing tendency to use automatic correction or imputation. The principal advantage of automatic correction is speed. But several countries confronted problems, especially where the imputation rules were poorly conceptualized and the number of records failing specific checks were high. Clearly, manual intervention provides better control over data quality, but is more time-consuming and labour intensive. Some countries found a balance, resorting to limited imputation. Australia, for example, preferred the strategy of limited imputations for non-response and those not imputed were coded and tabulated as "not stated". Instead of devoting resources to automated imputation countries should be encouraged first and foremost to place emphasis on improving the quality and level of response.

Greater use was made of statistical quality control procedures to enhance efficiency and accuracy. Quality control through inspection sampling at all stages of processing provides important checks on data quality and important management control information on processing errors and rates. For example, Malaysia reported that statistical quality control procedures led to more efficient processing. Quality controls need themselves to be tested to ensure that they are neither too tight nor too loose. Some countries, with the benefit of hindsight, felt that quality control measures were inadequate to identify processing problems at the right time; others felt that they might have been overly stringent, causing unnecessary delays and raising costs.

The rapid advances in microcomputers, including enhanced processing speeds, hard disks with ever-increasing internal storage capacity and expanding random access memories has provided a new technology especially suited for processing census data, particularly in countries with relatively small populations. The potential use of microcomputers for censuses has yet to be fully realized. However, several countries used microcomputers for data entry, editing and tabulating the results of their most recent censuses. All of these processes can be done with generalized software packages such as U-SP and IMPS, although some countries chose to design their own processing systems. Developments in recent years have been encouraging with many benefits to small national statistical offices. Subject matter specialists have more control over data processing; machines are relatively inexpensive and can be used for many purposes other than census processing. However, for countries contemplating using microcomputers in the 1990 round of censuses it will be prudent to make the purchases and plans well in advance and fully test the software before actual processing starts.

Evaluation

Census results are used for many different purposes. Some common ones include use as a basis for the allocation of funds to provincial and regional centres, and for electoral and political representation. Because of the importance placed on the results almost all countries conduct checks to evaluate census coverage and, in some cases, the quality of information on certain topics and procedures. In general the quality of census results tends to be least satisfactory in countries where communications and infrastructure are weak. The most widely used method of evaluation is the post enumeration survey (PES). Through a PES a randomly selected sample of households/dwellings are reinterviewed using independent and specially trained interviewers so as to determine the accuracy of census coverage by measuring the number of persons who were missed in the main census enumeration. Under-enumeration may be quantified by matching the PES with the census and taking the fraction of persons in the PES who were enumerated in the census as an estimate of the fraction of all persons reported in the census. This gives a measure of relative under-enumeration.

However, both the PES methodology and the utilization of PES results have been problematic in some countries. Matching between the PES and census returns can be difficult and time consuming. For example, the Republic of Korea encountered problems because the address system was not always systematic. In the 1981 census of Nepal the use of the PES to determine coverage errors gave rise to results which pointed to implausibly high levels of under-enumeration, again due largely to difficulties in matching. Difficulties may also arise when there is a long delay between the completion of the census and the PES. Some people change addresses during this period.

A further major reservation with PES estimates of coverage levels is that it is very likely that certain categories of persons missed in a census will also be missed in a PES. For example, new-born babies, single person households, households where both spouses are working outside the home, migrants, as well as nomadic groups. In general, levels of undercoverage are greater in urban areas than in rural areas. Thus, for example, in the 1981 census of India under-enumeration in urban areas was found to be twice that of rural areas. Additional methods of checking coverage (apart from a PES) should be used wherever possible to confirm the accuracy of census counts by comparing the results of two or more censuses through the use of cohort survival techniques. Further where birth registrations are complete and there is little migration births occurring between n and n + 1 years before the census can be forward survived and compared with the census count of the population aged n.

The results of the various coverage checks are not usually used to adjust the raw census counts. In some cases high levels of sampling errors of PES estimates will preclude the adjustment of sub-groups. However, the results might be used where practicable to adjust the population totals which are subsequently used as benchmarks in secondary analysis for mid-year population estimates or projections, as for example is the practice in Australia.

One country reported that an examination of the summary population totals was made to compare the 1980 provincial counts with those of 1970. In several provinces the growth rates were unreasonably high which led to scrutiny of the questionnaires for particular areas. This showed that in most questionnaires all lines available for household members had been completed and that in many cases the household composition was implausible. Clearly the census is vulnerable to manipulation by those with vested interests which can give rise to overcounts.

There are, of course, many other items in a census requiring evaluation apart from population totals. For example, the accuracy of age reporting can be determined by reference to several analytical techniques, so too can that of sex ratios at different ages. Birth rates implied either directly or indirectly by the census can be compared with comparable estimates from other data sources or by the use of indirect estimation techniques. Such methods of evaluation were widely used in evaluating the 1982 census of China.

Planning, public relations and publicity

The success, or lack of success, of a population census is in no small part associated with the strength and depth of national commitment. This commitment starts with the planning. In every country there is an important continuity between one census and the next. An integral part of the planning in a census office is the continuity with the past

maintained through staff who have lived through previous censuses and who are able to anticipate and suggest solutions to the types of problems that have arisen.

Planning starts by looking back at the past. Its continuity is ensured through the setting up of appropriate committee structures. Census offices in virtually every country in Asia and the Pacific set up planning committes at different levels several years before conducting their censuses. In some of the larger countries the committee structure operates from the top right the way down to the grass-roots level. In most countries, however, there is generally a single steering committee to exercise high-level control over the census; it is not unusual for countries to set up a special technical committee(s) to provide expert guidance in census design and execution.

The steering committee, is generally made up of senior level officials from the national statistical office, other government agencies and the central planning office. Technical and users' committees, where they are established, often include academics and persons from outside central government. Apart from providing specific guidance and feedback to census offices, consultations within these groups play an important part in public relations and enhancing goodwill towards the census.

All countries in Asia and the Pacific mounted significant publicity campaigns before their censuses. The strategy was generally to intensify the campaign as census day approached. All sorts of media were used including television, radio, newspapers, posters, special films as well as more novel techniques such as the use of postage stamps. In a few countries messages about the census were taught to school children so that they could inform their parents.

Publicity campaigns had several objectives. These included: (i) creating an awareness of the link between censuses and development plans and standards of living; (ii) creating a favourable climate to obtain public co-operation for the census, (iii) explaining the meaning of census concepts and the rationale for census questions; (iv) reminding the public that individual information collected in the census will remain confidential; and (v) making the public aware of their legal and social obligations to provide information to census takers.

Sometimes countries used campaign messages as in Vanuatu to remind people that they should know their age, and the ages of other household members, where age-reporting was known to have been bad in the past. In Japan the confidentiality of information was stressed. Issues of privacy and confidentiality have become ever more prominent throughout the world. For this reason, although costly, publicity campaigns are undoubtedly essential for improving census coverage and the quality of responses. Indeed several countries attributed the success of their censuses to the impact of their publicity campaigns.

Publications and dissemination

With the widespread use of computer technology for data processing there has been an enormous improvement in the production and timely release of census results. New technology enables the production of publication quality copy directly from computer files with minimal manual intervention. Many of the countries from Asia and the Pacific at the two working groups gave extensive lists of reports and publications arising from their most recent censuses. Increasing emphasis is being given to producing data for small geographic areas. Most publications were in the form of detailed statistical tables of the main census variables at national and subnational levels. In addition to publishing basic census tables several countries produced analytic reports and commentary on specific topics, including evaluation of the quality of the data. Expertise for in-depth analyses of census data is not always available in national statistical offices. Against that background and with the recognition of the value of the census as input for development planning, several countries produced census reports drawing upon the skills of national research organizations and universities. Thus, for example, in Indonesia researchers were invited to submit proposals to the national statistical office who then selected those considered of greatest national importance. In Hong Kong the main census report included population, household and other demographic projection results and discussion of policy implications.

The dissemination of census results is no longer through traditional publications alone. A range of media, including maps, microfiche, sample tapes and seminars, is increasingly being utilized. Thus, for example, Nepal and Sri Lanka held national seminars to report the main findings of their 1981 censuses, and China even held an international seminar because of the world-wide interest in its census results. In Japan the census results form part of a computerized data base from which analyses (and publications) are made that include the results of past censuses and related statistics. Increasingly, users are seeking and being provided with better direct computer access and census file interrogation facilities.

Technical assistance

Technical co-operation and assistance, particularly through the support of the United Nations Fund for Population Activities played a major role in the success of the 1980 round of censuses in Asia and the Pacific. Countries benefited from external support in a number of ways: through regional advisory services, international training workshops, fellowships and study tours. Many developing countries were assisted more directly through, for example, the funding of equipment and local costs.

It is apparent that the need for technical assistance to help countries, particularly the least developed countries,

continues through the 1990 round of censuses. A few countries have great deficiencies in areas such as data processing, sampling and cartography. There are also some who have a shortage of trained manpower, often due to a high staff turnover. Thus there will be a continued need for support for training in the planning and organization of the next census round.

The future

The exchange of experience between countries in the region has more than anything else accentuated the importance of the census as an agent of change. As plans are prepared and strategies put into place, a vision of the 1990 census round is appearing. Foremost is the favourable vantage point of the census statistician who controls both human and machine resources. Inevitably he or she will be better prepared for the traditional census problems. Design will be sounder, drawing more freely on sampling applications and advances in cartographic techniques.

Data entry will more often involve OMR; more flexibility will be permitted as the capabilities to interface OMR and key entry improve. In the future even more sophisticated data entry should be possible-perhaps linked to the further development of optical character recognition. Coding will also exploit new possibilities more fully. CAC offers exciting challenges to all countries to find better ways to streamline processing. Already software development for microcomputing is heralding a new era. User-friendly multi-functional software packages are in advanced stages of development and testing. Statistical offices will be offered a richer menu for selecting the software packages most suited to their circumstances.

Most important, the high cost of censuses will be better justified in terms of the uses that will be found for their outputs. Users are more knowledgeable about the census, and statisticians are showing a greater enthusiasm to keep dialogue open. This whole process is reinforced by a widening choice of methods for disseminating data. The establishment of more efficient user services will inevitably become a feature of the next census round.

But there will be pitfalls and new problems. National statistical offices will need no reminding that the population census is possibly the most complex data gathering activity; without adequate planning, without the dedication of census staff, and without the willing co-operation of the public, censuses in the 1990s will not meet the high expectations that have been set.

II. COUNTRY REVIEWS

1. AFGHANISTAN

The 1979 census

Afghanistan carried out its first ever census of population in 1979 with technical and financial assistance provided by UNFPA. The objectives of that census were to: (i) collect information on the size, distribution, composition and other demographic characteristics of the population; (ii) create a principal cartographic and statistical framework for future censuses and surveys; (iii) understand past demographic trends so as to be able to make assessments about the population size and composition in future years; and (iv) develop a census and survey-taking capability within the Central Statistical Office. The census was carried out by a newly-created census department in the Central Statistical Office. It consisted of various divisions, vis Demography, Field Operation, Data Processing, Communication, Administration and Vital Statistics.

A technical Committee, comprising local and foreign experts, planned and prepared the 1979 census. The Committee was headed by the Deputy Minister of Statistics. It was responsible for specific and technical issues relating to all aspects of census work. A National Census Committee was formed, which comprised of Minister of Planning, Education, Information and Culture, Interior, Communication, Agriculture and Land Reforms, Finance and Public Health, for co-ordinating the needs of the various ministries. In addition Census Co-ordination Committees were established at the provincial level for co-ordinating the assistance of ministries and government departments and institutions. The Census Co-ordination Committee for the capital was headed by the Minister of Planning.

To cope with the additional staff required for the 1979 census, district offices were established. The country was divided into 10,000 enumeration areas. The work of enumerators was supervised by controllers and that of the controllers by supervisors.

So as to ensure maximum assistance from the public a Census Act was enacted just prior to the 1979 census which made it obligatory for every citizen to co-operate with the census takers.

Planning

The planning for the 1979 census, including finalization of objectives, methodology, procedure, training and preparation of time schedule for various operations was started in 1976. It included mapping and cartographic work, preparation of the questionnaire, the writing of instruction manuals and so on. Detailed maps of all localities were prepared. These maps were useful for supervisory work. In the preliminary phase, while undertaking the work of house numbering and houselisting, data on the number of households and total household members were collected. These data enabled census authorities to draw up a precise and dependable enumeration plan and they helped facilitate the census data collection.

The training of supervisors and enumeration staff was imparted by senior staff and it included field training. Separate courses were arranged for provincial and local level officers, controllers, supervisors and enumerators. The training topics included preliminary work, map preparation, houselisting and so on. Instruction manuals were prepared for guiding the enumerators for completing census questionnaires and also for controllers for supervising the work of enumerators.

Questionnaire and enumeration

A household questionnaire was used which sought information about each member of the household. The first part of the questionnaire consisted of 18 items including, relationship to head, sex, age, place of birth, ethnic group or nationality, mother tongue, religion, schooling, type of school, highest grade completed, literacy, marital status, activity during last week, main occupation, industry and employment status. A question regarding births and deaths during the previous 12 months was also included. In urban areas questions regarding the characteristics of housing units, and facilities available in the households were also included. For the nomadic and semi-nomadic population questions were asked about their place of residence at different seasons, location of their camp, duration of stay and type of housing.

Census enumeration started on 15 June 1979 and was completed within 20 days. The choice of period and duration was decided on the basis of geographical conditions, including accessibility to remote areas. Information about foreign nationals residing in Afghanistan was obtained from country missions. The 1979 census used the *de jure* or "usual place of residence" approach. The data collected by enumerators were thoroughly checked and edited and sample checks were made by supervisors and controllers.

Data processing and results

After collecting the data, the enumeration forms were taken to provincial offices. The tabulation plan was divided into different stages. First, the population count classified by sex and province, was undertaken manually and results were prepared and published within a couple of months. In the second stage, more detailed tables were prepared. These tables were prepared on the basis of 5 per cent of

questionnaire from rural areas and 10 per cent of questionnaires from urban areas. The detailed cross-classified tables were processed by computer. The first results of the 1979 census were published by 1981. The publication of the final results was completed by early 1983.

Future plans

Afghanistan plans to carry out a complete census of the entire country around 1990. However, lack of resources, in terms of finance and expertise, means that the country will continue to rely on United Nations agencies to provide expertise, training facilities and financial assistance.

2. AUSTRALIA

Historical background

The first regular census of population in Australia was taken in New South Wales in November 1828. That census, which obtained information on the number, names, age-groups, sex and civil condition of the inhabitants of the colony, that was overseen by the resident magistrates. Police constables, or other competent persons appointed by the magistrates, were required to complete a separate return for each householder within their district. The number of persons enumerated was 36,598.

The first census of population to be held concommitantly throughout all the States of Australia was that taken in 1881. During the conduct of these pre-federation censuses, it became evident that the methods of inquiry and tabulation were, in certain respects, ill-adapted to Australia, and in 1890 a conference of statisticians was held to establish how census information could be collected throughout Australia in a uniform and effective manner. A further conference held in 1900 considered the scope of topics to be asked in subsequent censuses, and ultimately 13 topics were decided upon – name, sex, age, conjugal condition, relation to head of household, occupation, sickness and infirmity, birthplace, length of residence in the colony, religion, education, materials of house construction and number of rooms in each house.

These conferences were essentially " to bring about the adoption of a uniform procedure by which the census authorities throughout Australia agreed to institute the same inquiries on the same date, and to present the results in the various reports drawn up by them, as nearly as practicable, in the same manner". Although uniformity was attained in terms of the 1901 census form content, it did not extend beyond that.

It was obvious that for the census to obtain national uniformity, it needed to be under the control of a central organizing body. This was achieved with federation in 1901, when census-taking became the responsibility of the Commonwealth Government. In 1905 the Census and Statistics Act was passed which gave authority to the Governor-General to appoint a Commonwealth Statistician, one of whose duties was the taking of the census. The first Australian census of population conducted under the authority of the Census and Statistics Act 1905 was held in 1911.

The Census and Statistics Act 1905 stipulated that a census of population was to be taken in 1911, and every tenth year thereafter. The second Australian census was taken in 1921 but the economic depression was still prevailing in 1931, causing the 1931 census to be postponed until 1933. In 1930, the Act was amended to make the year in which the census was to be conducted more flexible. The Act, which had stated that a census be taken in every tenth year, was amended by the addition of the words; "or at such other times as prescribed".

The fourth census was not held until 1947 because of the second World War, and the fifth census was conducted in 1954 (the midpoint between 1947 and 1961). Since 1961, a census has been held every five years, because of the strong need for census statistics. During this period, Australian society was undergoing rapid change and quinquennial censuses were needed to provide relevant and accurate information. In 1977, an amendment was made to the Census and Statistics Act to future censuses carried out on a quinquennial basis.

The scope of the Australian census includes all persons present in Australia on census night, except for the exclusion of diplomatic personnel and their residences. Overseas visitors to Australia are included in the count, Australian residents temporarily overseas are excluded. Aboriginals were included in population counts for the first time at the 1971 censuses. Prior to an amendment, proclaimed in 1983, the Census and Statistics Act 1905 stipulated that a number of topics must be included in each census, and allowed for others to be prescribed by regulation. All the topics in the 1986 census were prescribed by regulations tabled in early 1985. This arrangement is planned to apply for future censuses.

As shown in appendix A, a number of topics have been included in every Australian census form since 1911. A number of these (name, sex, age, relationship, marital status, birthplace, nationality, period of residence, religion, education, occupation, and number of rooms) were topics laid down initially in the Act of 1905, and have remained in all censuses. Some topics which were not required by the Act have also been included on every census. These are: race, industry, labour force status, unemployment, class of dwelling, nature of occupancy and rent.

The 1976 census was the largest census ever attempted in terms of the number of questions, asking 53 questions as opposed to 37 in 1971. Although this was a significant increase, the response burden was not greatly increased. The length of the form and the more sensitive nature of a number of the questions such as handicaps, childcare, benefits, holidays, life assurance and licences combined to generate considerable public criticism of the census as being too intrusive.

The 1981 census was much more manageable in size, including 31 personal questions and four household ques-

tions. It required 43 responses from householders and three from collectors. The form was much better received as a result of an extensive public relations campaign. The 1986 census was of a similar size, containing 34 personal questions and four household questions. It required 46 responses from householders and two from collectors. Public reaction to the 1986 census was favourable.

Design of the 1986 census

Statistics collected in the 1986 census will be classified and presented according to the third Edition of the Australian Standard Geographical Classification (ASGC). The Census District (CD) is the smallest spatial unit type in the ASGC. It has been designed for use in the census of population and housing as the basic collection, coding, processing, tabulation and publication unit. CDs are defined for each population census and are current only at census time.

The basic concept of a CD is that of a ten-day field workload area of a census collector which also serves as the smallest area building block in the ASGC for the aggregation of CD statistics for higher level ASGC spatial units. In urban areas CDs average about 250 dwellings, while in rural areas the number of dwellings per CD reduces as population densities decrease. For the 1986 census the number of CDs is 29,629.

The CD boundaries must be readily identifiable on the ground, and must be capable of aggregation to broader geographic units. For field collection control purposes, CDs are aggregated to Census Subdivisions and Census Divisions.

A CD review programme is carried out before each census and local government authorities are consulted about the appropriateness of existing statistical boundaries, particularly in relation to the delimitation of urban boundaries. The updating and reproduction of current CD boundary maps, carried out by the Australian Bureau of Statistics (ABS) and the Division of National Mapping in collaboration, are activities of the utmost importance in the census field system. The Australian census has always been based upon personal delivery and collection of census forms by a paid enumerator (the census collector). It is essential for field control purposes that each census collector be provided with a map that clearly defines the boundary of their collection district. Map production and presentation techniques are reviewed at each census, with a view to containing production cost and time, and to improving presentation for collectors. Immediately after Government approval for the 1986 census was obtained, all known users of population census data were invited to make submissions on topics to be included in or excluded from the 1986 census. Advertisements were also placed in major newspapers inviting the public to make submissions. Public submissions on census content were first called by the ABS for the 1981 census. The submission scheme was assessed as being an important factor behind the success of the 1981 census. An open assessment of topics submitted by users and the public, supported by objective field tests of likely difficult or sensitive topics, is considered to be the best method of developing a census schedule which is widely accepted by the public. The experience of census taking in Australia indicated the critical importance of having public co-operation when conducting a census. The criteria used by the ABS to evaluate and recommend topics to the Government were: (i) whether the topic is of major importance; (ii) whether the topic is suitable for inclusion in the census; and (iii) whether the census is an appropriate method of collecting the data.

Submissions received from users indicated that most requirements were for a repeat of topics in the 1981 census with some improvements or modifications to meet extra needs. There was also a relatively small number of new topics proposed which were evaluated by the ABS against the specified criteria, and where appropriate, field tested.

An information paper giving the ABS's preliminary views on the content of the 1986 census was released in February 1984. This document was used as a basis for further discussion of topics with major users of census data. The document and the outcome of the consultations with users were discussed by the Australian Statistics Advisory Council (ASAC) before a submission was made to the Government on topics to be included in the 1986 census.

The programme of topic evaluation and tests is considered by the ABS to be an essential feature of a population census. The budget for the census development programme was approximately $A 0.5 million which is considered good value compared with potential costs incurred with a "bad" form. A programme of ten field tests ranging in size from 235 to 5,000 dwellings was implemented over the period January 1983 to November 1984 to meet the needs of new topics evaluation; to improve questions on regular topics and to evaluate new methods or procedures. For each test, a sample of dwellings was selected and a self-enumeration census form delivered to each selected dwelling. After collection of the completed forms, intensive interviews were conducted by trained ABS interviewers at some or all of the responding households. The objective of these interviews was to explore respondents' understanding of the census questions and, where possible, to determine the accuracy and completeness of responses.

The labour force and occupational status topics have been an essential part of every Australian census but have long been recognized as a source of confusion among some respondents, particularly retired persons and persons engaged in home duties. A number of tests were planned with the aim of simplifying these questions and improving their comparability with other ABS sources of labour force data.

Occupation data from the 1986 census are being coded to the new Australian Standard Classification of

Occupations (ASCO). The census field tests were used to help evaluate aspects of the new classifications as it was being developed and resulted in an extra question on tasks or duties of a person's job which will significantly improve the accuracy of the occupation coding. The Australian census is conducted on the basis of enumerating persons at their actual location on census night. When a household has a usual resident absent on census night the coding of families is based only on those persons present on census night. In previous censuses, therefore, spouses temporarily absent led to overstatement of the number of single-parent families and understatement of the number of families with both parents normally resident in a household. Tests for the 1986 census showed that these problems can be greatly reduced by the inclusion of a question on usual residents temporarily absent, which allows family members temporarily absent on census night to be included in the coding of family structures. The tests also helped develop procedures for extending family coding to persons residing caravans or mobile homes in caravan parks.

The 1986 Census Ethnicity Committee

During preparations for the 1981 census considerable interest was shown in data on ethnic origin. It was considered that the traditional census questions such as country of birth, nationality, religion, and so on did not provide adequate data. A small committee was established in December 1982 to advise the Australian statistician on census questions relating to the ethnic origin of persons. The Committee invited submissions from interested persons and organizations and then met with a number of those who made submissions. Five field tests of eight alternative questions on the ethnic background of the population were conducted.

Broadly, the requirements of users for ethnic origin data can be classified into two broad categories; data based on a self-perceived identification concept or on a historical/ancestry concept. The Committee recommended against a question based on self-identification because of the unreliable results demonstrated in Australian tests and overseas experience. The confusion, such questions caused in tests, led to high non-response rates with great variability likely between groups. The Committee recommended the inclusion of an ancestry question in the 1986 census.

The ABS included this recommendation in its submission to Government on the basis that the data produced from the question would be subject to a full analysis of its adequacy and reliability in order to determine the suitability of including a similar question in the 1991 or future censuses. It was noted that the inclusion of questions on birthplace of parents and language used at home, questions being considered for inclusion in their own right, would greatly assist such an analysis.

Training and fieldwork

The 1986 census was a self-enumeration census with forms delivered by collectors in the week preceding census day and collected by the same collectors in two-week period after census day. In previous censuses, Divisional Field Supervisors have generally all been drawn from staff of the Australian Electoral Commission, enabling the ABS to benefit from that organization's network of Divisional Returning Offices. However, it was not possible to maintain this arrangement for all regions in the 1986 census and for the first time a significant number of Divisional Field Supervisors were recruited from the general public. These officials are responsible for the recruitment, training and general supervision of temporary census staff.

For the delivery and collection of census forms approximately 38,000 group leaders and collectors were recruited across Australia for short-term field duties in mid-1986. Each group leader was responsible for approximately ten collectors who themselves were responsible for the delivery and collection of census forms from an average of 250 dwellings. In addition, special collectors were recruited to undertake census duties in large establishments and to enumerate persons in transit on trains, buses, and ships travelling between Australian ports. Proper training of the field staff is crucial to the success of the census. To cope with the task of providing a uniform standard of training to such a large and geographically widespread group of people, the ABS developed verbatim training manuals and for the first time, videos, which included the 1986 census television advertisements.

Divisional Field Supervisors (DFSs) were trained by ABS staff, group leaders were trained by DFSs and collectors by group leaders. Group leaders and collectors were required to read their operation manuals and complete a home study exercise before attending their training sessions. Several methods were implemented to provide assistance to householders in understanding the nature and purpose of the census, and in completing the census form. These included an extensive public awareness campaign, the distribution of a booklet to all households explaining aspects of the census, a telephone enquiry service, a telephone interpreter service, the recruitment of multilingual collectors, and recruitment of Aboriginal collectors in areas where there were a large Aboriginal population.

Field investigations, conducted after each census since 1971, have indicated difficulties in obtaining complete coverage of the Aboriginal population. Special procedures adopted in the 1986 census included the use of Aboriginal field staff wherever possible, use of a special interview form for remote areas where Aboriginal households were unable to complete a census form, special census awareness measures and greater involvement of Aboriginal organizations.

New procedures were also implemented to improve the quality of data collected on persons resident in non-private dwellings on census night. A list of non-private dwellings compiled to assist with field operations was made more complete and greater attention was given to the classification of the dwellings on this list and non-private dwellings found by collectors during enumeration.

Evaluation

The sparsely-populated rural areas of Australia present particular problems in terms of locating dwellings. Some persons may not wish to be counted, and others for various reasons may be inadvertently omitted from the count. It is almost inevitable that census coverage will be incomplete. Consequently, a Post Enumeration Survey (PES) was conducted to measure the number of persons and dwellings missed by the census. For the PES, respondents at randomly selected dwellings were subject to intensive interviews designed to determine the accuracy of census coverage at each selected dwelling.

Coverage is evaluated as follows: firstly, obtaining independent data for a sample of the Australian population by two separate systems – the census and the PES; secondly, determining which of the cases reported in the PES were also reported in the census, by matching the survey results to census forms and finally by using the proportion of persons in the PES who were reported in the census as an estimate of the proportion of all persons reported in the census.

The sample selected for the PES was a multi-stage area sample of approximately 40,000 private dwellings. All usual residents of selected dwellings were included in the survey scope unless they were absent for more than one month. Visitors to a selected dwelling were generally excluded.

Interviewers for the PES were recruited from ABS officers who normally conduct interviews for the Bureau's Monthly Population Surveys. To ensure independence from the census, the interviewers were not permitted to work as census field staff. Interviewing for the PES was mainly conducted in the fourth and fifth weeks following census day, after all census field work was complete. At the Census Data Transcription Centre (DTC), the information collected in the PES was matched to a census form for each address given to establish whether a person was counted, or counted more than once. After the matching phase, the net underenumeration rate will be calculated on the principle that the number of times a person was found on a census form(s) for any address(es) was the number of times that the person was enumerated. The PES provides estimates of age by sex underenumeration rates. The results of the PES, supplemented by demographic analysis and estimates of the number of residents temporarily overseas on census night, are used to adjust the population counts on a usual residence basis to provide the basis for the estimated resident population for Australia.

Data processing

After all forms had been collected in the field they were despatched to the DTC for input processing. Forms commenced arriving at the DTC from the field about four weeks after census day and initially were subject to preliminary checking. Then the forms passed through a number of coding processes, followed by data transcription. In recent censuses, the coded data were transferred clerically onto special documents and read by optical mark reading (OMR) machines. For the 1986 census, however, coded data were entered by keyboard operators directly onto computer disk and transferred by a communication link to the Bureau's central computer.

Two aspects of input processing of census forms are quality and flow control of the forms through the processing centre. Statistical quality control based on inspection sampling provides a check on data quality and important management control information on processing errors and rates. A quality control scheme for the keyboard entry process was developed for 1986, along with a quality control scheme for the coding processes similar to the 1981 scheme.

With a few exceptions, all edits were declared fatal and amendment action required reference to source documents. Imputation for non-response was limited to the very basic items of sex, age and marital status. Other questions with no response were coded and tabulated as "not stated". Users will therefore be aware of the extent of non-response to particular questions. Instead of devoting resources to the development of automated imputation programmes, resources were directed to improving the quality and level of response and to implementing the quality control scheme during processing to detect systematic errors made by coders and keyboard operators at an early stage.

Analysis and dissemination

Analytical work by the ABS on the 1986 census results will focus on the evaluation of data quality. The main elements of the programme are: (i) evaluation of coverage; (ii) evaluation of data on the Aboriginal population; (iii) evaluation of ethnicity data; (iv) evaluation of family data; and (v) evaluation of education data.

As in previous censuses, the PES together with demographic analysis will be used to assess coverage. In addition to the PES, estimates of the population by age and sex obtained from demographic analysis of pervious census data and birth, death and migration statistics will be used to evaluate coverage. The estimates allow an independent check of census coverage since they are derived from data sources that are unrelated to the current census. Such a check can provide useful information about coverage in the younger age groups, such as children under age 5.

A special evaluation study based on a post-censal survey of Aboriginals is being carried out in 1986 to check coverage. Survey respondents will be matched to their census forms in a way similar to the PES matching process, so that an assessment of coverage in those areas can be

made. The sample was not intended to be representative and was very small in size, so the results cannot be generalized to the whole country, however the study will provide useful information about the quality of Aboriginal data. Comparisons of the age-sex distributions with those of earlier censuses, taking into account trends in mortality and fertility as indicated by recent demographic studies will also be useful as will evaluations using other data sources such as numbers of Aboriginal students.

In 1986, a question on ancestry was asked for the first time, so a special evaluation of ancestry data will be conducted. Other components will include a review of all test results, cross-tabulations with other related variables, an attempt to estimate ethnic origin from other census questions, and comparisons with estimates from other sources. Responses to the ancestry question in the census will be cross-tabulated by birthplace, birthplace of parents, language and religion to examine the relationship of ancestry to these variables.

New relationship codes and an additional question on usual household members who are temporarily absent will result in a more accurate measurement of families and their composition. A series of internal consistency checks and comparisons with external sources will be made. In 1982, the ABS conducted a Families Survey. Data from the survey can be compared with 1986 census data to evaluate the implied trends in family structure. Comparison of the number of *de facto* couples, married couples and one-parent families by size and composition can be made.

In the 1986 census, the question on attendance at an educational institution was asked of everyone instead of only persons aged 15 and over, as it was in 1981. Information was also collected about the type of educational institution each person attends. Evaluation of these data is possible by comparing the aggregated data against statistics on school and tertiary education enrolment collected by the National Schools Statistics Collection and the Commonwealth Tertiary Education Commission respectively. As with the 1981 census, output from the 1986 census will be produced from a number of output systems in a variety of media. The extent to which each 1981 census output system and medium satisfied the needs of users was evaluated and influenced the detailed design of the 1986 census output system.

The production of output is again from four basic sources: (i) the geographic data base which is designed primarily to be a central store of census geographic information for use by output and other systems; (ii) unit record files which will be used to produce cross-classified tables available on microfiche and magnetic tape, as well as tables for a series of statistical publications; (iii) small area data bases which will be used to produce a series of planned outputs on microfiche for standard census geographic areas and sample unit record files which will contain unidentifiable unit records.

One aspect of output production which received extra attention for the 1986 census was the production of a greater range of outputs on a usual residence basis, instead of the commonly used actual location basis (the basis of enumeration). To accommodate needs expressed by users there will be an increase, compared with the 1981 census, in the amount of statistical data released in printed form, particularly for a range of thematic publications (such as the family, the aged, etc), and publications containing data for local government areas. A comprehensive set of information papers is being produced to advise users of census outputs and services, and assist them to understand census concepts and the data.

Publicity

Australian and overseas experience has shown that censuses cannot be conducted successfully without a public awareness campaign. An extensive public awareness campaign conducted prior to and during the collection phase of the 1981 census has been assessed as being an important factor in enabling the 1981 census to be conducted without the widespread antipathy to the census experienced in 1971 and 1976. It was decided that a campaign similar to that of 1981 would be needed in 1986, with a total cost of $A 2.2 million, of which approximately $A 1.7 million was for advertising. The objectives of the 1986 public awareness campaign were to assist in attaining the highest possible rate and quality of response and involved: (i) adequately informing householders and others of their rights and obligations, the reasons why the information was sought, how it would be used, and how privacy would be safeguarded; and (ii) creating and maintaining a favourable climate in which broad public approval and support for the census could be demonstrated, by extensive contact with opinion leaders and community groups.

The advertising campaign began in mid-June with newspaper, radio and TV advertising focussing on specific aspects of the census. On 30 June a special two-minute advertisement was shown on commercial TV stations, and a one-minute announcement on the ABC (the Government-owned TV network). These advertisements outlined the importance of the census, and requested public co-operation. At the end of the collection phase, there was post-census message in newspapers aimed at picking up households missed either during the delivery or pick-up stages. The opportunity was taken at that time to thank the public for its co-operation.

Personnel and costs

In the Central Office of the ABS approximately 60 permanent staff are involved in the population census programme, working on projects such as the development and evaluation of census topics and procedures, preparation and co-ordination of the field phase and processing, processing and release of census data, and public awareness.

The number of staff in State ABS offices working on the census varies greatly over the census cycle. State office staff are involved in such areas as mapping, pilot testing and public awareness. The 1986 census field operations involved over 38,000 group leaders and collectors Australia-wide, who were employed for several weeks in mid-1986. The 1986 census cost approximately $A 64 million (December 1985 prices). These costs exclude the salaries of ABS permanent officers and associated ongoing overheads. For comparison, the 1981 census cost $A 35 million (1981 prices).

Issues

Sampling in the collection phase (using a short form for a large percentage of the population and a long form for the remainder of the population) has been investigated by the ABS. This method reduces processing costs but there is no reduction in field costs when using a collector delivery and pick-up system. It is difficult to control the simultaneous distribution of long and short forms and overseas experience indicates that sample biases are likely to be incurred. There are also conceptual problems in selecting households in the field when there are multiple households within dwelling structures and contact on delivery of forms is made with only 40 per cent of the population.

The ABS is reviewing the feasibility of introducing mailback techniques for future population censuses. Several important areas such as costs, rates of non-response, implications for the PES and the possibility of conducting the census on a usual residence basis need to be closely examined.

All Australian censuses to date have been conducted on the basis of enumerating people at their actual location on census night. Since 1981 there has been an increased demand for data on a place of usual residence basis, but there are limits to the amount of data that can be produced. Conducting the census on the basis of enumerating people at their usual residence would overcome a number of problems in the current method employed for Australian censuses. "Usual Residence" is the basis on which censuses are conducted in the United States of America, Canada, Japan and most European countries. Changing the basis of enumeration would result in household forms containing full details for the usual residents of that household thus avoiding the current need for extra coding during processing. It would, however, cause a break in census time series data used for longitudinal studies and may mean that census counts of persons in an area on census night would no longer be available.

Changing to a "Usual Residence" basis would require considerable development costs, and research taking into account the experience of other countries. Particular conceptual issues that would need to be resolved include treatment of Australians temporarily overseas on census night and persons with no usual residence.

Plans for the next census

OMR technology has been used in other countries for census processing, notably in Latin America, Japan and some other Asian countries, and in the United States through FOSDIC. The success of an OMR strategy is very dependent upon the extent to which question design, enabling multiple choice of responses, can be incorporated. To this end, it is likely that some questions lend themselves to this design while others require text responses. The possibility of adopting a processing whereby the data are partially captured by OMR is being considered. The ABS has experience with using OMR technology for census processing, although not with respondent marked forms. In terms of cost, OMR becomes a much more attractive strategy if the forms are respondent-marked. The ability of the Australian public to complete OMR-designed forms unaided would be a major consideration.

Against the advantages of avoiding labour intensive data entry and the ability to capture data in computer readable form ABS will have to consider the cost of equipping with OMR technology, the receptiveness of the public to respondent-marked OMR and the costs of meeting OMR technological constraints such as the increased space needed for some questions on the form, higher paper and printing quality required and the need to provide for alternative processing of unreadable forms/responses. The increasing demand for small area data from the census has resulted in more and more use of CDs as the smallest output unit for data and for aggregating data to user-specified small areas. CDs are primarily designed for the administration of the field work for the census and are not ideal dissemination units. On the one hand they are generally too large to allow accurate aggregation to non-standard larger areas but on the other they are too small to allow for basic detailed data to be produced because of confidentiality constraints. The recording of postcode number (similar to the United States concept of "Zip code") and suburb reported on the census form as the person's address would allow for data to be more accurately compiled for such areas instead of the approximations made at present by the allocation of whole CDs to such areas.

The Division of National Mapping, which provides the necessary field and dissemination maps for each census, plans to develop an extensive geographical data base, including digitized map data and a system for computer generation of maps. This should reduce the cost of map preparation for each census and allow for quick and flexible generation of all maps required for field and dissemination purposes. The ABS has been invited to participate in these developments.

Appendix. Topics included in Australian censuses, 1911-1986

Topics	1911	1921	1933	1947	1954	1961	1966	1971	1976	1981	1986
Persons											
Name	*	*	*	*	*	*	*	*	*	*	*
Sex	*	*	*	*	*	*	*	*	*	*	*
Age	*	*	*	*	*	*	*	*	*	*	*
Relationship	*	*	*	*	*	*	*	*	*(a)	*(b)	*(c)
Marital status	*	*	*	*	*	*	*	*	*	*	*
Duration of existing marriage	*	*	*	*	*	*	*	*	*	*	*(d)
Duration of widowhood								*			
Married more than once										*	*
Issue											
– of existing marriage	*	*		*	*	*	*	*	*		
– of previous marriages	*	*									
– of all marriages								*	*		
– "ever had"										*	*
No. of dependent children		*	*	*							
Orphanhood			*								
Birthplace	*	*	*	*	*	*	*	*	*	*	*(e)
Birthplace of parents		*						*	*	*	*(e)
Citizenship	*	*	*	*	*	*	*	*	*(f)	*(f)	*(g)
Ancestry	*	*	*	*	*	*	*	*	*	*(h)	*(i)
Number of usual residents		*						*			*
Place of usual residence						*(j)			*	*	*
Residence 1 year ago									*	*	*
Residence previous census								*	*	*	*
Period of residence in Australia	*	*	*	*	*	*	*	*	*	*	*
Number of overseas residents or visitors								*	*		
Blindness, deaf-mutism	*	*	*								
Handicaps									*		
Language			*						*(k)	*(l)	*(m)
Religion	*	*	*	*	*	*	*	*	*	*	*
Holidays									*		
Child care									*		
Education											
– ability to read or write	*	*									
– highest level attained							*	*			
– current schooling	*	*	*	*	*	*	*	*	*(n)	*(n)	*(o)
– place of schooling or study								*	*		
– age left school									*	*	*
Qualifications						*	*	*(p)	*	*	*
War service			*								
Income			*						*	*	*
Life assurance									*		
Motor bike licences									*		

Appendix. *(Continued)*

Topics	1911	1921	1933	1947	1954	1961	1966	1971	1976	1981	1986
Motor vehicle licenses									*		
Benefits									*		
Retirement benefits									*		
Industry	*(q)	*(q)	*	*	*	*	*	*	*	*	*
Occupation	*	*	*	*	*	*	*	*	*	*	*(r)
Occupational status	*	*	*	*	*	*	*	*	*	*	*
Place of work					*	*	*	*	*	*	*
Unemployment											
– number	*	*	*	*	*	*	*	*	*	*	*
– duration	*	*	*	*	*	*					
– cause		*	*	*	*	*					
Hours worked							*	*(s)	*(s)	*(t)	*(t)
Method of travel to work									*	*	*
Type of dwelling/structure	*	*	*	*	*	*	*	*	*(u)	*(u)	*(u)
Materials of walls	*	*	*	*	*	*	*	*	*	*(u)	
Materials of roof		*		*							
Number of rooms	*	*	*	*	*	*	*	*	*	*	*
Number of bedrooms								*	*	*	*
Nature of occupancy	*	*	*	*	*	*	*	*	*	*	*
Rent	*	*	*	*	*	*	*	*	*	*	*
Mortgages									*	*	*
Date of building				*	*	*	*	*	*		
Facilities											
– gas				*	*	*	*	*	*(v)		
– electricity				*	*	*	*	*	*(v)		
– water supply				*					*(v)		
– toilet				*							
– bathroom				*	*	*	*	*	*	*	*
– kitchen					*	*	*	*	*	*	*
– television						*	*	*			
– cooking				*							
Number of vehicles							*	*	*	*	*
Sleeping out			*	*							
Farm dwelling					*	*	*	*	*		
Method of sewage disposal								*	*		
Number of extra homes owned or being purchased									*		
Reason unoccupied								*(w)	*(w)	*(w)	*(w)

Notes:

(a) Prior to and including 1976, the term "relationship to head "was used.

(b) The term "head" was considered inappropriate in 1981 and "relationship to Person 1" was asked.

(c) "Relationship to Person 1/Person 2" was used in the 1986 census.

(d) "Year of first marriage" will be used in 1986 as the data is preferred for family studies.

(e) In the 1986 census, "birthplace of father" and "birthplace of mother" will be asked as two separate questions.

(f) Prior to 1976, "national" rather than "citizenship" was asked.

Appendix. *(Continued)*

(g) The 1986 census will simply enquire whether or not the person is an Australian citizen.

(h) The 1981 and 1986 censuses focus on whether the person is of Aboriginal or Torres Strait Islander origin.

(i) An additional question in 1986 asked for each persons' ancestry.

(j) The 1961 census asked for "state of usual residence".

(k) The 1976 census asked for "all languages regularly used".

(l) In 1981 ability to speak English was used.

(m) Two separate questions were asked in 1986 – languages used and ability to speak English.

(n) The 1976, 1981 and 1986 censuses asked for "attendance at school or other educational institution".

(o) The 1986 census also asked for "type of educational institution attended".

(p) In 1971 "qualifications held and being studied" was asked.

(q) "Employers occupation" was asked in 1911 and 1921.

(r) An additional question was asked in 1986 – main tasks or duties performed in the occupation.

(s) 1971 and 1976 censuses focus on hours worked in all jobs held in week prior to the census.

(t) 1981 and 1986 censuses ask hours worked in main job held in week prior to the census.

(u) This question was completed by the Census Collector in 1976, 1981 and 1986.

(v) In 1976, type of fuel or power used for household purposes was asked.

(w) Completed by the collector in the censuses from 1971 to 1986.

3. BANGLADESH

Historical background

The first census of population in the area constituting Bangladesh was taken in 1872 as part of the census of British India. After that censuses were taken every ten years starting with 1881 except that in 1971 hostilities prevented a census. Bangladesh carried out its first post-indenpendence census in 1974. With a view to returning to the decennial periodicity and to having adequate and timely benchmark data, Bangladesh conducted its next census in 1981.

Apart from satisfying national requirements, past censuses have taken account of international considerations through the recommendations of the United Nations and its affiliated agencies. The concepts used in past censuses have been in conformity with United Nations recommendations.

In Bangladesh the census is usually preceeded by a housing census and succeeded by a sample survey. The main census count is taken with a small questionnaire and this is followed by a longer and detailed questionnaire. The household lists provided by the housing census serves as a coverage control for the complete count of population. The complete count serves as the frame for the sample survey.

In the 1951, 1961 and 1974 censuses one questionnaire sheet was used for each person. This individual type schedule was preferred in consideration of ease of hand sorting of the results. But in 1981 a household type schedule was introduced with questions on the characteristics of the household as well as individual household members (multiple). This helped in preparing cross tabulations of housing and household characteristics with those of individual household members. For example, how the characteristics of households were related to income, fertility, religion and ethnic characteristics.

In the most recent census of 1981 a major innovation was the use of Optical Mark Reader (OMR) questionnaires. Also for the first time maps were used to delineate every administrative unit. Every enumerator was supplied with a map showing the exact boundary of his enumeration area (EA).

Design of the 1981 census

The 1981 census of population and housing was designed to be taken in two phases, with the first phase devoted to 100 per cent enumeration of households and individuals and the second phase to sample enumeration. The full enumeration aimed to ensure the counting of every individual; account for each and every household; generate reliable data of basic characteristics of individuals and households and present enumeration results expeditiously. Information about socio-economic and demographic characteristics of the population was left to the sample phase of enumeration.

The survey part of the census was carried out with a long questionnaire which collected detailed information on housing, economic, social and demographic characteristics. The sample survey was taken eight months after the main census. The sample size consisted of 1 per cent of total households selected on a two-staged sample basis – the first stage being the enumeration areas (EAs) and the second stage the households. Staff from the Bangladesh Bureau of Statistics were employed as enumerators and supervisors for the sample survey programme. The sample survey questionnaire repeated some questions of the main census because individual data linkage between the two questionnaires was not feasible.

Maps and geo-codes were developed for all administrative units of the country-districts, subdivisions, thanas, unions/wards, mauzas and villages. Boundaries were identified by paying field visits to the lowest administrative units, that is the villages. The maps were specially prepared for use in the population census. The entire programme of mapping and establishing geo-codes centred around the preparation of the various types of base maps. That is, maps of thanas showing boundaries of unions and mauzas/villages and also important land marks; maps of municipalities and urban areas showing boundaries of wards, mohallas, EAs, location of housing units and roads, and maps of mauzas/villages showing location of housing units, roads, lakes, ponds and other important land marks.

Committee structure

The Bangladesh Bureau of Statistics (BBS) is the national Statistical Organization in the country responsible for taking all censuses and surveys. The Director General worked as the head of a special steering committee who decided plans and identified policy alternatives for the census and was assisted by separate technical groups with senior statisticians and trained statistical workers. In addition, the National Statistical Council, the highest statistical policy making body, was responsible for deciding major issues of when and how the census was to be taken. A Technical Advisory Committee was set up to assess data and research needs. The committee comprised of representatives of data users, research scholars, demographers and administrators. Under the Technical Advisory

Committee several sub-committees were formed to give attention to census publicity, printing and so on.

Training and fieldwork

Imparting training to more than 200,000 enumerators and 40,000 supervisors was a formidable task. A core group of 25 senior officers of the Bureau was trained. They in turn trained 96 supervisory officers and 801 zonal officers who at the field level trained 40,324 local supervisors. Finally each supervisor trained a group of four to six enumerators. At all stages of training, a verbatim training manual, finalized in field tests, was adopted to help ensure uniformity.

In November 1980 all zonal officers were trained in fieldwork relating to census management at headquarters in Dhaka. After that they were sent to their respective zones and asked to pay visits personally to all the places-mohallas, mauzas and villages – within their respective zones and select local supervisors, and physically show the EA to the enumerator with the aid of a map marking the boundaries.

The field enumeration was completed in three days between 6 and 8 March 1981 and was preceded by enumeration of transient persons on the mid-night of 5 March 1981, which was the census reference period. The week end was selected for the census enumeration because of the greater possibility of all household members being present at the household during the field enumeration.

A *de facto* method of enumeration was followed. Household numbering with crayon chalks was done simultaneously with the enumeration. The enumerator moved from house to house in a systematic path, entered the data of household characteristics and individual persons available at the enumeration time, numbered the household and proceeded to the next household.

Evaluation

A Post Enumeration Check (PEC) was conducted two weeks after completion of the field enumeration work to determine the extent of coverage and content errors. The PEC programme was designed by an independent group of experts and carried out by independent teams of trained supervisors and enumerators who were selected from experienced staff of the BBS. A probability sample of 100 urban EAs and 150 rural EAs was designated for the PEC programme. All these sample EAs were re-enumerated. Findings of re-enumeration were matched against census enumerated results. All unmatched events were rechecked by paying several field visits. Final analysis of PEC results showed under-coverage error of around 3 per cent, lower than under-coverage errors of past censuses.

Data processing

Processing plans for the 1974 census of population envisaged processing of 100 per cent of census schedules within a period of two years. Due to various limitations, only 5 per cent of the schedules were processed for detailed tabulations. Two factors were mainly responsible for the delay: firstly input preparation and secondly, the printing methodology of the reports. During the planning stage of the 1981 census these two aspects were examined very carefully.

With a view to minimizing the time for processing, minimizing cost and minimizing administrative and other related aspects it was decided to adopt OMR for data entry. At first all questionnaires were subjected to quick manual editing. Next they were read through an optical mark reader for transferring data onto magnetic tapes. The designated data transferring plan was to use two optical mark readers and finish transferring data by about one year. This schedule could not be adhered to because of delayed procurement of optical mark reading machines from abroad. Installation of even one such machine could not be completed until October 1981, more than six months after receipt of all field returns at headquarter. With one machine commissioned, data transferring work was done within a period of 18 months and without any rejection.

Manual editing is the initial step before mechanical processing. In this step it was ensured that all the questionnaires were in good physical condition; every book carried correct Geo-code; marking system and intensity was in conformity with the machine requirements and all the questions had been answered and marked. It was expected that one OMR would read about 40,000 sheets per day. That meant that about 50,000 households had to be edited and kept ready for feeding into the OMR. Delay in the installation of the OMR equipment and intermittant machine failure resulted in accumulation of edited output. It was therefore decided to edit 100 per cent of the documents irrespective of number of errors. This time the scope of editing was extended to check all missing information and impute, where possible, missing data. Consistency checks were avoided.

The OMR output tape was edited through a comprehensive edit programme. Every element of the records was examined for validity and consistency. If any one was found to be invalid or inconsistent it was imputed on the basis of some given principles. Count of every item-wise imputation was printed. During the test, it was observed that about 70 per cent of the imputations (other than age) were correct. About 55 per cent of age imputations were correct, 30 per cent were nearly correct and 15 per cent were incorrect. On the basis of these observations, it was decided that a maximum of 1 per cent imputation in age and sex would be acceptable. If the rate of imputation in age or sex was more than 1 per cent the entire batch would be manually re-edited. It was also observed that imputation of other items was almost totally correct if based on the correct age and sex of the person.

The edited tape was sorted in geo-code (upto EA level), household serial and serial of all members within

the household. This provided the basis for summary counts by village, mauza/mohalla, union/ward and thana. From the summary tape, 12 community tables were printed. Each of these records also contained a geographic area name which was extracted randomly from an indexed sequential geo-code file.

Another programme prepared Thana-wise summary tapes for five tables on household characteristics and 19 tables on population characteristics. These records were actually print images of all the tables which were printed through printing programmes. Percentages were calculated at the time of printing. Output tapes of all Thanas were merged and sorted on table number and line number as well as geo-codes. From the sorted tape, district and national tables were printed using the same printing programmes. The "Administrative Report of the Census" contains a detailed account of the planning, pretests, pilot census, budget, personnel, publicity, methodology, training, field operation including logistics, storage, editing, processing, tabulation and publications. All computer programmes have been preserved for future reference.

All input magnetic tapes were exhaustively computer edited and cleaned before final computer processing. All computer programmes for edit, validation and tabulations were written by programmers of the Bureau. The Bureau's own computer hardware, the IBM system 4341, was installed in May 1983. Before then, the Bureau used outside computer facilities in order to continue data processing work without undue delays.

Analysis and dissemination

The data presented in tables were analysed to highlight the socio-economic and demographic conditions prevailing in the country. The analysis were based on the following characteristics: (i) population growth, urbanization and migration; (ii) age-sex composition; (iii) marital status; (iv) religions composition; (v) literacy; (vi) household and housing; (vii) economic participation; and (viii) tribal population.

The result of the census were published in the form of several reports. The reports included the preliminary report of the 1981 population census released three months after the census. The national volume with analytical findings and national tables, the PEC report, the district and the thana reports were all published separately. Union level statistics were disseminated in a report entitled "Union Statistics"

The preliminary report contains population aggregates by district and thana. It also gives the individual municipality population and the tribal population by age group and by main occupations. In the national volume data aggregated by district have been presented. The district reports contain tables giving data aggregated at thana level. In each thana report there are four community tables besides five household and 19 population tables. The data provided in the four community tables have proved extremely useful in formulating plans and policies on a small area basis. These micro data have been preserved in a data bank of the Bureau and integrated with data of other census and survey programmes with a view to establishing a very comprehensive data base for continued use.

The census data have been preserved in tapes and are available for future use. These will be preserved until the next census and are accessible to any user on a payment basis.

Publicity

Wide publicity about the census objectives and types of data to be collected was given through the media. Newspapers, radio, television, cinema houses, posters, pamplets, brochures, handbills and stickers carried messages of the 1981 census. Drum beating in rural areas and mike announcements in urban localities were made. In all cinema houses of the country and through mobile vans, a short feature film on census was screened. The film was also shown through the country's television network. The census campaigning was mounted about a month and a half before the actual enumeration date with the campaigning gradually intensifying as enumeration date approached.

Personnel and costs

The core of the census organization was built on the support of some 200,000 enumerators and 40,000 supervisors at the field level with higher supervisory management personnel at Union, Ward, Thana, Sub-division and District levels and a control team of senior most professional statisticians at the top level in the Dhaka head office.

The total cost of the 1981 census was about Tk 157 million ($US 7.3 million) of which Tk 97 million was provided by the government and Tk 60 million as a Technical Assistance Grant from the UNFPA.

Plans for the next census

The next census of population is planned for 1991. The methodology of census taking is expected to be more or less the same as that of 1981 census. A 1991 population census will be important to Bangladesh for several reasons. Firstly, the maintenance of linkages with other censuses and surveys. Secondly, for monitoring socio-economic development, including poverty monitoring, agrarian reforms and rural development. Thirdly, it will provide a basis for "horizontal" and "vertical" planning.

Population problems have been identified as the most critical of all in Bangladesh. Therefore more stress will be given on the accurate estimation of growth rates, monitoring and evaluation of local problems, migration (especially

that between urban and rural areas) and the establishment of benchmark data for local administrative areas.

At the preparatory phase of the next population census, the field staff will be engaged in the collection of community data not normally collected by the census itself. Topics may include infrastructural facilities, environment, agricultural aspect and community institutions. These will be combined with the results of the population census.

4. BHUTAN

Historical background

A census in Bhutan was taken on a traditional basis in 1958. That census was conducted and maintained at the district level with the compilation being carried out at the national level. The first complete population census with improved methods was conducted in 1980. The questionnaires for this census sought information on personal and household characteristics. Bhutan approached this census with a view to developing a census taking capability from a relatively low threshold.

Design of the 1980 census

The 1980 census was designed to meet the requirements of national planning and included questions on basic households, social, economic and demographic aspects. The census operation did not make any use of sampling. Mapping was used to a very little extent. The census adopted a *de jure* method of enumeration, the criteria being a minimum of six months duration of residence. No regular census committee structures were formed. However, problems relating to the preparation and implementation of the census were discussed in several *ad hoc* meetings with the major user-organizations. Key decisions relating to the census were taken by the Ministry of Home Affairs.

The 1980 census data were processed manually due to lack of trained and qualified personnel. No detailed editing and checking were carried out.

Analysis and tabulations of the census data by various characteristics, such as population by occupation, literacy/education, marital status, migration and so on by district have been completed manually. The preliminary census results comprising basic population and household information were published in 1986. A complete report on the 1980 census will be published before the planning of the 1990 census.

Issues

The shortage of trained and qualified personnel was a major problem encountered in the 1980 census. Similarly, the scarcity of fund was another problem. No external assistance was given and there was only very limited use of any modern technology.

Other major problem encountered were: (i) logistical problems and non availability of efficient transportation; (ii) a general lack of awareness about the importance and use of population census data; and (iii) a lack of any computer facilities.

Plans for the next census

Bhutan has decided to conduct a census every ten years and the next census will be held in 1990. Detailed planning for the 1990 census will commence in 1987. It will be conducted on a more scientific basis than in 1980. Thus the census questionnaires will include more detail questions on fertility, mortality, migration and housing conditions. A separate questionnaire will be used for housing and field tabulations will be done at block levels. The questionnaires will be pretested several times before the actual census begins. Similarly the enumerators and supervisors will be provided extensive training and field offices will be established.

It is hoped that a standing committee, technical committee and user committee could be formed involving the Ministry of Home Affairs, the Department of Immigration and Census, Planning Commission, civil authorities and various other technical/user organizations. The executive responsibility for the entire census operation will rest with the Department of Immigration and Census.

The number of staff in the census division will be increased and staff training will be given priority. A separate computer section will be established and equipped with a microcomputer to begin with.

Detailed time schedule and budgeting for the 1990 census will be worked out well in advance. A project proposal is being drafted for submission to the UNDP for financial and technical assistance amounting to $US 10.1 million for the procurement of: vehicles, computer hardware and software, office equipment/stationary, field equipment such as tents and sleeping bags and staff training.

5. BRUNEI DARUSSALAM

Historical background

The first recorded population census in Brunei Darussalam was in 1911. It was held to get information on the constituents of the native races of the new state and the growth of the small town population. The second census was held in 1921, the year when compulsory registration of births was legally introduced. This was followed by the 1931 census. These two later censuses were conducted as part of the censuses of the Straits Settlements with which Brunei formed as a separate unit. The 1947 census was held in conjunction with Sarawak and the Census in 1960 was administered by a specially created joint census Department for Brunei, Sarawak and Sabah (then known as North Borneo). The population census of 1971 was the first conducted by Brunei Darussalam alone.

The concepts and definitions as well as coverage and scope of the 1981 census were designed according to internal needs. At the same time, wherever possible, account was taken of new aspects of methodological changes and recommended approaches.

Design of the 1981 census

Several new items, such as duration of residence and place of previous residence, were included in the questionnaire for the 1981 census. Questions on income and bonus were introduced under economic items. Other topics, such as physical disabilities, age at first marriage and number of children born alive for ever-married females were also asked. However, in Brunei Darussalam we found it was extremely difficult to ascertain information on physical disabilities of the population through the census.

Administratively, Brunei Darussalam is divided into four districts, Brunei-Muara, Belait, Tutong and Temburong. The capital of Brunei Darussalam is Bandar Seri Begawan, which is in the Brunei-Muara district. Each district is divided into several mukims (sub-districts) and in each mukim there are a number of kampongs (villages). For the purpose of 1981 census, Brunei Darussalam was divided into five census districts Belait, Tutong, Temburong and Brunei-Muara. The latter was divided as Bandar Seri Begawan and the Brunei-Muara census district. The demarcation of enumeration areas (EAs) was similar to that of the 1971 census, using sketch maps of kampongs prepared by the office of the malaria eradication programme (MEP) of the medical services. The MEP had maps of kampongs in the rural areas with the location of houses marked on them. Maps provided by the Survey Department and maps prepared by Town and Country Planning Department were also used.

The 1971 census provided a list of kampongs and local areas in each district, classified by urban and rural, together with the number of persons living in each area. Based on these data, mukims and kampongs in each census district were divided into enumeration areas; the size of which was not greater than 99 households. If two adjacent kampongs within the same mukim were small then they were combined into a single EA. Sketch maps were prepared in the census office and subsequently used for the house numbering. After the house numbering, some adjustments were made to split EAs which had more than 99 houses. A total of 717 EAs were covered by the 1981 census.

Sampling was not used in the 1981 census. All items in the questionnaire were asked on a full enumeration basis. Sampling methods were however employed for the pilot survey and post enumeration survey. The objective of the pilot survey was to test the adequacy of the questionnaire design and to estimate the work load for enumerators and at the same time to emulate problems of field supervision under actual census condition.

Census organization

Under the Brunei Darussalam 1947 Census Act provision was made for the appointment of various categories of census officers led by the Census Superintendent and Deputy, to enable a census organization to be set up on an *ad hoc* basis. The census field organization consisted of assistant superintendents, chief supervisors, supervisors, enumerators or house numberers. Districts Officers of each district and their assistants were external members, appointed as assistant superintendent and chief supervisors respectively. A central office for census activities was specially established within each EPU as a separate unit, with temporary offices set up in each district during the field work.

Each of the census officers in EPU was assigned functions and duties throughout the planning and implementation period. Another committee of census co-ordinators was established comprising members from heads of government departments with an interest in the census results. That committee decided and finalized topics to be included in the 1981 census, fixed the time period for census week, as well as made recommendations on the suitability of the house numberers, enumerators and supervisors. To ensure the smooth flow of the census work members of the committee were required to give all necessary assistance during the field work in activities which related to their departments, such as transportation, security, guidance, publicity and lodging facilities.

Training and fieldwork

Training of the supervisors and enumerators for the census was held in August 1981 in five different training centres involving some 500 enumerators. The majority had some field work experience during the house numbering stage and in the housing census conducted from 11 to 20 May 1981. The training for the population census took about a week for supervisors and another week for the enumerators. The training was based on a manual especially prepared for the census.

Training was given by assistant superintendents who were assisted by the chief supervisors. The training manuals were used extensively for conveying concepts and for understanding the theoretical aspects of the census, while practical sessions were kept for the last two days of the training. Where possible training included the use of video guides. Enumerators were taught how to recognize a census house and census households. They were taught to prepare the census house card, interview households, plot their routes on the sketch map, and to fully understand the definitions of all items asked in the questionnaire. Thev were also exposed to possible field problems and trained how to deal with them in a tactful way.

The census was conducted from 26 August to 2 September 1981. Trained enumerators visited every house or building suspected of being used for habitation to collect information pertaining to household relationships, sex, age, place of birth, race, marital status, religion, level of education, age at first marriage, number of children born alive, employment and income of each person staying in the house or building during the census night the night of the 25 August 1981. All trained enumerators carried their letters of appointment and wore census badges. The enumerators were enthusiastic and appeared to be dedicated to their duties. Supervisors were asked to meet their five enumerators every morning to learn about their progress and to solve any field problems which might have arisen. The response of the public was generally good due to the wide publicity given to the census by radio and television before and during the census week. The central office and the district census offices kept continuous contact with various supervisors to receive day to day progress reports from enumerators.

Census enumeration was completed on 2 September and the supervisors and enumerators were allowed a few days to check and correct discrepancies before returning all census documents and other important materials to the central office. Editing and coding of census data were done at the central census office. The computer section of EPU was responsible for the processing of the data using an ICL main frame.

Evaluation

A Post Enumeration Survey was conducted by the staff of the EPU from 26 November to 17 December 1981. The purpose of the survey was to determine the percentage error and to have a general view of the quality of the data collected. A 10 per cent random sample of the total number of houses was taken covering all districts. The results from the post-enumeration survey showed that the field enumeration was well conducted.

Dissemination

The 1981 census tabulations were prepared on the basis of both what had been produced in the 1972 census and a list of additional tables drawn up after consultations with census users. References were also made to global recommendations on the type of census tabulations which were highlighted during the ESCAP regional workshop held prior to the census. The results were analysed and a first report released to all government departments. The local media also played an active role in disseminating the main census results. Emphasis was given on the distribution of population by district, sex, age group an ethnic composition at the national level.

Costs

The 1981 census was a little less than half a million Brunei dollars.

6. CHINA

Historical background

It was only after the founding of the People's Republic of China that organized nation-wide population censuses were conducted according to unified survey items, time and tabulation forms. The first population census was taken in 1953 when the total population was in excess of 600 million. The questionnaire was relatively simple and included name, relationship to household head, age, sex, nationality and address of household. The census data were obtained by manual tabulation. The second census was conducted in 1964 when the total population was in excess of 720 million. The questionnaire covered more topics from six in 1953 to nine. The three additional items were educational level, occupation and personal class status. As in 1953 the data were manually tabulated. The most recent population census was in 1982. The questionnaire of that census contained 19 items.

Design of the 1982 census

China's 1982 population census was guided by the Statute of the Third National Population Census which was approved and issued by the State Council of the People's Republic of China. The reference time for the Census was zero hour 1 July 1982. The census covered the 29 provinces, Municipalities and Autonomous regions in mainland China.

Everybody who held the citizenship of the People's Republic of China and was residing in the country was enumerated. The principle of permanent resident enumeration was followed, and everybody was enumerated at the place of his/her permanent resident.

The census procedures make the administrative area of a production brigade in rural areas, or that of a neighbourhood committee in towns and cities, a census enumeration area. China has four levels of people's governments, central, provincial, county and people's commune. Under the people's commune there were two other levels, production brigade (residents' committee) and production team (residents' group). Each administrative area at any level had clear cut geographical confines and an appropriate administrative structure. It was not necessary to spend resources and time on drawing detailed maps of enumerated areas. Instead, we took advantage of the existing administrative divisions and made the production brigades in rural areas, or residents' committee in towns and cities, enumeration areas. By that means, China was divided into 720 thousand census enumeration areas, each averaging about 1,500 persons.

There are 19 items on the questionnaire, which included 13 individual items of name, relationship to head of household, sex, age, nationality, registration status of permanent resident, educational level, industry and occupation, status of non-working members, marital status, number of children ever-born and remaining alive, women's fertility status in 1981, and six household items – type of household (family or collective), address coding, number of household members, number of births in 1981, number of deaths in 1981, and number of those who have left their registered place of residence for more than one year. That questionnaire was conducted all over the country, except in Tibet Autonomous Region where fewer questions were asked.

Committee structures

To conduct the census in a country of one billion people requires an authoritative setup to take charge of census work. China's second census was conducted 18 years previously and there was no permanent census office. However, it has been a tradition in China that people-oriented projects like the census are handled under unified leadership and in a well-coordinated fashion. In conducting China's 1982 population census we adopted and developed the experience of two previous censuses. Census offices of different size were established at all levels from the central to the provincial, prefectural, county, commune and production brigade level.

The 1982 Census was regarded as an important item on the agenda of government at all levels. Major issues concerning the census were decided by the people's government at each level through discussions. The head of population census leading group at all levels is a government official who is in full charge of the census.

The census office provincial and central levels consisted of four divisions. The first division, named enumeration division was responsible for formulating the enumeration scheme, design of questionnaire and giving directions on enumeration work. The second division, statistics division, took responsibility of designing tabulation forms and organizing the complete tabulation, advanced sample tabulation and manual tabulation. The third division, coding and computing division, was responsible for construction of coding, area-code and questionnaire code, data processing and the quality control for coding, data entry, editing and data processing. The fourth division, publicity division, was responsible for publicity work. Some experts and scholars from research institutes and universities acted as advisers.

The members of leading groups at all levels were staffed with officials of different departments connected

with planning, statistics, household registration, publicity, finance, civil administration, labour, health, family planning and education. The census offices at all levels were staffed with professionals from departments covering statistics, household registration and publicity and education. In this way, the census was not only the work of statistics departments, but also the common task for many concerned departments.

Training and registration

To familiarize leading cadres with population census-taking, we held more than ten conferences with participants of leading cadres and backbone members from all provincial, municipal and autonomous census offices.

In order to gain more experiences of census-taking and make the training programme for core staff of census offices more effective, we conducted several pilot censuses, first in Wuxi city and Wuxi county, in Jiangsu province and then at lower geographical levels. The number of people involved in the pilot censuses grew with each stage.

The pilot censuses covered a total population of 25.4 million and involved a staff of 504,000. Most of the persons involved in the pilot census became supervisors in the main census.

The training of enumerators was carried out at commune level. Instructors were provided by the counties. In all training courses the same teaching material compiled by the Census Office of the State Council was issued. Each training course lasted 5 to 7 days with the focus on contacting household and completing questionnaires. The trainees were also asked to read the terminology for enumerators, so that their questioning would be accurate, polite and easy to understand. An examination was taken at the end of the training course, and certificates were issued to those who passed.

Census registration stared simultaneously across the country on the morning of 1 July. There were mainly two ways of registration. First, census stations, a place easily accessible to the registrants (such as in a large courtyard, an apartment building or in a group of houses) where respondents come to answer questions asked by the enumerators on the questionnaire. Second, questioning and form-filling at registrants' homes. Approximately 80 per cent of the population were registered the first way and 15 per cent the second, and the rest completed registration at their work place with the help of the enumerators.

For the registration, in addition to 5.2 million enumerators and 1.1 million census supervisors, 8.6 million people volunteered to assist in the work. On average there were three such voluntary assistants for every two census workers. These assistants were well versed with local affairs, eager to serve and were capable guides, helping hands and advisors.

In order to enable the enumerator's work to be carried in an unhurried manner, a maximum of 40 to 70 persons per day were registered by one enumerator. The census supervisor, on the other hand, went round giving guidance and checking the work, reviewing the completed questionnaires and called enumerators for discussions on ways to improve their work. Registration finished throughout the country by 10 July.

Evaluation

In order to make a reliable assessment of the quality of the 1982 Census, many methods were used to evaluate the data quality. First, after registration was completed, a Post Enumeration Survey using sampling methods was taken for the purpose of evaluating the quality of the census enumeration. The census offices of provinces, municipalities and autonomous regions selected, 25 days after census reference time, by systematic and cluster sampling, 972 production teams and residents' groups as the sampling units according to the Regulations Governing the Sampling Check on the Quality of Enumeration Work. At the same time, relevant counties were instructed to seal up the questionnaires of these sampling units. The census offices then sent competent and specially trained personnel to selected sampling units where they conducted a PES. Figures thus obtained were compared with the original questionnaires. When discrepancies were found a second check was made to see if there were errors. The census personnel who had originally carried out the census enumeration were not supposed to conduct the PES.

Evaluation of the age and sex composition of China's population was made by calculating a Whipples index, Myers index and a United Nations Age and Sex Accuracy index. The underlying assumptions of these indexes were not always applicable to the Chinese situation. Nevertheless, they served as a guide.

The 1982 national sample survey of fertility, or the One-per-thousand National Survey of Fertility of Women, was conducted by the Family Planning Commission of China in September 1982. It adopted the census reference time, used census control list as its sampling frame, employed a group of enumerators entirely different from that of the census, and applied a sampling design different from the PES. Since the survey was conducted only two months after the census enumeration, it may be seen as a second PES completely independent from the census and therefore is important for evaluating the census quality. The two sets of results showed a high degree of consistency.

Data processing

Processing of the census data was taken in three steps. First, the major figures were obtained by manual tabulation with abacus and calculators within three months of the census enumeration, and a communique was issued.

Second, computer processing of a 10 per cent sample of the data was completed within one year. Third, the final census data were processed within two years. After the census enumeration, recheck and acceptance were completed, a group of people were selected from among the enumerators and trained for the manual tabulations which included 7 out of 19 items. The work was performed at six levels: census area (product brigade), commune, county, prefecture, province and finally the national level. This work began on 21 July 1982 and was completed on 20 October 1982.

Coding the enumerations of one billion people is a monumental task. The work was divided among 2,741 counties and equivalent units. Intensive training of coders was made by county level units throughout the country using the same course including a set of slides and pamphlets. After strict examination, those who passed were issued certificates. Every coding team was divided into groups and a system of quality control and checking maintained. After the checking, the census office of prefectures and provinces sent people down to the counties to check and accept against the quality control criteria.

Data entry was conducted in 28 provinces, municipalities and autonomous regions at the same time using the key-to-diskette devices to convert the data on questionnaires into machine readable form. In order to ensure the smooth operation of data entry each census office assigned personnel to work in shifts at computer centres and be ready to answer questions arising during the recording process.

After assessing the experience of several pilot censuses and through repeated discussions and revisions, the Census Office of the State Council developed the Rules of Computer Logic Check containing 11 articles with 51 items. The system consists of five components. The first component, which might be called a structural check of input records, examined the sequence and types of input records, and the consistency between the number of household members reported in the record of the household and the actual number of person-records for the household. The second component was a validity check to examine the individual codes. The third was a consistency check between two or more codes. The fourth concerned procedures for correcting or imputing invalid or inconsistent codes. The fifth component was a compilation of the error statistics.

Two-level decentralized data processing depends upon large scale data processing equipment. We used 30 computer systems, one IBM4341 system was set in the national computer center, 20 IBM4331 systems, 8 WANG VS/80 systems and one FILLIX C-512 system were used at the provincial level.

Analysis and dissemination

An international seminar on China's 1982 Population Census was held in Beijing from 26 to 31 March 1984 by the Population Census Leading Group of the State Council and the State Statistical Bureau. Some 88 participants attended the seminar and 47 academic papers were presented. The papers covered a wide range of analysis, ranging from census organization to data processing and from evaluation of the reliability of the census results to analysis of census results, fertility, mortality and also the trend and projection of China's population.

After the manual tabulations, 10 per cent sample computer tabulations and the final results were completed, the census offices at provincial and national levels provided several special reports to government. So far, the State Statistics Bureau and Census Office of the State Council have published the following:

1. Communique of China's 1982 Population Census;
2. Major Figures of China's 1982 Population Census;
3. 10 Per Cent Sampling Tabulations on China's Population Census;
4. Results of Computer Tabulation on 1982 Population Census of China;
5. Papers for International Seminar on China's 1982 Population Census;
6. Population and Death by Ages, Sex and Provinces, Municipalities and Autonomous Regions.

Publicity

In the pre-census months under the leadership of government at different levels, a publicity campaign was launched in newspapers, broadcasts and television and through films, slides, performances of dances and songs, streamers, leaflets, posters and so on. Meanwhile, millions of grassroots cadres and census workers and tens of millions of volunteers, as well as primary and secondary school teachers, were organized for publicity work. In the publicity drive, efforts are made to help people understand the relationship between census and national development and between census and people's standard of living, and to explain the survey items and their meaning. People were asked to co-operate and report truthfully. At the same time it was emphasized that the census would not affect the rights and obligations of citizens.

Personnel and costs

To make the 1982 census successful, census offices were established at all levels from central to the provincial, prefectural, county, commune and production brigade. Member of census offices at all levels consisted of departments concerned with statistics, household registration, publicity and education. Both the enumerators and supervisors were loaned from various units by the local people's

governments in line with the requirements set by the state and quota set by the local census offices. A few of them were recruited from the general public. Statistics show that among the enumerators, 20 per cent were cadres and workers from administrative offices and enterprises, 6 per cent were teachers and workers from schools, 69 per cent were from offices of communes or production teams and 5 per cent from among the public.

The budget expenditure for both central and local authorities was about 400 million yuan ($US 208 million). The UNFPA provided support of $US 15.6 million which was mainly spent on data processing equipment.

Issues

Naturally, there were some shortcomings in the 1982 Census: some quality control standards were a bit too strict, the procedures were somewhat too complex and the final tables were imperfect in some respects.

Plans for the next census

The State Council of China has made a decision to conduct the fourth population census of China in 1990. Preparations are currently being made. We plan to innovate in the questionnaire to be canvassed. We envisage increasing the number of items to include migration for example.

7. COOK ISLANDS

Historical background

Census activities began in the Cook Islands in 1902, following the annexation of the Cook Islands by New Zealand. The second census of population was in 1906 and then every fifth year thereafter. The New Zealand Government, during its administration, appointed a Chief Enumerator in Rarotonga. The Chief Enumerator in his turn engaged the Resident Agents on each island to conduct the field work. The Justice Department was responsible for the various census activities. The scope of the early censuses was limited to head counts.

Questions on age or sex were not asked. The main interest was to know the number of Maoris and Europeans on each island. While the Maoris were simply counted, more detailed information was sought of the Europeans. Gradually questions on sex, age, marital status, religion and so on were added to the schedules. The 1966 census, conducted after the Cook Islands assumed self governing status, was by far the most complete census taken and covered housing also. Since 1966 the censuses of population and that of dwellings have been conducted simultaneously. The 1986 census was the fourth conducted by the Cook Islands' Statistical Office.

Results of earlier censuses were published as part of the New Zealand Census Report. The first published independently and in the Cook Islands was for the 1966 census. The 1976 census report included some hitherto unpublished data from earlier censuses for comparative purposes.

Results of all censuses up to 1961 were processed manually. The 1966 and the 1971 censuses were processed with the help of the New Zealand Computer Service. For various reasons the final results of the 1971 census were not available before March 1976, almost five years after the field work. This unpleasant experience of computer processing was one of the factors which influenced the decision to process the 1976 census data manually. In the 1981 census, the Cook Islands once again moved back into computer processing using a microcomputer provided by the UNFPA. Processing was done in the Cook Islands and a great deal of experience built up.

The 1986 census

The 1986 census was a *de facto* census which covered all persons found present in the islands, and on the inter-island vessels, on the preceding night. Crew and passengers of foreign vessels were enumerated only if they landed on the shore. Thus Cook Islanders living or holidaying temporarily abroad were excluded while foreigners temporarily in the Cook Islands were included.

During the 1986 census preparations additional topics were raised and added to the questionnaires, including a question on the ways of collecting and storing water, a question related to agricultural services together with questions on fishing and fishing capabilities. There was also a question on energy driven appliances. In the Personal Questionnaire a question on migration, with a time-frame for periods absent from usual residence of six months or more during the last five years, was added.

Land rights in the Cook Islands is a sensitive issue due to the fact that many persons have rights to land but are temporarily absent. The Cook Islands Land Registry Office have complete records of persons who have a right to the land but these records are not readily available for analysis. The 1986 census asked information regarding land ownership by type, lease, occupation right and family land.

Census methodology

The Census Organization did not have to create new maps. The Statistics Office had earlier in the year updated its maps to facilitate the Household Expenditure Survey. These maps were used for the census. Updating of the maps was done by the census field staff during the pre-enumeration stages. According to legal requirements, the Census Organization is headed by the Chief Census Officer and the Census is required to be conducted every five years. The Chief Census Officer in the last census selected the various committees associated with census taking. During the planning stages of the census, committees were comprised of members of the Public Service Commission; Ministry of Health; Ministry of works; Ministry of Internal Affairs; Ministry of Economic Development; Ministry of Trade, Labour and Transport; Ministry of Post and Telecommunications; Ministry of Energy, and Department of Electric Power Supply.

Training of the field workers was carried out together with the distribution of the census field papers. The final field workers were selected on the basis of their past experience in census field work and secondly of their knowledge of the area assigned. Peace satellite training sessions were carried out also for the Northern Group Islands in addition to the rather hurried session during the local vessels visit. Training materials included the Census Instruction Manual.

The 1986 census has not been fully processed because of the effects of a cyclone. Some editing was carried out in

the field when the census records were collected. Further editing is still being carried out. The 1986 census results will eventually be publicised in the same manner as the 1981 results. The final tabulations should be released before the end of 1987. Some demographic analysis will be conducted jointly with the assistance of the South Pacific Commission. This may be seen as an attempt by the Cook Islands to analyze the data with the assistance of an outside agency so as to ensure the necessary standard and to provide training for Statistics Office personnel in the field of demography.

8. FEDERATED STATES OF MICRONESIA

Historical background

Prior to the formation of the Federated States of Micronesia in 1979, censuses of the population were undertaken by a variety of governments and organizations, including the Japanese Government, which administered the territory from 1914 to 1945. Since 1945 censuses have been organized by the United States Department of the Navy, the United States Bureau of the Census, the Office of the High Commissioner of the Trust Territories of the Pacific (with technical assistance from the South Pacific Commission), and the Division of Statistics of the Office of Planning and Statistics of the Government of the Federated States of Micronesia.

Prior to the current census round, the most recent censuses were those of 1973, 1980 and 1985 round. The 1973 census was organized through the Office of the High Commissioner with help from the South Pacific Commission (SPC), and the 1980 exercise by the United States Bureau of the census. Doubts have been expressed as to the accuracy of both of these censuses, mainly because the results of the 1980 census were at variance with projections made for that year based on the 1973 census. In the case of Yap, Truk and Pohnpei (three of the four States in the Federation) it seemed there was an undercount in 1980 (or an overcount in 1973), and in Kosrae the reverse appears to have been the case.

However, in the absence of post enumeration surveys it is difficult to draw any firm conclusions about the level of coverage. Moreover, the population projections, which called into question the accuracy of the census results, are also suspect since vital statistics of births and deaths are incomplete. It was from these data that estimates of fertility and mortality projections were made.

The 1985 census

The Congress of the Federated States of Micronesia allocated funds for a nation-wide census programmes starting in 1985. Censuses have so far been taken in Pohnpei (1985), Kosrae (1986) and in Yap (1987); preparations are being made for a census in Truk. The reason that censuses were spread over a two-year period was the high resource cost of taking a census in all four states at the same time. From a statistical point of view, it would have been preferable if simultaneous censuses could have been undertaken in the four states. However, given the availability of staff and the distances between islands that was not feasible.

The Federated States of Micronesia census programme has been designed to facilitate subsequent health, economic and demographic surveys. Based on experience in Pohnpei and Kosrae, we are attempting to use the results of the Yap census to set up a continuous population register – a permanent and complete register of all persons by name with their vital event histories. This is an ambitious undertaking, and as yet we are not sure if it will succeed. If it does, we will be in a much stronger position when detailed analytical work is carried out.

The census questionnaires for the 1985 round of censuses were designed to reflect national characteristics. Subsistence farming/fishing is the predominant economic activity in the Federated States of Micronesia. Nations of economic activity and the classification of people into various occupations are not very relevant in our context; particularly so if economically active people are defined as those in a market economy. Hence, we have collected data on economic activity without direct reference to the concept of economically active population.

In the Federated States of Micronesia, the 1985 round of censuses were undertaken on the basis of a *de facto* count, that is people were enumerated at the place they spent the night of the census, rather than on the basis of a *de jure* count. One of the main reasons for difficulties with some of the earlier censuses was that the *de jure* method was used and that tended to give biased counts. For many people, the concept of place of usual residence is linked to place of birth or the place where the parents live, which may be different from the place in which the person usually sleeps. We therefore favoured a *de facto* count.

By undertaking censuses sequentially in the different States we have been gaining experience over time. We have also been able to extend the questionnaire, so that, for example, additional questions on housing have been included on the Yap questionnaire form. In ideal circumstances it would be best if the forms in all four States were identical, some compromises had to be made when the census programme was started.

Plans for the next census

The next national population census in the Federated States of Micronesia will be held in the early 1990s. At the present time we are taking stock of the current census programme, noting technical and logistical observations to be incorporated into future censuses. We are also aware that the data collected so far in our censuses are only of a very basic nature. The data collected have deliberately been kept to a minimum so as to obtain accurate responses. However, as statistical awareness grows, we intend to expand our questionnaires to include additional sections on housing and amenities.

9. FIJI

Historical background

Fiji has a history of census-taking dating back to 1881 when the population was just over 127,000. Censuses after 1881 have been carried out every ten years with a break in the series after the 1921 population count when the interval was 15 years. Since 1936 there has been a census ever ten years, the most recent being in 1986.

The objective of earlier censuses was counting the number of persons living in each geographical and administrative areas in Fiji, with some of their basic population characteristics such as age, sex and ethnicity. Only later did the information gathered extend to include topics on economic and demographic characteristics. For the first time in the 1986 census questions on housing and services were added.

Design of the 1986 census

Planning for the 1986 census begun in 1985 and some preliminary work was undertaken to revise the geographical frame in urban areas. However, it was not unitl January 1986 that a Census Office was established to begin active preparations for a census to be taken with reference to 31 August.

The 1986 census was conducted under the authority of the Census Act. Under the Act the Public Service Commission (PSC) should appoint a Census Commissioner to conduct a census for the country. In November 1985 the PSC appointed the Government Statistician to be the Census Commissioner. The Census Commissioner was supported by a Census Administrator and by a team of professionals and clerical officers from the Bureau of Statistics. A cartographer joined the office just before the enumeration to be responsible for analytical mapping. Temporary coders and data entry operators were appointed as required. Divisional Planning Officers and District Officers were appointed Superintendents of Census, to be responsible for the enumerators.

Because of time considerations it was decided that census methods and procedures should be similar to those in 1976. The census was held on a *de facto* basis. The count was conducted as a house to house canvass by enumerators in the five days following census night and the information recorded on household forms.

Potential users of census information were consulted as to their needs. Far more requests were received than could be accommodated in the census and many were unsuitable. It was apparent that while intercensal sample surveys can provide data which are valid at the national level, there is no substitute for the census as a source of information for small geographical units and for that part of the economically active population which cannot be reached through surveys of establishments, for those active in subsistence occupations, for the unemployed and for those not economically active. It was in these areas that demand was pressing and the difficulties most intractable.

A questionnaire was drawn and tested at a pilot census in 13 enumeration areas chosen to give experience of working in diverse and difficults conditions. The pilot census was taken with reference to Monday 24 February. The field work was supervised by professional officers of the Bureau of Statistics working independently and was concluded by Monday 3 March.

The pilot census provided experience which afforded a sound base for planning the enumeration. The effectiveness of the questionnaire and enumerator's instructions were assessed, public response was gauged and administrative problems were explored. It was not possible to process the data fully, but six tables were compiled by hand in order to obtain information with which to assess the working of the questions.

The practice of conducting the enumeration as a double round of visits, in use since 1956, was abandoned. It was thought that a canvass, before census night to record particulars of persons dwelling in a household and likely to be there on the night, followed by a quick round of visits after census night to bring the record up to date was efficient and productive of more accurate results than could be obtained otherwise. However, the double doubt approach is more expensive in manpower and time. It was demonstrated at the pilot that a simple single round procedures had operational advantages and that accuracy was not sacrificed.

There was no time for elaborate mapping before the 1986 census. Fortunately the 1976 frame was basically sound and the rural population is relatively stable in location. Field work was concentrated on urban and peri-urban areas where there had been rapid development. Base maps were those used in 1976. There had been no significant new mapping undertaken since. There were no air photo mosaics up to date, though there was some recent air photography from 1984/85. Enlargements were obtained, rough mosaics were compiled in the Census Office and were used in the field to re-establish 1976 boundaries and make viable subdivisions where necessary. The staff who did this work subsequently briefed those responsible for the enumeration. In rural areas, the topographical maps from 1976 were up-dated to show recent physical development, mainly rural roads.

The 1986 frame allows direct comparison with 1976 at the level of the enumeration area (approximately 100 households). This was done by adding an extra digit to the enumeration area (EA) identifying codes so as to permit sub-divisions of EAs where necessary, mainly in urban and peri-urban areas. Similarly, the definition's urban and rural were maintained unchanged in order to keep direct comparability with the censuses of 1966 and 1976, notwithstanding changes to municipal boundaries and the creation of Lami Town. If changes were shown to be necessary they were made after the enumeration on the basis of information as to the proportion of persons in non-agricultural occupations and other criteria.

The provisional questionnaire, tested at the pilot census, was more ambitious than any used in previous censuses. Its working was critically examined and improvements were made in the light of experience. Apart from new household questions, the main new feature was the inclusion of supplementary questions on place of birth and of residence in 1981. The past practice of showing population movement in a provincial matrix was defective because it did not properly allow for urban-rural sectoral flows to be shown. Some urban areas extend over two provinces and some provinces had two or more urban areas. The provincial matrix was nevertheless maintained to preserve comparability with past censuses and a more useful one was constructed.

Publicity

The main thrust of pre-census publicity was to put a leaflet into every household beforehand. It explained in English, Fijian and Hindi what the census was about and how it would be taken. On the reverse was a facsimile questionnaire which showed what questions were being asked and which might be completed beforehand to save time and trouble. They were distributed through schools and by courtesy of the Fiji Electricity Authority to all its domestic subscribers. Leaflets were supplemented by posters which were displayed in shops and public places and by a booklet called "The Census: Questions and Answers". Extensive use was made of the wireless in co-operation with the Fiji Broadcasting Company.

It is difficult to assess the effects of the publicity campaign but there is no doubt that the census enjoyed the public support it needed as well as good and sympathetic coverage in the press. Virtually everyone in Fiji knew that a census was being taken and the vast majority co-operation excellently.

Fieldwork

Arrangements for planning the enumeration strategy were begun as soon as the lessons of the pilot census had been studied and the procedures decided. Legal powers were taken, rates of pay were agreed, printing was arranged, administrative instructions were written and materials were designed, ordered and made ready. Census Superintendents were briefed at a conference in Suva on 7 to 11 July. They were responsible for the conduct of the enumeration in their areas and began preparing for it immediately after the conference.

For each district a plan of operations was drawn to show requirements of manpower, transport, fuel and money for training and for the enumeration itself. Superintendents had a free hand as to whom they recruited as long as those they chose were mature, had secondary education and were acceptable to all sections of the community. The Census Office prepared a manual of Instruction for superintendents, supervisors and enumerators which became the instrument used in training sessions.

The enumeration coincided with the school holidays from 22 August to 8 September. Census night, 31 August, was a week later than had been planned in order to accommodate a meeting of the Great Council of Chiefs. The period 1 to 6 September was allowed for the enumeration which was completed on time in all but a handful of areas where field checking went on for an extra day or two. By 26 September all records had been returned from the field and on 6 October preliminary results were published.

Data processing

Coders carried out a clerical edit and entered numeric codes on the questionnaires. These were input to the computer from the original documents. On input, data were subjected to a structural edit to ensure that records were neither omitted nor duplicated and that identifying codes were valid. Errors were corrected on line and no further processing was undertaken until the data file was structurally sound.

Codes were next checked for range and consistency, the checks being built round values for sex and age in such a way that characteristics incompatible with these parameters were reported. Corrections were made automatically in accordance with predetermined rules. The general rule was to impute not stated values for invalid codes and for inconsistent subordinate characteristics.

Analysis and dissemination

It is envisaged that the first batch of tables would be produced by the end of April 1987. The census report will have five parts to the analysis. The first will be administrative report with the tables as produced by electronic data processing (EDP) services. The second report will be an analysis of demographic characteristics. The third report will contain social characteristics with emphasis on employment and education. The fourth report will have internal migration and the fifth will cover household characteristics.

The first stage in disseminating census results was the publication of provisional figures released on 6 October

1986. Since then supplementary requests have been met where possible on an *ad hoc* basis, with the authority of the Census Commissioner. A series of relatively small volumes presenting raw data with no analytical commentary is envisaged.

Access to census data files will be confined to approved official users until the various reports have been published. The data tapes will be copied and released to approved users. Nothing on the tapes appears to breach confidentiality but if it is thought desirable to ensure anonymity, the EA codes might be deleted together with small locality codes.

Costs

Unlike previous censuses, where the Fiji census enjoyed much funding from United Nations Population Fund (UNFPA), the 1986 census was done mostly from Fiji's own funding. The census office was set up in late 1985 and costing to run the census office goes through 1988 when the bulk of the reports will be produced. The estimated budget for the 1986 census was $F 1.2 million.

Issues

1. Advance planning: As mentioned earlier, the main constraint was the extremely tight schedule and inadequate time for proper planning. The whole exercise was planned and actually carried out within ten months (from November 1985 to August 1986). This should not be allowed to happen during a major project such as a census.

2. Mapping: Delineation of boundaries for each enumeration areas should be continuously revised and up-dated with reliable maps used. Continuous consultation and co-ordination should be held between the Census Office and the Department of Lands and Surveys.

3. Data processing: In-house data processing equipment and facilities together with local capabilities should be developed well in advance for the 1996 census.

4. Team work: Consideration will need to be given for field staff to work as a team, one supervisor and all enumerators in his/her area to cover the area together, rather than one enumerator for each EA. This may help better coverage and adequate supervision and checking at all times.

10. FRENCH POLYNESIA

English summary

Since 1848, 28 censuses have been carried out in French Polynesia. There are two separate periods: before 1945 (simple population counts) and after 1945 (modern censuses). The last was carried out on 15 October 1983 by a team from the French National Institute for Statistics and Economic Studies. The newly created Territorial Statistical Institute of French Polynesia (established in 1980) provided important logistic support (in the form of mapping, loan of senior personnel, preparation of data processing procedures).

The 1983 census comprised a "housing" part and an "individual" part. Difficulties in collecting data – apart from those pertaining to the wide dispersion of the outlying islands over an area as large as Europe – were encountered in the urban area because people were away from home at work and because of the quality of the enumerators. No evaluation of the censuses has ever been carried out in French Polynesia. The cost per head of the census was $US 4.15, which is a fairly high figure. The next census is to be held in 1990 or 1991.

Historique des recensements sur les populations et les logements

La première opération démographique effectuée en Polynésie Française date du ler février 1848. Il s'agissait d'un dénombrement qui ne concernait que Tahiti et Moorea (Iles du Vent). Elle visait surtout à compter la population polynésienne, les autres étant à l'époque encore peu nombreux (essentiellement des militaires et quelques fonctionnaires ou commerçants).

De 1848 à 1983, 28 opérations de recensement ont été menées en Polynésie Française. En fait, il faut distinguer 2 périodes, avant la dernière guerre mondiale et depuis 1945. De 1848 à 1941, 20 opérations de dénombrement ont eu lieu; ce n'est qu'en 1902 que l'ensemble des archipels a été couvert de manière complète. Ces operations se limitaient au décompte des effectifs, mais avec des variations de méthodes (prise en compte ou non, selon les circonstances, des troupes de marine) qui rendent les comparaisons difficiles; généralement les résultats distinguaient les hommes des femmes, les enfants de moins de 14 ans des adultes, les populations autochtones des populations non originaires. Sur le plan démographique, les recensements de cette période ont été de peu d'intérêt.

A partir de 1946, les recensements deviennent de véritables opérations démographiques, tout en gardant leur aspect administratif. L'Institut National de la Statistique et des Etudes Economiques (INSEE) a ainsi procédé à 7 recensements depuis 1946 (1946, 1951, 1956, 1962, 1971, 1977, 1983), une 8 ème opération (plutôt administrative) a été menée en 1967 avant la mise en place de la réforme communale. Toutes les opérations de l'après-guerre ont porté sur l'ensemble du territoire et sur l'ensemble des populations. En 1946 et 1951 apparaissent des bulletins individuels, mais en 1956, le recensement se fait avec un questionnaire appelé feuille de ménage sur laquelle sont portés tous les individus. Il en sera de même en 1962 et 1971. En 1977 apparaissent les feuilles de logement et les bulletins individuels. Les feuilles de logement permettent de faire pour la première fois un recensement des logements et d'obtenir des informations sur les habitations et sur l'équipement des ménages. En 1983, le même processus a été utilisé.

Les recensements de Polynésie Française n'ont jamais été très innovateurs, dans la mesure où ils s'inscrivent dans un programme national qui prévoit le recensement de la Métropole, celui des départements d'outre-mer (Martinique, Guadeloupe, Guyane, Réunion, Saint-Pierre et Miquelon) et celui des territoires d'outre-mer (Nouvelle-Calédonie, Wallis et Futuna, Polynésie Française). Les questionnaires sont généralement mis au point en France, après consultation locale. L'existence d'un état civil bien tenu et fiable n'a jamais permis d'envisager de poser des questions du type des méthodes indirectes de démographie, alors que cela permettrait de tester la "robustesse" de ces différentes methodes.

Conception du dernier recensement

Le dernier recensement a été réalisé le 15 octobre 1983. Le maître d'oeuvre en a été l'INSEE, comme pour tous les autres recensements depuis 1946. L'Institut Territorial de la Statistique est intervenu en qualité de support logistique, notamment en préparant la cartographie, en fournissant quelques agents d'encadrement et en réalisant l'exploitation informatique. Aucun échantillonage n'a été utilisé lors du dernier recensement, ni des précédents. Le dépouillement est effectué sur l'ensemble de la population ou des logements, en raison des faibles effectifs.

Les recensements de 1977 et 1983 ont été réalisés en s'appuyant sur une documentation cartographique complète. Ainsi le découpage de la ville de Papeete a été le même pour les 2 opérations. Pour les autres communes, le découpage a tenu compte des entités administratives du territoire, à savoir les communes et communes associées qui correspondaient aux anciens districts existants avant la reforme communale. En 1983, la mission INSEE qui s'occupait du recensement a bénéficié pour Tahiti et Moorea, ainsi que pour certaines zones assez peuplées

du'une couverture aérienne au 1/5000 ème. Pour le reste du territoire, une cartographie (à échelles variables) a permis de découper les différentes communes associées en districts de recensement. L'existence de la couverture aérienne a notamment facilité le travail de contrôle des opérations de collecte.

Structures des comités

Dès 1981, l'Institut Territorial de la Statistique a procédé en Polynésie Française à une consultation large des autorités et services administratifs afin de connaître les désidérata de chacun pour le recensement de 1983. Mais en fait aucun comité n'a été officiellement mis en place. Ancun comité directeur n'a été crée en 1983, ni les années précédentes. La direction technique du recensement de 1983 était assurée par un administrateur de l'INSEE, assisté d'un attaché de l'INSEE, de 2 cadres de l'Institut Territorial de la Statistique, et de 5 chefs de secteur et d'une vintaine de contrôleurs. Aucun comité d'utilisateurs n'a été mis en place.

Formation et travail sur le terrain

La formation des contrôleurs et agents enquêteurs s'est déroulée en 2 étapes. Les contrôleurs ont été formés en premier pendant près d'une semaine, avec des opérations sur le terrain. Les agents enquêteurs ont été formés en 2 jours, avec un certain nombre de tests pour s'assurer de la compréhension des concepts utilisés et des méthodes utilisées. Les contrôleurs ont assuré une partie de cette formation, sous la responsabilité des chefs de secteur.

Evaluation

Aucune opération d'évaluation de recensement n'a jamais été entreprise en Polynésie Française. L'Institut Territorial de la Statistique envisage de demander que le prochain recensement soit suivi d'une opération de ce type, au moins sur la zone urbaine, où il semble qu'il y ait le plus de problèmes. Une opération de mise à jour du fichier des logements, en 1984-1985, en vue de préparer une enquête par sondage sur les revenus et les dépenses des ménages, a montré qu'un bon nombre des logements déclarés vacants en 1983 ne l'étaient pas.

Traitement et analyse des données

L'ensemble de la codification, de la saisie, du traitement et de l'analyse ont été effectués en Polynésie Française, les tableaux issus du recensement étant disponibles le 15 avril 1984, soit 6 mois après la date officielle du recensement. Une première vérification des documents était effectuée par les contrôleurs ou chefs de secteur sur le terrain au moment de la collecte. Cette vérification visait à contrôler les absences d'informations et à y remédier sur place. Après rassemblement des documents à Papeete, ceux-ci étaient chiffrés en vue de leur saisie par voie informatique.

Un contrôle immédiat de saisie (validité des codes) était assuré lors de la saisie. Après saisie, un certain nombre de contrôles de cohérence étaient réalisés sur les données et des rectifications étaient effectuées soit par retour au questionnaire, soit par redressement automatique. La mise en tableaux a été réalisée dès que les fichiers ont été disponibles, un certain nombre de tableaux ayant été définis d'avance. Les notes explicatives et une analyse descriptive des résultats du recensement de la population ont été rédigées en avril 1984 et diffusées sous forme provisoire dès le mois de mai 1984, sous forme définitive en septembre 1984.

La totalité du recensement a été traitée sur l'ordinateur de l'Institut Territorial de la Statistique, un IMB 34. Pour la saisie et les redressements, un logiciel a été spécialement écrit. Pour la tabulation, il a été fait appel au logiciel DES (Dépouillement d'Enquêtes Statistiques) mis au point par les informaticiens de l'Institut Territorial de la Statistique pour la tabulation de tous les travaux. Ce logiciel permet de tabuler sur un fichier en croisant jusqu' à 8 variables, en sélectionnant tout ou partie du fichier (6 sélections possibles en même temps, avec les arguments ET ou OU, et les opérateurs =, <, >, < >, > =, < =); de plus le nombre de variables peut être accru en utilisant des cumuls qui apparaissent dans les colonnes, comme des sous-variables). Ce logiciel a également été utilisé pour Wallis et Futuna et la Nouvelle-Calédonie, les informaticiens de l'Institut Territorial de la Statistique et des Etudies Economiques de ce territoire l'ayant complété et perfectionné. Dans la mesure où les fichiers informatiques sont disponibles à l'Institut Territorial de la Statistique, il est possible de dire qu'il existe à tout moment une corrélation entre l'informatique et le domaine d'utilisation. Il faut cependant noter que les fichiers sont strictement anonymes, conformément aux dispositions d'une loi de 1951 sur le secret statistique, et qu'une loi datant de 1978, appelée "loi informatique et libertés" et applicable en Polynésie Française, est venue renforcer la protection des citoyens en ce domaine.

Analyse et diffusion

Une analyse purement descriptive des résultats du recensement a été effectuée en avril 1984. Aucune analyse démographique n'a été entreprise, en partie en raison de l'existence séparée de données d'état civil. L'Institut Territorial de la Statistique prépare un document qui reprendra une partie des résultats du recensement de 1983 et analysera les mouvements de l'état civil. Des projections de population seront entreprises ensuite. Les rapports techniques n'ont eu pour destinataire que l'INSEE. Aucun tableau n'a été considéré comme spécial. Tous les tableaux édités ont fait l'objet d'une diffusion sans restriction. Tout tableau peut encore être demandé à l'Institut Territorial de

la Statistique qui possède un exemplaire des fichiers de tabulations.

Les fichiers informatiques sont propriété de l'INSEE à qui les demandes de copie peuvent être adressées (INSEE – division DOM-TOM – 18, boulevard Adolphe-Pinard – 75675 PARIS Cedex 14 – France) > Toute demande de tableaux peut être formulée à l'Institut Territorial de la Statistique (B.P. n° 395 – PAPEETE (Tahiti) Polynésie Française).

Publicité

Une publicité a été entreprise 2 semaines avant la date officielle de recensement (15 octobre 1983), par voie de presse écrite, de télévision (en français et en tahitien), de radio (en français et en tahitien), d'affiches apposées dans les lieux publics. Pendant les opérations de collecte, des messages fréquents ont rappelé que le recensement était en cours. La diffusion des résultats a fait l'objet d'une large publicité auprès des organes de presse.

Personnel et coût

Outre l'équipe d'encadrement (2 statisticiens de l'INSEE), le recensement a necessité le recrutement de chefs de secteur (5), de contrôleurs (une trentaine), d'agents recenseurs (240), de chiffreurs (8), de personnel de saisie (7). C'est donc environ 300 personnes qui ont participé au recensement de 1983. Le coût global du recensement de 1983 a été de 4,185,000 francs français, soit 76,1 millions de francs cfp (690,000 dollars US, au taux de change 1987), soit 456 francs cfp par individu recensé (4,15 dollars US). Ce coût peut paraître prohibitif, mais il est fonction du niveau de salaire de la PF, et du problème des déplacements sur un territoire éparpillé sur une étendue d'océan vaste comme l'Europe. La totalité des coûts du recensement de la population de 1983 a été supportée par le gouvernement français (budget de l'INSEE).

Aperçu rapide des plans envisagés pour le prochain recensement

Aucun choix technique n'a encore été opéré pour le prochain recensement de la population qui devrait avoir lieu en 1990 ou 1991.

Il comportera une partie recensement des logements et une partie recensement des populations. Les travaux cartographiques commenceront dès 1988. Les consultations préalables à la rédaction des questionnaires seront entreprises en 1988 et début 1989.

Faut-il effectuer un prérecensement de manière à alléger le travail des agents recenseurs et les tâches de contrôle? Faut-il recueillir ou traiter une partie des informations par sondage? Faut-il effectuer une opération post-censitaire de contrôle? Ce sont trois questions (parmitant d'autres) auxquelles il faudra répondre avant d'engager la mise en place des opérations. Il est vraisemblable que la totalité de l'opération sera traitée informatiquement sur le territoire comme en 1983.

11. GUAM

Historical background

The Island of Guam was ceded by Spain to the United States of America in 1898. From 1898 to 1950, except during the brief period of Japanese occupation during Second World War, the Island was administered by the Department of the Navy. Subsequently Guam was transferred from the Secretary of the Navy to the Secretary of the Interior. Local censuses of population were taken by the naval governors in 1901 and 1910. In 1920, and in subsequent censuses, the population of the Island was enumerated in conjunction with the regular decennial census of the United States.

Since the 1920 census, the concepts, coverage and scope have remained unchanged. However, questionnaire designs have been gradually expanded to address more of the territorial needs and specific requirements for proper planning. The enumeration was conducted on a *de jure* basis, where the population was counted at their usual place of residence or usual place of abode. This is generally construed to mean the place where an individual lives and sleeps most of the time. This place is not necessarily the same as his legal residence, voting residence, or domicile; however, in the vast majority of cases, the use of these different bases of classification would produce substantially the same statistics, although there may be appreciable differences for a few areas.

In the application of this rule, persons were not always classified as residents of the places in which they happened to be found by the census enumerators. Ordinarily, visitors in private homes and transient guests in hotels were not enumerated as residents of these places. Information regarding persons away from their usual place of residence was obtained from other members of their families, landlords, neighbours and so on.

Design of the 1980 census

For the 1980 census, the preparation of maps began in 1977; these were edited for errors and inconsistencies since the quality of the maps directly affects the accuracy and completeness of the census. The contents of these maps were divided into two categories. First, Enumerators Districts (EDs), which were designed to be handled by one enumerator. An ED boundary can easily be recognized by visible roads, streets, streams or major power lines, and encompasses an optimum 140 to 160 housing units. There were 198 EDs covering the entire island. Second, Crew Leaders' (Supervisors) Districts (CLDs) – approximately 27 CLDs were drawn to accommodate the supervision of 212 enumerators. The ratio of enumerators to supervisors was between 7 and 8. The preparation of the census questionnaires commenced in November of 1978 with the assistance of two staff members from the East-West Population Institute (EWPI), East-West Center (EWC). Several meetings with other government departments were held to address the contents of the census questionnaires. The final meeting was held in Honolulu, where recommendations for the 1980 census were submitted and discussed with the United States Bureau of the Census staff by representatives of the Territory of American Samoa, the Commonwealth of the Northern Marianas, Guam and the Trust Territories of the Pacific Islands.

Committee structures

A complete Count Committee was formed in December 1979. Its purpose was to launch a publicity campaign to inform the public of the confidentiality safeguards regarding personal census information, of the federal funds that flow to Guam on the basis of the census figures, and of the many other benefits to the community that come from various programmes based on census data. The confidentiality was a basis for the confident co-operation of the public. A Census Advisory Council was an outgrowth of the Local Review Program requested by the United States Bureau. In addition to screening preliminary census figures before they were made public, the Council provided advice in the preparation and the taking of the census. Membership included university professors, government officials connected with the services of education, public health, labour, economic affairs, and planning, representatives of private and semi-official organizations, and persons representing other data users and interested groups.

Training and fieldwork

The census staff took an oath that personal information could not be used for other than strictly statistical purposes and could not be revealed in any identifiable form. The census oath of office placed a legal requirement upon the employees to guard and keep individual information confidential. The oath of office was given crew leaders and enumerators on their first day of training and to other staff on the first day they reported to work.

The census co-ordinator and his assistants trained the census staff and 27 crew leaders. With the aid of the census co-ordinator, the crew leaders, in turn, trained the enumerators. The training sessions were held a few days before census day. The proper training of supervisors was essentiallly because they were required to train and supervise the

enumerators during the field work. The supervisors were required to familiarize themselves with the training materials provided by the United States Bureau. They were trained to the extent that they fully understood the maps, questionnaires, instructions, definitions, and interviewing procedures so that they were equipped to answer questions from both enumerators and respondents. The field personnel were also trained to develop good rapport with respondents in order to obtain understanding and co-operation and to minimize refusals. Any refusals that could not be resolved by the Crew Leaders were referred to the census co-ordinator, who oversees the entire census operation.

Data processing

Data preparations were processed in the census office upon the submission of completed questionnaires. The office staff's responsibility was to ensure that all completed questionnaires were placed or stacked according to their respective districts after random editing was completed. This was to ensure that all questions in every questionnaire were completely answered. The Guam Census Office staff has limited functions in data processing. In accordance with the Memorandum of Agreement between the Governor of Guam and the United States Bureau, the territorial census office involvement ended when all surplus materials and completed questionnaires were packed and returned to the United States Bureau. In turn, the United States Bureau was responsible for data processing, final editing, tabulation and publicizing the results of the project.

Analysis

For the first time in the history of the Guam census, the Guam representatives have agreed to become involved in the preparation of a monograph with subject matter analysis of the 1980 census data. The finalization of this monograph is underway. All reports of the 1980 census results have been the responsibility of the United States Bureau. Special tabulations of the census data can be made available upon request at minimal cost. Access to computer records has been prohibited to all who are not the United States Bureau employees.

Publicity

The aim of the publicity campaign was to reach the public with a series of convincing, timely, and meaningful messages designed to motivate the entire population to fully co-operate with the 1980 enumerators. Besides the efforts of the Complete Count Committee, an advertising firm was contracted to develop publicity materials in addition to those provided by the United States Bureau and the Guam Department of Commerce, and to implement the publicity strategy for the census. The Governor of Guam proclaimed April 1980 "Census Month of Guam"

To improve the coverage of minority groups, some publicity materials were translated into several languages such as Chamorro, Tagalog, Japanese, Mandarin, Korean, and Palauan. Interpreters were summoned to help overcome language barriers with people who did not adequately understand English.

Other publicity materials included production and delivery of two huge banners; posters; distribution of 50,000 brochures to households throughout Guam by the Boy Scouts; 300 posters distributed to major supermarkets, commissioner offices, secondary schools and military bases; visits to foreign consulate offices to request for co-operation from them in the notification of their ethnic groups; media regarding important events related to the census; press releases to all radio and TV stations and a 15 minute film about the census shown in elementary and secondary schools.

Costs

In reference to the Memorandum of Agreement, the Governor of Guam appointed a census co-ordinator and charged him with the responsibility of preparing a budget for the census to be presented to the representative of the United States Bureau. The budget prepared was based upon 1970 expenditures, with a mark-up to address the projection population of 1980. The Bureau approved $US 229,673 for the 1980 census; an additional $US 40,000 was requested and approved because of an unanticipated shortfall.

12. HONG KONG

Historical background

The census in Hong Kong has a long tradition dating back to the nineteenth century. From 1844 to 1867, a "Census of Hong Kong on December 31" was published annually in the gazette. After 1871, periodic censuses were taken at five and ten year intervals. No census was taken during the 30 year period between 1931 and 1961. Since 1961, it has become the practice to conduct a full-scale population census every ten years and a sample by-census on the fifth year after the full census. The last decennial population census was taken in March 1981 and the by-census for this decade in March 1986.

Design of the 1981 census

The 1981 census covered all persons present in Hong Kong at the time of the census, including transients, locally domiciled military personnel and their dependents as well as local residents who were temporarily away from Hong kong on the census reference day.

Not all persons were asked the same questions, however. The census adopted for the first time a two-phase design comprising a simple 100 per cent head count by age and sex and a 20 per cent sample survey covering a broad range of social, economic and demographic characteristics of the population. Therefore, two kinds of questionnaires were used: a short form, including only such basic questions as age, sex and relationship to head of household; and a long form, including all the questions on the short form plus questions on other socio-economic characteristics. For transients and local residents temporarily away from Hong Kong only simple questions on age and sex were asked. An exception to the general scheme was made for the marine population where a 100 per cent enumeration was taken in order to provide adequate information about the boat people in each harbour district, and to facilitate the enumeration process. To facilitate the selection of the 20 per cent sample for detailed enumeration, an up-to-date sampling frame was prepared. The sampling frame consisted of two part: for urban areas and the new towns, samples were selected from a list of permanent living quarters, each identified by a unique address, and for rural and temporary-structure areas, samples were selected from a list of segments, each segment being a cluster of 10 to 15 structures delineated by permanent landmarks such as roads, ditches and footpaths.

The choice of a 20 per cent sampling fraction was based on cost and precision considerations. Analysis of the standard error tabulations from the 1976 By-census, which was a 10 per cent sample survey, showed that the relative error for most characteristics of the population at an all-area level was less than 5 per cent. Corresponding estimates by geographic division and detailed classification were subject to larger sampling errors. In order to improve the precision of the estimates of population characteristics for small areas, it was decided that a larger sample than that used for the by-census would be used for the 1981 census. A cost-precision study was undertaken from which it was established that, for a given cost, a 20 per cent sample would give better precision than other sampling fractions.

A one-stage, replicated, stratified sampling method was adopted for the census. Stratification was by geographic district. No other explicit stratification was introduced, although the kind of structures in the frame would enable implicit stratification by type of housing. The equal probability selection method was used and a uniform sampling fraction was applied to all strata. Replicates were selected within each stratum. The use of replication in the design was to simplify the computation of sampling errors for the estimates and to produce 40 sub-samples, each of 0.5 per cent. The sub-samples were used as random samples for post census household surveys.

To prepare a complete and up-to-date sampling frame for the census, systematic rounds of field visits were conducted by permanent field staff to update existing geographic records. The updating programme extended for well over two years and comprised two stages.

Stage one involved visiting all permanent living quarters within the territory to list their addresses and identify their type and usage and updating the maps created and used in the 1976 By-census. For temporary structures, updating was specifically geared to the delineation of area segments. Stage two began some nine months before the census. It involved checking the completeness of the lists of living quarters and maps, searching for obscure buildings, reviewing the segment boundaries and relisting structures within those temporary-structure areas that had undergone substantial changes.

As a result of these efforts, the following up-to-date geographic records were available at the start of the census. (i) a complete listing permanent living quarters; (ii) a complete listing of area segments; (iii) maps showing detailed locations of permanent buildings; (iv) maps showing detailed locations of segment boundaries and structures within area segments; and (v) maps showing the approach to area segments.

To ensure that there was no omission of living quarters from the census, Hong Kong was delineated into "enumerator blocks". Each block consisted of a cluster

of living quarters assigned to a pair of enumerators – one for the 20 per cent sample detailed enumeration and the other for the simple head count. The blocks were non-overlapping and together they made up the whole terrain of Hong Kong. Each block was identified by traceable and relatively permanent boundaries such as streets, buildings, floors, footpaths, levels and so on.

Census organization

Authority to conduct a population census is vested in the Commissioner for Census and Statistics, who is himself the head of the Census and Statistics Department. A census division was set up in the Department in early 1979 to plan the 1981 census. The division was headed by an assistant commissioner, and comprised three sections. The Census Planning Section, headed by a statistician and under the guidance of a senior statistician, was responsible for the over-all planning and all statistical and professional work related to the census. The Census Fieldwork Section was responsible for the field operations, including the updating of the list of living quarters, the cutting of enumerator blocks, training and organizing temporary staff and supervising the enumeration. The Census Administrations Section was responsible for the procurement of temporary accommodation, the recruitment of temporary staff, the organization of training classes and arrangements for finance, printing, stores, transport and publicity.

For field control purposes, Hong Kong was divided into five areas, namely, Hong Kong Island, Kowloon, New Kowloon, the New Territories (East) and the New Territories (West). Each area was under the charge of a senior census and survey officer, assisted by a number of census and survey officers. The whole fieldwork programme was co-ordinated by a chief census and survey officer who took charge of the over-all control of the field operations. The fieldwork was carried out by about 9,500 enumerators who were temporarily appointed for this census. About 800 chief enumerators and 2,400 field editors and checkers were also appointed. The chief enumerators were responsible for training and supervising the enumerators; the field editors were responsible for examining the completed census questionnaires to identify any missing information, wrong codings or obvious inconsistencies in the data collected; the checkers were responsible for checking all non-enumerated cases reported by the enumerators by making follow-up visits to these living quarters.

Training and fieldwork

For the 1981 census some 17,500 enumerators, 3,300 field editors and checkers and 1,100 chief enumerators were recruited and trained. The sheer number of staff could only be met by recruiting students and teachers and, to enable a sufficient number of them to participate in the census, a special school holiday was declared by the Education Department during the ten-day operation period. While the posts of chief enumerators were filled by teachers, enumerators were mainly recruited from senior students of secondary schools; and field editors and checkers from post-secondary students.

The number of enumeration staff that had to be trained inevitably created problems of organization. Consequently, a relay approach was adopted whereby permanent field staff would first train the chief enumerators who would in turn train the enumerators. It was feared that without standardized training, individual teachers might not understand the census concepts well enough to give adequate and uniform instruction to their classes. But because television was being used as a medium of instruction in the schools, it was possible for the 1981 census to use television facilities for training purposes. With the assistance of Radio Television Hong Kong, a set of nine training films was produced covering the full set of instructions to be issued to enumerators. The viewing of these films formed a major part of the training.

As in previous censuses, the 1981 census consisted of two separate operations, the marine census and the land census. Both censuses adopted the enumerator method for obtaining information. The enumeration of the boat people lasted only four days, 1 to 4 February 1981. This was the period just before the Chinese New Year when all vessels returned to port to celebrate the festival. For the land census, since complete and up-to-date lists of living quarters and segments were available, no separate operation of household listing was required. Enumerators visited the households within the enumerator blocks assigned to them during the ten days between 6 and 15 March 1981, and ensured that no living quarters were omitted. The long-form enumerators were instructed to follow strictly the addresses listed on their assignments and the short-form enumerators were also required to search the whole block and enumerated any non-listed living quarters.

Both the marine census and the land census were taken on a *de facto* basis. A "shifting census moment" approach was adopted, that is to say, information was gathered on persons who were in the household the night before the enumerator's visit to the household. Only a single visit was therefore required.

Evaluation

The post-enumeration field check for the 1981 census consisted of two parts, a coverage check and a content check. The coverage check, carried out ten days after the census, was a sample survey covering 10 per cent of all enumerator blocks. The check was carried out by permanent field staff who canvassed the selected blocks to determine whether any living quarters had been missed by the census and, if so to enumerate the persons living there with the short form. The content check attempted to detect any undercount of population within the enumerated households and whether information on age and sex had been correctly recorded.

Data processing

The information obtained during the census was recorded on the schedules in longhand by the enumerators, who were also responsible for coding all but a few difficult items – occupation, industry, address five years ago and household composition. The field editors, who were stationed at the field centres, were responsible for coding occupation and industry. Information on household composition and address five years ago was more complex and had to be coded by specialist coders at the census headquarters.

For the 1981 census, the key-to-disc method was used to input the data. It was established that the key-to-disc method was more cost-effective than the Universal Document Transfer mark-sensing system used in the 1971 census. More importantly, it meant that the census questionnaires would not require special handling during fieldwork, thus relieving the field supervision of that burden and resulting in better control of data quality.

All input data were verified on a 100 per cent basis to minimize keypunching errors. To ensure that there was no omission of records during input, independent information on the number of forms and number of persons in each batch of questionnaires was entered into the system for checking purposes. No editing was, however, performed at the data preparation stage, although the installation had the capacity for such checking.

The editing system of the 1981 census consisted of three parts: field editing, validation and imputation. Field editing comprised manual checks of the completed census questionnaires submitted by enumerators at the field centres. Editing at this level was limited to basic checks. Validation involved identification of basic errors by computer and manual amendment of these errors. Within-record consistency checks had been kept to a minimum and almost all such checks were related to the validation of age and type of household. In the imputation stage other variables were checked against these two key variables. Imputation was completedly automatic. Its purpose was to identify inconsistencies between characteristics in a record and to remove them by imputing new values to the variables involved.

The basis for determining the scope of the tabulation programme of the 1981 census was the demand for information by various users of census statistics. An analysis of the usage of the 1976 By census data was conducted and based on that, a tentative tabulation programme was drawn up for consultation with government departments and others interested.

The tabulations prepared for the 1981 census were completed in stages according to the priorities set for the release of census information. A higher priority was given to the release of summary tabulations at small area levels.

A significant development of the 1981 census was the release of advance tabulations based on a 5 per cent sample of households (that 25 per cent of the long-form sample) in about two months after the census. This improved the usefulness and timeliness of the census results.

For the input of census data, two key-to-disc XL 40 installations, each with 16 stations, were used to prepare the data on magnetic tapes. The mainframe was an ICL 2950 central processor with 256K words of core storage, four magnetic tape units, six exchangeable disc drives and one line printer with maximum printing speed of 1200 lines per minute. A software package FILAN was used for tabulating the census data. Tailor-made programmes, however, were developed, for editing (both validation and imputation) and for the preparation of summary tabulations with simple cross-classifications.

Analysis and dissemination

A new approach was adopted for the writing up of the 1981 census main report. Apart from showing summary tables with comparisons with previous censuses and describing the census methodology, the report made detailed analyses of demographic trends in Hong Kong, of household and housing characteristics, internal movement and inward migration. The report also included the results of a series of projections of major demographic and socioeconomic aggregates and highlighted their applications in the areas of housing, manpower forecasting and the new town programme planning. A census monograph on disablement characteristics was also prepared.

Results of the 1981 census were disseminated in different forms and by stages. Considerable emphasis was given to the publication of small area data. A series of reports was published showing census information by different levels of geographic breakdown accompanied by detailed maps showing the boundaries of each area. For general readers, the major finds of the census were published in such forms as summary tables of analytical figures, statistical maps, charts and graphs.

Publicity

The purpose of the publicity programme was to inform the public of the census operations with a view to winning their support and co-operation. The publicity programme involved a wide range of media, including pamphlets, display boards, posters, newspapers, mobile van broadcasts, radio interviews and announcements, short films on television and talks. The publicity covered general as well as specific issues, such as the gazetting of the census orders (to emphasize the legal basis for the census), the destruction of questionnaires for the pilot census (to illustrate the confidentiality of information) and the identification of enumerators (to dissipate any anxiety over the enumerator's identity). Starting seven months before the field operations the campaign gradually intensified and

reached a climax at the main operational period. Special publicity measures were also mounted to win the co-operation of specific target groups. These measures included talking to district board members, sending a circular to civil servants, broadcasting a radio announcement to the marine population and making a special appeal to the consulates and religious bodies.

Costs

The cost per person enumerated for the 1981 census was about $HK 4.2. The total direct expenditure on the census, during the period between September 1979 and March 1982, excluding data processing, was $HK 20.8 million.

The 1986 By-census

A By-census was conducted in March 1986 based on a sample of the population. An important aim of the By-census was to collect up-to-date small area statistics (as a result of changes in the spatial distribution of the population since 1981) and to provide up-to-date benchmark information on the demographic, social and economic characteristics of the population. The By-census was originally designed as a two-phase operation with a 15 per cent sample for short-form enumeration in the first phase and a 5 per cent sample for long-form enumeration in the second phase. The pilot census, however, showed that such a design was not cost-effective. It was subsequently revised to a one-phase design with long-form enumeration as representing the best use of the approved resources.

A large amount of manual effort was spent in each census in the selection of samples, transcription and typing of addresses of living quarters for the preparation of enumerator assignments. To streamline this operation for cost and efficiency considerations, a computer-based system was developed for the 1986 By-census whereby the sampling frame of living quarters was computerized and the selection samples, delineation of enumerator blocks and printing of enumerator assignments were all handled by computer.

Plans for the next census

The Hong Kong census is conducted as a household survey using the enumerator method. Information with respect to all members of the household and the living quarters is collected on a census schedule. Not all questions are collected on the basis of a complete enumeration. For the next census, it is planned that a two-phase design will again be adopted whereby basic information will be collected in the head count and questions on detailed characteristics will be addressed to a sample of households. It is also planned to use the householder method (self-enumeration) for collecting data in the simple head count in some selected districts (to be determined by the results of the pilot census) as this will help reduce the total expenditure on the census (more than two-fifths of the expenditure is to cover honoraria for temporary enumeration staff). It may not be appropriate to go for self-enumeration completely for the head count in the coming census because of the literacy problem that is associated with the still rather uneven distribution of education of the population.

The "mail in – enumerators collect" approach will be used for the householder method. This has the advantage over the "mail in mail out" approach that it permits enumerators to assist householders in completing the questionnaires if they have difficulty, to check whether enough copies of questionnaires have been sent to a living quarters and to enumerate any households which have not received a copy. This is particularly important in districts where a high proportion of living quarters are occupied by more than one household.

The issue of how to disseminate and market the census data effectively will warrant careful consideration. The plans for the next census will be to give priority again to the timely release of the final population count, summary data on small areas and advance tabulations based on a sample of data from questions asked of the long-form households. As part of the census data dissemination programme, sample tapes providing a range of samples of census records will be produced to support research which requires access to microdata.

13. INDIA

Historical background

Census taking in India has a long history. However, it was not until 1881 that the first national census of population was held. Since then censuses have been taken without break every 10 years in the first year in each new decade.

In 1948 a Census Act was enacted so that after Independence censuses were conducted under legal authority. The Act empowers the Central Government to take a census of the country after notifying their intention to do so. The Act makes it obligatory for the public to answer all the questions faithfully, it guarantees confidentiality of information collected.

The population census is a Union subject under the Ministry of Home Affairs. The Office of the Registrar General and ex-officio Census Commissioner of India is attached to the Home Ministry. In each of the states and union territories, a senior officer is appointed as Director of Census Operations during each census period. The directors are responsible to the Registrar General and Census Commissioner of India in organising and supervising the census operations within their jurisdiction. The directors of census operations are assisted by a number of deputy and assistant directors.

Though a Union subject, the census is carried out by the co-operative effort of both the central and State Governments. the entire field operation, both the house-listing and enumeration, is organized through the general administrative machinery of the State Governments. Census enumerators are mostly drawn from school teachers, but they are also drawn from the central and State Governments' employees and employees of local bodies. This type of administrative set up helps in keeping constant touch with the field agency and it is a matter of pride for the Indian census organization that preliminary results are generally announced within a few days of the census count itself.

Prior to the 1941 census, a *de facto* system of enumeration was followed. Under this system a person was enumerated with reference to his/her location at a certain reference point. However, it was found to be operationally difficult to enumerate the entire population on this basis, as it involved employing a large number of enumerators. Since 1941 the system of enumeration has changed such that it is neither totally de facto nor totally *de jure*. It is a combination of the two and may be called an extended *de facto* system, Thus, the reference date for the 1981 census enumeration was the sun-rise of 1 March 1981. The enumeration period was 9 to 28 February. There was a revisional round during 1 to 5 March to bring the enumeration upto-date as of 1 March. The following four categories of persons were eligible for enumeration:

(i) All persons who normally stayed or were present in the household during the period of enumeration.

(ii) Persons who were known to be normally residing and had actually stayed in the household during part of the enumeration period but were not present at the time of enumeration.

(iii) Those who were known to be normally residing in the household and who were not present at the time of enumeration but were expected to return before 1 March 1981.

(iv) Visitors who were present in the household at the time of enumeration and who had been away from the place of their usual residence during the entire enumeration period.

The canvasser method of enumeration is employed under which the enumerator visits every household and fills-in the questionnaire based on the answers given by the respondents.

The concept adopted to classify economic data has varied from census to census. Before 1961 the classification was based on what is generally termed the "dependency approach", through the enumeration of the "gainfully occupied". In later censuses the "work approach", defined in terms of production of economic goods and services has been adopted. Under that approach a person is identified as economically active if he considers himself to have a gainful occupation.

Even though the 1961, 1971 and 1981 censuses used work as a basis for classifying a person, there were differences in the concepts used. In the 1961 census, every person was classified as a worker or a non-worker. In the 1971 census, however, a person was classified as a worker only if he worked for the major part of the year, that is a labour time disposition criterion was adopted. In the 1981 census, every person was classified as a worker if he had done work on any one of the preceding 365 days. All the persons who had done any work during the preceding year were further classified into main workers and marginal workers by probing whether they worked for the major part of the previous year or not. Persons who had not worked for a single day of the previous year were classified as non-workers.

Prior to the 1961 census, there was no uniform definition of urban area. Urban areas included (i) municipalities;

(ii) all civil lines not included within municipal limits; (iii) every cantonment; and (iv) every other continuous collection of houses inhabited by not less than 5,000 persons.

Since 1961 urban areas have included; (i) municipal corporation on town committee or notified area committee or cantonment board; (ii) selected places with a minimum population of 5,000 and a density of not less than 400 persons per sq. km. and three fourths of the working population engaged in non-agricultural occupation. The concept of urban agglomeration was used for the first time in 1971 in the place of town groups, apart from individual towns and cities. Very often large railway colonies, university campuses, port areas, military camps are located outside a city or town but adjoining it. Such areas may not by themselves qualify to be treated as towns but if they form a continuous spread with the town, they are outgrowths of the town and deserve to be treated as urban. Such towns together with their outgrowths have been treated as one urban unit called "urban agglomeration".

A new concept of standard urban area introduced in the 1971 census was also followed for the 1981 census. The essential requirements for the constitution of a standard urban area were: (i) it should have a core town of a minimum population of 50,000; (ii) the contiguous areas made up of other urban as well as rural administrative units should have mutual socio-economic links with the core town; and (iii) in all probability this entire area should get fully urbanized in a period of two or three decades.

Design of the 1981 census

From time to time sampling has been used in Indian censuses for tabulation purposes. Sampling at the tabulation stage was adopted as early as 1941 as an economy measure and has continued since. But it was not until the 1981 census that, for the first time in the history of Indian census taking, sampling was adopted at the enumeration stage to broaden the scope of the census programme. The sample enumeration was simultaneously carried out with complete enumeration. Two slips were canvassed. These were termed universal and sample slips. The universal slip was canvassed for every individual. The sample slip was canvassed for all persons living in the 20 per cent sample of enumeration blocks in the major States. In all other States and union territories, both the universal and sample slips were canvassed for all individuals.

The universal slip collected particulars on relationship to head of household, age, sex, marital status, religion, mother tongue, other languages spoken, whether an individual belonged to scheduled caste or tribe, whether a person was worker or non-worker with details of industry and occupation of the worker. The sample individual slip contained information on migration by place of birth and place of last residence, duration of residence at place of enumeration, reasons for migration. It also contained four questions relating to fertility. These pertained to age at marriage, number of surviving children, number of children ever born and whether any child had been born during the last year. The first three questions were canvassed for all ever-married women while the last one was canvassed only in respect of currently married women.

The schedules that were canvassed were finalized after pretests. The pretests helped in highlighting the difficulties encountered and provided valuable field experience for the census office personnel. There was also a pilot survey in 1981 to test the questions relating to the economic activity of the population. The analysis of the results of the pilot survey resulted in certain modifications in the content of the question included. In the 1981 census about 1.4 million enumerators and supervisors were deployed. Most of the enumerators were school teachers. In many areas village officials and municipal officials were also employed. The enumerators were paid a nominal honorarium. Training such a vast number of enumerators was a challenging task. Manuals of instructions to enumerators and supervisors for filling the schedules was prepared at the headquearters and arrangments were made to print them in English and regional languages. The training was organized at three phases. in the first phase, the individual directors and their deputies in each state and union territory were imparted a thorough training. The census directors and their deputies, in turn, took up the training of the district officers and the urban and rural census charge officers. The charge officers trained the enumerators and supervisors. Each enumerator was expected to attend four or five training classes which included practice enumeration classes as well.

For complete coverage in the census, it is necessary to have up-to-date maps of all the administrative areas. A full inventory of administrative jurisdictions in the country was taken up about three years prior to the actual census operations. These administrative jurisdictions were the revenue villages at the lowest level in the surveyed regions and the census villages duly defined in consultation with the State/Union Territory Governments in other areas where cadastral surveys were not completed for the preliminary work.

All villages with village boundaries were marked on tehsil/taluk maps for reference and given geographical codes, so that there was no omission of any jurisdiction. Changes that had occurred between the dates of the preceding census and the ensuing census were incorporated in maps. The Ministry of Home Affairs of the Government of India issued instructions to the State/Union Territory Governments to freeze the administrative changes prior to the census.

The concept and definitions of urban areas towns were applied to identify the urban areas, including outgrowths and new urban extensions. These were plotted

on large scale maps of respective towns/urban agglomerations to fix the boundary for the census purpose. Relevant changes from rural to urban, as occurred during the period between the preceding census and the ensuing census, were taken into account so that rural and urban areas were precisely known for mapping and the demarcation of enumeration areas.

After that rough maps of rural and urban enumeration blocks (EB) were prepared on the consideration that each EB comprised 750 persons (about 150 households) in rural areas and 600 persons (about 120 households) in urban areas. These "national maps" of enumeration blocks numbered about 1.27 million in the 1981 census.

Committee structures

The preparation of the census schedules involved wide consultation with data users which included both government departments and non-government organizations. The economic questions included in the 1981 census were discussed and cleared by the technical advisory committee (TAC) on statistics of employment and unemployment constituted by the Department of Statistics prior to census. The TAC had members from government and non-government agencies. On the basis of these discussions, a preliminary version of the questionnaire was developed for field testing. A sub-committee of data users went into the actual wordings of the questions to be included in the 1981 census. These were approved by the technical advisory committee and were included as part of the census. A preliminary version of tabulation plan was also discussed in the data users conference. The data users conference provided a forum wherein the views expressed by both government and non-government agencies were considered and their feasibility examined in the light of operational difficulties.

Evaluation

Since 1961 evaluation surveys have been conducted within a month of the census. In the 1981 census, a Post Enumeration Check (PEC) was conducted in a sample of enumeration blocks. The PEC survey was intended to establish (i) how accurate the census count had been (coverage error), and (ii) how accurately the particulars of the individuals had been recorded with regard to certain specific characteristics (content error)

The coverage error check consists of firstly, omission or duplication of persons due to omission or duplication of entire households. This was referred to as a type I error. Secondly, omission or duplication of individuals in households which have been enumerated. This was referred to a type II error.

Some 4,000 enumeration blocks spread over the country were selected for the PEC. The PEC interviewers were specially recruited and trained. The schedules for detecting type II errors were canvassed in a 10 per cent sub-sample of households selected from the blocks where schedules for type I error were canvassed. The content error schedule was canvassed in a sub-sample of 750 enumeration blocks spread over various states.

The sample was selected at the headquarters and the list of selected blocks as kept confidential until the census enumeration was completed. The enumerators who canvassed the PEC schedules were trained at the state-level. The schedules were then compared with the schedules prepared by the census enumerators. The discrepancies between the PEC enumerator and census enumerator were verified in the field. To ensure operational independence the PEC enumerators who canvassed the schedules did not do the matching and verification in their own block.

Nationally, the omission rate was estimated as 1.8 per cent. Significant differentials in omission rate were observed between rural and urban areas with that in urban areas being about twice the level of rural areas.

Soon after the 1981 census was completed a census evaluation study (CES) was conducted to estimate the extent of misreporting of age at younger ages in the census. This was done in a sub-sample of the blocks that are covered under the Sample Registration System (SRS).

Data processing

For various reasons it was not possible to adopt a statistically designed control plan at the data collection stage in the 1981 census. Statistical quality control (SQC) was adopted in 1981 to achieve an adequate level of accuracy of coding the schedules. The application of the SQC was restricted to the coding of responses to the economic questions on the individual slips and to certain areas only. The primary purpose of SQC was to screen out errors made in coding so that only a tolerable proportion remain in the data passed for further processing.

By using sampling techniques, much of the checking that was necessary with a 100 per cent check could be avoided. The use of sampling implied, however, a risk that some proportion of the unchecked coding would be in error. Keeping this proportion at a tolerable level was the object of the quality control exercises. The quality control check allowed substantial precision in assessing the accuracy of the census results. It increased the depth of understanding of the causes of errors arising in coding census data and suggested measures to reduce these errors in future censuses.

For the first time in the 1981 census most of the data were processed on computers. Direct data entry systems were used to expedite the processing. In the 1981 census only five basic tables were compiled manually. The remaining 100 or so tables were prepared by computers.

The schedules were manually edited and coded in different directorates and then sent to Direct Data Entry

Centres (DDEC) for keying-in of the data. There are 32 Direct Data Entry Systems (DDES) installed at 14 DDECs across the country. Each DDES has 16 terminals. The keyed-in data received from DDECs were brought to headquarters for main frame computer processing. Initially from DDE output tapes, master tape files were generated after ensuring that record counts on the master tape tallied with the manual inventory counts.

The master tape was then edited and auto-corrected with the held of a very comprehensive edit and imputation programme. This programme was developed on the basis of a detailed list of range and consistency checks formulated by a team of data processing and subject matter specialists. The fully edited data, together with the estimation factors, were then processed for getting estimated summary tabulation and control figures. The summary data were then aggregated at various levels district, State and all India, and printed.

Because of the large volume of data and complex nature of the tables, the 1981 census data were processed on seven computers, all located in Delhi and DEC System at Chandigarh. A high level of programming and processing expertise was required for the conversion of software for each computer system, the movement of data tapes from one system to another, detailed monitoring of processing at the various installations, scrutiny of the intermediate outputs and thorough scrutiny of final computer printouts.

Analysis and dissemination

Apart from basic tables a number of analytical reports based on the results of the 1981 census have been brought out. Mention can be made of the three reports released during 1981/82 based on the provisional population, the first giving some analysis of population growth, literacy and sex ratio, the second analysing the rural-urban split, and the third analysing the data on workers and non-workers. A technical report examining the quality of the age data collected has been released. A report called "Estimates of Vital Rates for the Decade 1971-1981" has also been published. The census data were disseminated through a number of publications brought out by the Office of the Registrar General, India. The Offices publishes volumes relating to India as a whole, termed Series 1. Data relating to each State and union territory are published in separate series, numbered Series-2 to Series-32. In each of the series (for all India and each State/union territory) different series of tables are given in separate volumes. These are termed: A-Series – General Population Tables, B-Series – General Economic Tables, C-Series – Social and Cultural Tables, D-Series – Migration Tables, F-Series – Fertility Tables, H-Series – Housing Tables, HH-Series – Household Tables, and SC/ST-Series – Special Tables for Scheduled Castes and Scheduled Tribes.

Publicity

The success of census enumeration depends to a great extent on wide publicity explaining the importance and objectives of the census to the public well in advance. A vast publicity campaign was mounted before the 1981 census with the help of the All India Radio, Doordarshan (TV), the films division of the Ministry of Information and Broadcasting, the directorate of advertising and visual publicity and the press itself. Publicity regarding the census included imaginative posters, slides and films. The media carried the census messages to all parts of the country.

14. INDONESIA

Historical background

Indonesia has carried out three censuses since independence in 1945. In 1960 a census act was enacted which stated that population censuses should be taken every ten years in the years divisible by 10, except for the first census, which was taken in 1961. The 1961 census was the first by the independent Indonesian government and covered the whole of the Republic of Indonesia except for the province of Irian Jaya, which was then still occupied by the Netherlands.

The 1961 census employed two methods of enumeration: the first was a household listing conducted in March 1961, and the second was the actual complete enumeration carried out during the month of October. The census scheduled for 1970 was not taken until 1971 because the budget was approved late and additional time was needed for preparation. This census was much superior to that of 1961 in terms of planning, field operations, and processing of the data. The field operation consisted of a household listing carried out in June-July 1970, which was combined with the electoral registration for the 1971 general election, and the census, which was taken in September-October 1971. The most recent census was taken in September/October 1980. There was a complete enumeration of basic items and a 5 per cent sample of more detailed information.

Design of the 1980 census

Past experience showed that it was often impossible to locate the boundaries of enumeration areas (EAs) in the field. So an important consideration in the formation of EAs prior to the 1980 census was that whenever possible they should have permanent natural boundaries. But the resulting variations in area and population size meant that the use of EAs as the lowest sampling unit was not practical. To use households as the sampling unit would increase the sampling efficiency, but would also increase the cost and complicate the organization and execution of fieldwork. Therefore a unit between the EA and the household had to be formed, and its size had to be less varied than that of the EA in order to keep sampling variation to a minimum. It was deemed that the maximum number of households for this sampling unit should be 100. Where possible clear and permanent boundaries were sought for these units which were called census blocks (CBs).

For selecting a 5 per cent sample the following general rules were applied: (i) each regency and municipality was considered an estimation area; (ii) in every regency and municipality two strata were formed, one for urban areas and one for rural areas; (iii) all of the villages in each stratum were ordered according to their location, starting with the village in the southwest corner; (iv) from each stratum, 5 per cent of the ordinary CBs were selected. The ordinary CBs were selected systematically with a random start, and all households in the selected CBs were enumerated.

Mapping was preceded by the updating of the list of all villages in the country and the reclassification of villages as urban or rural. The updating of the village lists was carried out by the subdistrict statistics officers from December 1978 to February 1979. The list was instrumental for subsequent activities, including village mapping, formation of EAs and CBs, development of a sampling frames, and the stratification of CBs. Village mapping was done by census field-workers from 10 to 31 October 1979. Boundaries of EAs and CBs were drawn on the maps. One copy of each map was sent to the central office.

The village maps were used as basis for sample selection, for estimation of the number of documents needed, for household listing, and for enumeration. The maps were heavily used to support both operational and financial plans. In addition to village maps, subdistrict, regency, and municipality maps were drawn, which facilitated the sample selection. Census maps were used as the basis for the formation of CBs. These maps were prepared just before the complete enumeration. Enumerators and supervisors, using the available maps, divided the enumeration areas into blocks and assigned each block to a sample-census enumerator.

Census organization

The Central Bureau of Statistics (CBS) has responsibility for conducting censuses of population. In addition to providing the government and the public with primary and secondary data, the CBS is in charge of improving the level of knowledge and enhancing the co-operation of the people in order to increase the usefulness of the data collected.

In addition to the appointment of the national director and deputy director of the 1980 census, two committees were formed- the National Advisory Committee and the Technical Committee. The first committee comprised prominent experts in various fields as well as representatives from government departments. The second committee was formed from the technical staff within the CBS and was responsible for the planning, executing and monitoring of the census.

Training and fieldwork

The training of the census fieldworkers was done in stages, and each stage was composed of batches. In the first stage, 333 national instructors were trained by 14 master instructors. This training was organized by the CBS at two sessions, each for the duration of nine days. In the next stage, the national instructors trained local instructors. Some 5,000 persons were trained as local instructors. Other participants included sample-census enumerators, enumerators of special census blocks, and assistants to the subregency census co-ordinators. This training programme was conducted for nine days for local instructors and for six days for other participants. The number of persons trained was around 20,500. The final stage of the training was for census enumerators and the village clerks who were assigned to complete the village potential forms. About 226,000 persons were trained for three days.

At all stages of the training instruction manuals were used in class discussions. These manuals contained background information on census taking in Indonesia, instructions on the method of completing the forms, definitions and concepts adopted in the census and an over-all view of the census organization. The manuals served as useful references during the fieldwork. The complete census was conducted from 20 September through 31 October 1980. Although the orginal plan was for enumerators to list and assign numbers to the households in one operation and then to return later to complete the enumeration, the household listing for the 1980 census was conducted simultaneously with the enumeration.

When enumerators came to their assigned enumeration areas, they first identified the boundaries of the EA, including those of each census block, and drew sketches of each census block. For census blocks selected for the sample census, two copies of census block sketches were made, one copy to be used by the sample-census enumerator. In preparing these documents, the enumerator had to make sure that all buildings were mapped and all households residing in the census block were listed. He then had to attach stickers identifying the census building number at the entrance of each building. A form was used to list all buildings and households in the selected census block and to record type of physical structure and usage of buildings. Once the enumerators had completed these tasks they canvassed the households and household members.

Sample-census enumerators obtained the sketch of the census block assigned to them from the complete census enumerator prior to canvassing. They collected detailed information on the condition of the house and on each household member using the long form. Part of the schedule was addressed to specific groups of persons, that is, for example, to persons ten years and over for their economic activity, to ever-married women for fertility information, and to currently married women for family planning questions. The sample census covered 5 per cent of the population, and was conducted from 6 to 31 October 1980.

At each administrative level a person was designated census co-ordinator. The co-ordinator's main function was to oversee the over-all census operation from the planning to the dissemination of the results, including the recruitment and training of the field-workers and the fieldwork itself.

Supervisors were recruited for both the complete and sample enumerations. They supervised the distribution of documents to their enumerators and checked the completed forms for completeness, accuracy, and consistency. Two or three enumerators worked under each supervisor. Manuals for supervision were prepared and discussed in class during the field-worker training.

The questionnaires used in the complete census were designed to facilitate checking the work of the enumerators. Each item on the complete census form was added to obtain summary data at each administrative level, that is household, census block, enumeration area, village up to the province level. It was the responsibility of the supervisor at each level to make sure that the totals in each column were correct.

Evaluation

Post enumeration survey (PES) was conducted approximately two months after the census and covered 2,100 EAs throughout Indonesia. The PES was designed to measure coverage error. To estimate the extent of undercount in the 1980 census two methods were used: the balancing equation approach and the case-by-case matching of persons recorded in the census and in the PES. The results of the PES are generally expected to be better than those of the main census, and the population recorded in the PES assumed to be the true population. The PES indicated over-enumeration in the census of the order of 0.33 per cent. That finding was surprising and led us to believe that the PES enumeration also contained errors.

For the purpose of matching of records from the census to records from the PES, a sub-sample of 827 census blocks with a population of 5,887 households was drawn. The first step was to list all persons recorded on forms used in canvassing individual households during the complete census and those used in the PES in a specially designed worksheet that enabled the matching of names. The next step was to classify the population into three groups: those who were recorded in both the census and the PES, those who were recorded only in the census, and those who were recorded only in the PES. The under-enumeration of the 1980 census was estimated to be 3.31 per cent.

Data processing

Processing of the complete enumeration was done manually in the respective regions. The enumerators first totaled each column in the household questionnaires to

obtain the household summary and then prepared the CB and EA summaries. The supervisor prepared the village summary based on the enumeration area summaries. Next the summaries for the subdistricts were prepared; these constituted the basis for the regency/municipality, the province, and the national summaries. The summary of each administrative unit was checked and corrected before further summaries were made.

Although this system had a number of advantages, particularly the speedy production of the complete-census results, the system was not problem free. The hierarchical summaries from households to national level passed through the hands of many people. An error made at one level would be carried through the higher levels, and it would be almost impossible to correct this error except by going back to the level where the error occured. One measure taken to reduce this type of error was to provide checks at every level. In addition, one copy of the village summary was sent directly to the central office to be input to the computer; this report could then be used as a check of totals at every level higher than the village.

There were some 22,000 census blocks in the sample enumeration, yielding approximately 9 million forms. For document control and monitoring purposes two other forms were used. Each enumerator completed a census block summary form after enumerating the assigned census block. The summary form contained the total number of persons, households and buildings in each census block. A batch control form was used at the central office after the questionnaires were batched. It contained an identification code, batch number, and the number of census blocks in the batch. This form was used to check the completeness of the census block during the processing stage.

The sample-census schedules were collected at the regional census offices and sent to the central office in cardboard boxes. When these boxes arrived at the CBS they were unpacked by the Reception Unit in the Storage Section and checked for their completeness. The questionnaires were then stored by the Storage Unit. This unit also checked whether the forms from all census blocks had been sent by the regional office. When the forms of all selected census blocks in a given region had been received they were stored in batches, each batch consisting of approximately 20 census blocks. They were later sent to the Editing/Coding Section for processing.

The Editing/Coding Section comprises two units, one dealing with the editing and coding of the data prior to entry into the computer, and the other with the checking of the data using the error messages put out by the computer. In the Precomputer Editing/Coding Unit there were two manual checks employed: one to check the completeness of the forms and the other to check the codes of all items on the questionnaires.

The Post-computer Editing Unit received the computer error list from the Computer Section. The error records were corrected by referring to the original questionnaires. A special worksheet was used to reenter corrected records onto a magnetic tape file.

In the Data Entry Section 70 NEC Model N6300 key-to-diskette systems were used to transfer the original data into a computer medium. No verification was employed at this stage. The Computer Section's processing system was divided into subsystem to produce the clean data file and a subsystem to produce tables. Four main programmes were written to produce the clean data file for tabulation. A dual system of NEC ACOS-500 machines each having 1.5 megabytes was used.

Analysis and dissemination

Since an extremely limited amount of analysis came out of the 1971 census, the CBS allocated a large fund to support census analysis and to advocate the participation of researchers throughout the country in using 1980 census data. A Technical Team for the 1980 census analysis was formed in early 1981. This team comprised six groups: fertility, mortality, family planning, migration, labour force, and housing and socio-economic aspects of the population. Each group developed tables in its area of interest.

Researchers were invited to submit proposals for analysing the census data in which they were to identify the types of tables required in their studies. These tables were to be drawn from the previously constructed tables. The Technical Team reviewed the substance and future use of the proposed studies in relation to development planning in the country. This endeavor succeeded in drawing interest from a large number of researchers throughout the country.

The CBS began to publish results of the complete enumeration in April 1981. All of the tables released contained summary counts at each administrative level. In addition, all province and regency/ municipality statistical offices produced reports for their respective areas. The publication of reports for small geographic units enabled the CBS to present population data at the village level for the first time in its history. The 1980 sample census tabulations were done two stages: the advance and the final tabulations. Advance tabulations were generated from a 10 per cent sub-sample of the selected census blocks and were released in May 1982. The advance tabulation publication presented an over-all view of the Indonesian population in 58 tables. All the tables were produced at the national level.

Soon after the publication of the advance tables, a descriptive analysis of the level and trend of the population characteristics was presented in a small book called "A Brief Note on 1980 Population Census".

The final tables were produced by processing all of the selected sample blocks. These tables were published in 27 volumes: one national volume, and 26 provincial

volumes. In addition, several volumes have been published on specific topics, such as fertility, mortality, family planning, labour force, migration, and housing and social welfare conditions.

The data set from the sample census, in the form of magnetic tapes, was also available to the public three years after the census. The data set contains most of the information collected in the sample census while the location identification of the respondents was removed.

Publicity

In an attempt to recruit the people's voluntary assistance, the communication materials were geared towards presenting the uses of census results in development planning, the importance of accurate data as a basis for future planning programmes, and the fact that census information would not be used for taxation purposes.

As previously, the CBS announced the government's intention to conduct the census months before the actual fieldwork. The publicity began with the issuance of the government decree on the execution of the census and the President's instruction to the Minister of Home Affairs and the Director General of the CBS to carry out the task. A technical committee on census communication was established in the central office. This committee designed the entire communication programme, identifying audiences and the media most appropriate to approach them, specifying schedules for each activity, and designing the materials to be used in the campaign.

The intensive campaign began in July 1980. During the four-month period July to September 1980. As the census activities intensified publicity materials were distributed, census slides were shown in cinemas, radio spots and special census announcements were broadcast, and television films and dramas were shown.

Personnel and costs

The number of questionnaires to be completed and the accuracy of the information to be recorded meant that the census organizers had to recruit close to one-quarter of a million persons, as census takers. All of the field-workers were selected from the residents of the areas they were to enumerate.

The complete-census enumerators were required to have at least finished primary school, to be mature and responsible, and to live in the assigned enumeration area. To be a sample-census field-worker, a person had to have a high school education. Each enumerator was assigned one census block, and had to finish the enumeration in 25 days.

The CBS's permanent staff who were stationed in the sub-regency offices were appointed census co-ordinators of their respective areas. Their responsibilities included the management and payment of personnel and the management of the document transfers to and from their offices.

Costs

The 1980 census consisted of five stages of activities, viz, planning, preparation, fieldwork, processing and analysis, each of which was carried out in one fiscal year. The total budget is estimated at $US 27,454,950.00. The United Nations Population Fund (UNFPA) second country programme for Indonesia assisted the CBS with the 1980 population census and related activities. The total amount of UNFPA assistance to CBS for the five-year period, 1980-1985 is estimated to be $US 2,000,000.

Plans for the next census

Preparation toward the conduct of the forthcoming population census will be initiated in the 1987/88 fiscal year with a pilot study on mapping and formation of statistical units. The CBS fells that enumeration areas and census blocks formed prior to the 1980 census were outdated because of boundary changes and population mobility. At the same time the rules for classifying villages into urban and rural areas are being re-examined. During the coming fiscal year a study will be carried out in search of a reclassification of the more than 66,000 villages in the country. The variables and technique for determining urban villages will be the same as in the 1980 census, although more information on village characteristics may be added in the questionnaire. Three pilot surveys are planned to test the questionnaires and field organization.

15. ISLAMIC REPUBLIC OF IRAN

Historical background

The first national census of population and housing in Iran was in 1956. There were also censuses in 1966 and 1976. Following the Islamic revolution in Iran, there was a sharp demand for basic data for various planning purposes and this led to a plan to conduct a census in 1984. However, this would have led to a break in the previous pattern of decennial censuses. Although planning for that census went ahead it was postponed for two years just before it was due to be held.

Design of the 1986 census

For the planned 1984 census a Committee for Research and Investigation started collecting information on the statistical requirements of different government organizations. The census headquarters determined the items to be canvassed in the census, taking into account the policies and objectives of population censuses and international recommendations and statistical requirements of state organizations.

Given that the size of census enumeration districts (EDs) depends upon the the estimated number of households in each urban block or rural village, it was decided to carry out a household enumeration prior to the census. Maps of all cities and large villages whose population in the 1976 census was more than 2,000 were updated.

To ensure the accuracy of maps, the Cartography Centre of the country started taking aerial photographs of cities and large villages. At the same time, the branches of Plan and Budget Organization in Ostans (provinces) were advised to conduct the household enumeration in every city immediately after preparation, completion, or correction of the maps in such a manner that both map and information on the number of households in each block or village could be sent simultaneously to the census headquarters at the Statistical Centre of Iran.

Due to the wide variety of climatic, socio-economic and cultural conditions in the Islamic Republic of Iran, choice of areas for a pilot census enumeration is of great importance. With these considerations in view, census headquarters selected three different areas for the pilot census. Problem and difficulties peculiar to these areas and arising from their social, economic and natural conditions could have represented difficulties in the census. The pilot census of these area was designed in such a way that all census activities from preparatory work to publication of results were tested so that deficiencies and shortcomings in might be detected and removed.

According to a pre-arranged programme, Plan and Budget Organization branches in Ostans were responsible for the conduction of the census in each Ostan. In order to make them more acquainted with and prepared for the census, it was decided to carry out a pilot census in each Ostan on a very limited level. Therefore, five EDs in Tehran and two EDs in each one of the remaining 19 Ostans were enumerated. Each urban or rural ED was composed of 300 households.

The pilot census training programme was performed in two stages: the first stage was a 12-day briefing seminar during which teachers of the second stage and officers-in-charge of the pilot census execution discussed the objectives and quality of the census plan and got familiar with census questionnaires and instructions.

The second stage was allocated to the training of the technical staff. Classes were held in the centres of Ostans and sample Shahrestans and lasted for 18 days. At this stage of training, a well-organized group of experts responsible for answering questions and solving problems of the teachers and establishing harmony between them so that all the definitions and concepts could be communicated in the same manner.

The pilot census publicity activities aimed to make the people acquainted with the census and attract the co-operation of authorities and people in the three sample Shahrestans and EDs selected for pilot census enumeration. To achieve the first objective, interviews were broadcast from radio and television networks and relevant news were published in newspapers and magazines. To achieve the second objective, direct contacts were made with responsible bodies and authorities in sample Shahrestans, such as governors and chief clergymen for Friday prayers, to seek their help in inviting the people to co-operate with enumerators.

During the time when pilot census enumeration was being carried out in November 1983, information on the enumerated number of establishments and households was compiled at the end of every day and sent to census headquarters.

Delaying the census enumeration from 1984 to 1986 provided the Statistical Centre with a two-year period during which most census activities could be further developed and revised. Immediately after the execution of the pilot census enumeration, a long range work programme was drawn up to assess the plan and prepare the final census plan.

For the 1986 census, three questionnaires were prepared: Form 1 Listing; Form 2 Household Questionnaire;

and From 3 Village Questionnaire. After careful investigation of the results obtained from the pilot census, the content of the questionnaire was determined. Particular attention was paid to the household questionnaire form. That form was designed in such a way that all the individual characteristics of each household member was recorded in front of his/her name. Questions on fertility and mortality were included for the first time. Investigations about migration, citizenship and language are also peculiar to this census.

The 1986 census covered the whole territory of the Islamic Republic of Iran. The census enumeration started on 8 October and ended two weeks later. To ensure full coverage, particular attention was paid to the provision of up-to-date maps. One of the most important activities performed in connection with the census planning was the correction and updating of urban and rural maps. The maps were originally prepared on the basis of aerial photographs taken by the Cartography Centre in 1964 and have been repeatedly corrected and updated on different occasions. A review of maps was essential due to the rapid expansion of cities during the last two decades and the movement of the population in rural areas. Urban maps were prepared for administrative divisions of cities. But experience proved that urban maps are as important for populous areas, not classified as cities as they are for urban areas. Maps for a number of places were prepared on the basis of aerial photographs already available in the Cartography Centre of the country. For some other places, aerial photos were ordered from the Cartography Centre by The Statistical Centre of Iran and statistical maps for these places were prepared on the basis of new photos.

Rural maps were prepared in two stages. Firstly, all sources of rural maps were collected and compared in the centres of Ostans and their discrepancies were identified and recorded in certain tables. Secondly, surveyors visited all the villages and compared their actual location with that printed on the maps, verified their positions and determined the location of new villages. They also recorded on the maps changes in administrative divisions and roads as well as the estimated number of households for each village. Finally, a complete series of maps and list of all the rural areas was prepared.

All households, whether Iranian or foreign residents, with the exception of members of diplomatic corps and their families were visited, their names registered and their personal data recorded. Some questions were also asked on housing characteristics of each household.

The concept of *de jure* coverage was applied for the enumeration. The mobile population and those without a fixed address were enumerated wherever they were met by enumerators. Transit passengers and travellers staying in hotels, guest houses, inns, caravans and the like were not enumerated.

Census organization

Experiences obtained from the pilot census enumeration resulted in a revision of the census organization. That is, the census headquarters approved the formation of 11 divisions instead of seven to facilitate decision-making and co-ordinating activities relating to preparatory work, designing and implementation of the census. The census organization was prepared in two stages. At the first stage, the organization chart showing the census organization of Ostans and Shahrestans, as well as different staff categories together with a description of each. At the second stage, the urban, rural, and tribal population of every one of the 195 Shahrestans of the country was estimated. After that, the census organization suitable for each Shahrestan was determined on the basis of population size and location of the relevant Shahrestan. The same procedure was followed for determining the census organization of Ostans. In this way, the manpower required for the census enumeration was determined.

Training and fieldwork

All personnel involved in the census were familiarized with the definitions and concepts used in the questionnaires and technical, executive, financial and administrative forms and instructions. For this purpose educational programmes were held at three stages for census execution, data processing and administrative and financial affairs. The chief clergyman who conducted Friday prayers spoke about the necessity of the census enumeration on the first and second Fridays during the census and the last Friday preceding the enumeration.

A part of the training was held in Tehran, which consisted of a short-term administrative, financial and technical briefing course. During this course, chiefs of Ostans and Shahrestans got acquainted with financial and administrative forms and discussed probable executive and administrative difficulties, census organization and census management. A technical training course was arranged for staff members responsible for training and conducting the census which included practical and field work.

Training in data processing was held in Tehran to teach coding procedures to deputies from Ostans and Shahrestans, who would teach the same procedures to enumerators and other coding personnel on return to their relevant Shahrestans.

Training for administrative and financial affairs was held in Tehran where administrative and financial duties of chiefs of Ostans and Sharestans were explained.

Census enumerators, who had been selected from among students of teachers training colleges, and got acquainted with their duties and responsibilities in educational courses, received a map showing their share of work

immediately before census enumeration. The enumerators used the maps to identify their relevant EDs. They were asked to correct the map, if necessary.

Having visited the site and identified his relvant ED, each enumerator listed all places in it. If the place listed was a dwelling place, the enumerator completed the household questionnaire form simultaneously with the listing form, Completed questionnaires were collected at the end of each day to be investigated by a technical editor. Incomplete questionnaires were returned to the enumerator for completion.

After census enumeration the questionnaires were given back to each enumerator for coding. Some of the questions had been coded during the enumeration process. For others, special codes were prepared and put at the disposal of each enuemrator so that he might give the appropriate code to each information item. For this purpose, a short-term course of about one day was arranged. Then, all the coded questionnaires were investigated by the code editors. Having corrected deficiencies the questionnaires were sent to census headquarters together with the maps and other forms.

Evaluation

A post enumeration survey (PES) was conducted to evaluate coverage and content errors. The method selected for the post enumeration survey was cluster sampling. Each cluster consisted of one or more blocks, or part of one block in urban areas, and of one or more villages, or part of one village, in rural areas. The urban sample cluster included 20 households while the rural sample cluster consisted of 40 households. The number of clusters required was about 700 in the urban areas and 400 in the rural areas.

Two forms were prepared for the post enumeration survey: a listing form and a houshold questionnaire. They were similar to the census forms. Additional columns were provided, for example for reporting babies born after the enumeration of the hoousehold in the census proper.

Two days after the census field work was completed the PES started in the sample clusters. The duration of the post enumeration survey was two days in urban areas and three days in rural areas. The PES staff were selected from among the most efficient census enumerators, crew leaders and chiefs of regions. The expert-in-charge of the PES in each Shahrestan selected the PES enumerators immediately after the census enumeration was completed. The selected enumerators attended a very short training course and, having received the necessary maps and other supplies, were despatched to the sample clusters assigned to them.

Publicity

A wide range of propaganda programmes were prepared to sttract public attention and to prepare the people for co-operation in the census enumeration. As the most important and basic means of mass communications, radio was used from a month before the census to broadcast suitable reports and short messages. A variety of short films as well as news programmes, cartoons, interludes, slides and short messages were shown on television networks. National and local newspapers printed reports about the census. Essays on the census were published through the Islamic Republic News Agency.

Plans for the 1986 census

Once the coding and punching of the information is completed it is planned to transfer the information to electronic data processing equipment to obtain the final results. This will last until autumn 1987. As the results get compiled gradually according to schedule, publication of reports will be started and continued until early 1988. Thus punching, data processing and publication activities will be performed simultaneously. Tables selected for publication will appear in different series of varying circulation under a total of 352 titles.

The publication of census results will take about 16 months to be completed. However, some statistical requirements are urgent. To meet such requirements, sampling methods will be applied to prepare and publish some of the information as advance census results. Further, the household questionnaire form was designed such that data on the total number of people, number of people 6 years of age and over, number of literate people and number of employed people can be calculated and released shortly after the end of the census enumeration.

Socio-economic census of nomadic tribes in the Islamic Republic of Iran

In the Islamic Republic of Iran, nomadic tribes form a considerable proportion of the total population. These tribes were not enumerated in the main 1986 census of population and housing. The Agricultural Statistics Department of the Statistics Centre of Iran plans to a socio-economic census of the nomads.

In the first phase of this census the plan is to identify the nomadic tribes. That is, to identify their social structures and organization; their patterns of mobility; their seasonal places of settlement; the best time, to visit them and the manner of their livelihood. It is planned to map their settlement patterns.

In August 1984, a first stage pilot census was carried out for two clans: Babadi clan from Bakhtiyari tribe and the Negin Taji clan from the Bayer Ahmad tribe. Subsequently, between February and August 1985 experts and tribal guides visited all areas of the country to prepare a listing of names and settlement patterns of all tribes.

It is planned to visit each clan and collect information at three levels, through (i) a village type questionnaire; (ii) a household questionnaire; and (iii) an agricultural

questionnaire. In the first instance efforts will be directed towards getting; (i) names of tribes, clans or sub-clans; (ii) name of chief-head-of-clans or sub-clans; (iii) number of households; (iv) number and type of livestock; (iv) date of movement to Summer (winter) quarters; (v) date of settling in Summer (Winter) quarters; (vi) length of time taken moving to Summer (Winter) quarters; (iv) address of Summer (Winter) quarters and length of stay; and (viii) length of time spent at points en route to Summer (Winter) quarters.

16. JAPAN

Historical background

Population censuses have been taken in Japan almost every five years since 1920, the latest in 1985 being the fourteenth. In addition to these regular censuses, special nationwide population surveys were conducted in 1944, 1945, 1946 and 1948 due to the particular administrative needs before and after the end of second World War.

Regular quinquennial censuses include both full-scale and simplified censuses. The censuses that were taken every ten years starting 1920 were the full-scale censuses, while those taken in the fifth year were simplified ones. In a simplified census, questions were limited to the basic characteristics of population, such as name, sex, age, marital status, while full-scale censuses cover questions on economic variables in addition to the basic characteristics of population.

The population censuses since 1955 enumerate the *de jure* population in the territory of Japan which refers to those who were usually living in an area. The wording "persons usually living" was defined in the census as those who had lived, or were going to live for three months or more at their respective households at the census date. In recent censuses all persons living in Japan have been enumerated except the foreign diplomatic corps and their dependents and foreign military corps and their dependents.

Design of the 1985 census

The 1985 population census, taken on 1 October, was in conformity with the provisions of the Statistics Law, as had been the previous censuses since 1947. In order to carry out the 1985 census, the following orders and regulations were established: a Cabinet Order for the Population Census; a regulation for the execution of the Population Census, and a Prime Minister's Office Order for Instruction for the Establishment of Enumeration Districts for the population census. The 1985 census used the so-called *de jure* population concept in enumerating the people. That is, a person was enumerated at the place where he or she usually lived, and was included in the population of that area. The wording "persons usually living" was defined in the census as those persons who had lived, or were going to live, for three months or more at their respective households at the census date. The following were, however, exceptions to this general rule: (i) students and pupils of regular schools, as well as those attending vocational schools, were enumerated at the places where they lived for attending schools; (ii) in-patients in hospitals were enumerated in the hospitals only when they had been hospitalized for three months or more at the date of census; (iii) crew aboard ships, except those of the Self-Defence Forces, were enumerated at their residences on land, if any; (iv) residents of Self-Defence Forces camps were enumerated in the camps; crew aboard ships of the Self-Defence Forces were enumerated at the places where the local general headquarters to which their ships belong were situated; (v) prisoners in prisons and inmates of reformatories and women's guidance homes were enumerated at their institutions; (vi) persons who had no fixed abode, or whose usual abode was unknown, were enumerated at the place where they were present at the time of the census.

The 1985 population census questionnaire contained the following 17 items:

For a household member:

1. Name
2. Sex
3. Year and month of birth
4. Relationship to the head of the household
5. Marital status
6. Nationality
7. Type of activity
8. Name of establishment and kind of business (Industry)
9. Kind of work (Occupation)
10. Employment status
11. Place of work or location of school

For a household:

12. Type of household
13. Number of household members
14. Type of tenure of dwelling
15. Number of living rooms
16. Area of floor space of living rooms
17. Type of building and number of stories

Before the census-taking, the whole area to be covered by the census was divided into enumeration districts (EDs) with accurate ED maps. The enumeration districts for the 1985 census were delineated as of 1 October 1984, a year before the census date, in such a way as to change the boundaries of the enumeration districts for the 1980 census as little as possible. Thereafter, the enumeration districts were amended up to the census date in the cases of changes of boundaries of shi, ku, machi, mura, (cities, wards, towns,

villages) and so on. Thus, the enumeration districts were demarcated as of the census date. There were 780,000 enumeration districts, 40,000 more than in the 1980 census.

There were three types of enumeration districts in the 1985 census: Ordinary Enumeration Districts, Special Enumeration Districts, and Water Enumeration Districts. Ordinary Enumeration Districts (about 95 per cent of the total) were set up in areas where residents were comparatively concentrated; they were delineated to contain 30 to 70 households in principle, or about 50 households on average, utilizing geographically apparent features for their boundaries. Special Enumeration Districts were established in areas which contained few inhabitants or in areas where special groups of people lived. Water Enumeration Districts covered the areas of harbours and mouths of rivers and canals where people were living in boats or ships.

ED maps were produced in the following ways. First, base maps was selected by each municipal office. After selecting the appropriate base maps, the following indications were given to each map: (i) boundaries of EDs in red; (ii) lines and codes of the Standard Areal Grid Square; (iii) central point of population for each ED; (iv) ED numbers; and (v) scales and direction. Original ED maps thus produced were photocopied in triplicate; one for each municipal office, one for each prefectural government and one for the Statistics Bureau, Management and Coordination Agency. For the 1985 census, 40,098 sheets of the original ED maps were produced.

Four pilot surveys were conducted prior to the 1985 census. Through these pilot surveys the questionnaire design and instructions were modified; the period of collecting the completed questionnaires was extended to one week, and enumeration and other related documents were improved.

At the planning stage, the possibility of adopting other new measures was studied extensively. Some of which included use of sampling in the field operation, assigning two enumeration districts or a larger number of households than in previous censuses to each enumerator, and direct reception of the completed questionnaires at the municipal offices for households the members of which were apt to be away from home. According to the results of the pilot surveys, however, they were considered impractical and it was decided not to adopt them.

In recent years the increasing consciousness of individuals towards the protection of privacy has made conducting statistical surveys more difficult. In order to minimize the fear people might have and get their full co-operation in the census-taking, the following measures were taken: (i) whenever possible the enumerator was assigned to an enumeration district where he was not acquainted with the residents; (ii) to make the field operation smoother, an attempt was made to improve the enumerator's manual, and a videotape for training the enumerators was prepared; (iii) the publicity campaign for the census was intensified to make people better appreciate the necessity and importance of the census, and assure them that all the information given would be treated in strict confidence by the census-taker; and (iv) an instruction leaflet was prepared that could be used for folding and sealing the completed questionnaire when a respondent did to wish to hand it directly to the enumerator.

Committee structures

To discuss problems and make plans for the 1985 census, the "Planning Committee of the 1985 Population Census" was set up in the Statistics Bureau in February 1982. In addition, the "Committee on the Environment Problems of Statistical Survey" was established in December 1982 with legal experts to study the protection of privacy, and held six meetings by the middle of February 1984. With regard to relations with other government agencies, the "Liaison Committee for Governmental Agencies" was set up in April 1984 under the chairmanship of the director-general of the Statistics Bureau to confer with representatives of other governmental agencies about the tabulation and publication plans and to ask for co-operation in carrying out the census. In October 1984, the "Central Headquarters for the Execution of the 1985 Population Census" was organized jointly by the Statistics Bureau and the Statistics Center to carry out the census work more effectively in full co-operation. In addition, meetings with officials of local governments and/or specialists were held more frequently and intensively than in the past censuses to discuss and study various problems in each stage of census-taking including those mentioned above.

Training and fieldwork

A conference of the Chiefs of Statistics Divisions of Prefectures was held in April 1985 at the Statistics Bureau. In this conference, the Statistics Bureau explained the overall plans for the 1985 census and responsibilities and duties of the prefectural governments, municipal offices, supervisors and enumerators. Several training and instruction meetings were held for the prefectural officials in charge of statistics. The principal subjects of the meetings were the detailed explanations on the procedures for conducting the census, the enumerators' duties, responsibilities and work of the municipal offices and prefectural governments, and recruitment of the field staff.

The municipal offices organized training sessions for supervisors from the end of July to the beginning of August 1985. These gave the supervisors detailed instructions on their duties, the contents of the census, field work methods, and the examination of completed census forms and other documents. Each session was for about 15 supervisors, and about 4,300 sessions were held throughout the country.

After the appointment of enumerators, the municipal offices organized training sessions which were attended by

30 to 40 enumerators. In these sessions, training and instruction for the census were given by officials of municipal offices or by supervisors. The instructions given included the outline of the population census, duties of enumerators, explanations on how to fill in the questionnaire and other related documents, checking up the entries of questionnaires, and confidentiality. On average, the training session lasted half a day and was conducted in a classroom manner, with instructions given on the basis of the Enumerator's Manual and other training materials.

In the 1985 population census, mark sheet-type questionnaires printed on both sides were used. These questionnaires were completed by the heads of households. In principle, each enumerator was assigned to one enumeration district, which contained 50 households on average. The enumerator visited all households within the enumeration district assigned to him/her during the week from 24 to 30 September 1985; delivered the questionnaires and instruction leaflets; and requested that the household heads fill out the forms. At this stage, the enumerator prepared a list of households, giving the name of household heads, the number of household members and other necessary items, and drew the Summary Map of EDs showing the location of each household and landmarks.

During the period from 1 through 7 October, the enumerator visited every household in his/her enumeration district again, collected completed questionnaires and examined all the entries. He or she then updated the entries in the list of households. For the item "Year and month of birth," the household heads were asked to give answers in numerals, which were later transcribed by the enumerators in marks. Similarly, the name of country of nationality for non-Japanese and place of work or location of school were entered by the household heads in characters, and codes were given in marks by the enumerators.

Evaluation

Evaluation of the census results was made by assessing coverage errors, resulting from persons being omitted or counted more than once; content errors, the calculation of sampling errors in the case of sample tabulations.

In Japan, the methods for measuring the coverage errors include: (a) comparing the census population with the registered population; (b) comparing the census population with the population estimate; (c) conducting a post enumeration survey; and (d) cohort analysis. The content errors are given by comparison with the results of the other surveys, in particular, checking the answers of the census and the labour force survey which were taken at the same time. It is also possible to check the content errors through the PES.

The PES has been conducted following every census since 1950. The PES for the 1985 census was conducted two and a half months after the census in the areas sampled from among the enumeration districts of the 1985 census at the ratio of the one 350th in urban areas and one 700th in rural areas.

Those who answered PES questionnaires are collated with those on census questionnaires, excluding those who did not have to be counted in the census. Those who cannot be confirmed are treated as "those who may have been omitted from the census," and people whose names overlap in the census questionnaires are treated as "those double counted." Differences in answers between the census and the PES are checked on such items as sex, relationship to head of household, year and month of birth and marital status.

In the planning stage of the 1985 census, a detailed analysis was made of groups for whom omissions and duplications were found to be highest in the 1980 PES. The omission rate was highest in cities 0.7 per cent, compared with 0.4 per cent in towns and villages. The rate was relatively high among males aged 20-24 years (1.8 per cent) and 25-29 years (1.4 per cent), and females aged 20-24 years (1.4 per cent). By type of household, the omission rate was relatively high for single persons living in company dormitories (2.1 per cent), for other one-person households (2.7 per cent), and for quasi-households such as students in school dormitories and in-patients in hospitals (4.1 per cent). Special efforts were made to minimize omissions in these areas/groups.

In designing the tabulation systems for the population census, the following are usually considered: (a) meeting various statistical needs in a prompt manner so that the needed data do not become out-of-date and lose their usefulness; and (b) computerizing as much part of the tabulating work as possible for a vast amount of data on more than 120 million persons through proper editing and imputation processes, then finalizing the examination of completed statistical tables.

The tabulation of the 1985 census consists of seven basic systems: ED master system, OMR input system, data editing system, summary tabulation system, kanji (Chinese character) printing system, automatic checking system of consistency of tables, and support system for data examination. These systems are used in common at each tabulation phase.

The ED master system is used in data editing process in the general control of the information on the enumeration districts. Input of individual data on mark sheet-type questionnaires is processed by Optical Mark Readers (OMR). The OMR input system consists of the input of individual records from questionnaires, arrangement of input data format and correction of rejected data. Original input data are loaded into disks though the OMR and in magnetic tapes in the hierarchical order of prefectures, municipalities, enumeration districts, and households with serial numbers of households.

The data editing system is one of the most important tabulation systems, and is composed of the following

processes: editing of original data; compilation of editing list; correction of incorrect data; checking of the corrected data, and compilation of individual data files for tabulation.

Correction of errors detected by computer editing are made manually referring to original questionnaires, and necessary corrections are recorded on the error lists. Then, corrected data replace the erroneous data in the disk through display terminals.

The tabulated statistical tables need to be examined from various points of view before their official release. After checking the consistency of data among different tables using the automatic checking system, the principal figures in the census results are compared with the time series data and/or the related statistical tables. When some doubtful figures are found, their validity is verified by tracing back to summary data or individual data, which was often time-consuming in the past censuses.

For the 1985 census, some of these examination processes were computerized. The new system developed for this purpose has the following functions: rearrangement of summary data with the previous census data and/or related statistical summary data, and retrieval of individual data.

For the 1985 census, instead of the ACOS 800 MODEL 3 computer, the more advanced ACOS 950 was installed in August 1985. Tabulation work efficiency is estimated to have doubled as compared with that in the 1980 census.

The Statistical Center has introduced quality control approaches in processing the 1985 census data. In the 1980 census, quality control approaches were used in a limited scope to assess the degree of accuracy in coding industry and occupation by sampling inspection and to obtain data which might be useful for future quality control plans. Based on the experience gained in the 1980 census, quality control approaches in the 1985 census were carefully planned and implemented. In the quality control approaches more emphasis was placed on prevention of possible errors in early phases of the operation than on detection and correction of errors by sampling inspection in later stages. After editing the questionnaires and coding minor groups of industry and occupation have been conducted, the Evaluation Group carried out an inspection of codes, on a sample basis. They keep detailed records of errors detected and analyse their nature and cause. Based on the analysis, the Group prepares supplementary instructions for coding, including examples of typical or serious errors and remarks on treatment of doubtful cases.

The 1985 census tabulations are the starting point for the creation of a data base. A data base has an important role in the examination of the census results. The data base encompasses the results of population censuses in the past and other released statistics. In checking up the census data, relevant data are retrieved on-line from the data base, as the necessity arises, to terminal equipment which makes comparative analyses.

Analysis and dissemination

The results of the 1985 census will be released in seven volumes. Besides these reports, "Prompt Tabulation Series", "Reference Report Series", "Population Maps of Japan Series" and "Abridged Reports Series" will also be published. In addition, "Monograph Series" will be compiled to provide detailed analytical studies dealing with main subjects on population. The Statistics Center takes charge of the whole tabulation of the census results and the Statistics Bureau is responsible for the publication and dissemination of the census data. The following publication work is to be done and disseminated by the Statistics Bureau after completion of the tabulation in the Statistics Center.

Publicity

In view of the deteriorating situation in public co-operation in statistical surveys in recent years, publicity was considered very important to get full co-operation in the census-taking, and a great amount of resources were appropriated for publicity activities. Newspapers, television and radio broadcasting, films, magazines and other media were utilized to the maximum extent possible for publicity campaigns, both at national and local levels, with the co-operation of the Government Publicity Office. Several kinds of posters, banners, pamphlets and leaftlets were also prepared by the Statistics Bureau.

Personnel and costs

Field operation of the census was vested with the local governments. Under the supervision of the Statistics Bureau, the Statistics sections of the prefectural governments took responsibilities for the census operation in each prefecture. Census work, including distribution of census documents to municipal offices, supervision of the field work, collection of census documents within the prefecture and so forth, was performed through the statistics sections of the prefectural governments. All prefectural governments set up Prefectural Headquarters for the execution of the 1985 population census. Under the supervision of the prefectural government, shi (city), ku (ward), machi (town), and mura (village) offices performed such work as establishment of the enumeration districts, selection and training of supervisors and enumerators, distribution of census documents to the supervisors and enumerators, and their collection, and scrutinizing the completed questionnaires.

The field work was carried out by about 800,000 enumerators who were temporarily appointed for this census. Moreover, about 60,000 supervisors were appointed to take the responsibilities of training and supervising enumerators, of examination of entries in the census

Table 1. Reports of the 1985 population census of Japan

Title of publication	Date of release
The Report of the 1985 Population Census of Japan	
Vol. 1 Total Population	January 1987
Vol. 2 Results of the First Basic Complete Tabulation-Basic Characteristics of Population and Households	
Part 1 Whole Japan	December 1986
Part 2 Prefecture and Municipalities (47 parts)	June to November 1986
Vol. 3 Results of the Second Basic complete Tabulation-Industry	
Part 1 Whole Japan	October 1987
Part 2 Prefecture and Municipalities (47 parts)	February to September 1987
Vol. 4 Results of the Third Basic Complete Tabulation-Occupation and Specific Households	
Part 1 Whole Japan	August 1988
Part 2 Prefecture and Municipalities (47 parts)	February to July 1988
Vol. 5 Results of Detailed Sample Tabulation	
Part 1 Whole Japan (2 parts)	December 1989
Part 2 Prefecture (47 parts)	February to September 1989
Vol. 6 Commutation	
Part 1 Place of Work or Schooling of Population By Sex, Age and Industry (Major Groups)	November 1987
Part 2 Place of Work or Schooling of Population Occupation (Major Groups)	September 1988
Part 3 Place of Work or Schooling of Population By Industry and Occupation (Medium Grops)	December 1989
Vol. 7 Results of Special Tabulation	Not fixed
Special Vol. Densely Inhabited Districts of Japan	January 1987
Prompt Tabulation Series	
1. Preliminary Counts of the Population on the Basis of Summary Sheets	December 1985
2. Prompt Report of the Basic Findings (Results of One Per cent Sample Tabulation)	
Part 1 Whole Japan	June 1986
Part 2 Prefectures	June 1986
Reference Report Series	
1. Commuting Population	October 1988
2. Population of Major Metropolitan Areas	November 1988
3. Results by Population Size of Shi, Machi and Mura and of DIDs	January 1989
4. Aged Population	1988 to 1989
5. Aged-person Household	1988 to 1989
Abridged Report Series	
1. Major Aspects of Population of Japan (Results of One Per cent Sample Tabulation)	December 1986
2. Population of Japan	
Part 1 Basic Characteristics of Population and Households	June 1987
Part 2 Industrial Structure	April 1988
Part 3 Occupational Structure and Specific Households	January 1989
Special Vol. Outline of the Census and Explanation of Terms	December 1987
3. Population of Prefecture (47 parts)	May 1987 to February 1988
Population Maps of Japan Series	
Materials Related to Enumeration Districts	
1. User's Guide to Census Data and Materials Related to Enumeration Districts	February 1988
2. Materials for Census Tracts	Not fixed

questionnaires and so forth. These enumerators and supervisors were appointed by the Director-General of the Management and Coordination Agency. Enumerators and supervisors were appointed, in principle, from among private persons, but a fairly large portion of supervisors were appointed from employees of municipal offices. The budget for the 1985 census in fiscal years 1983, 1984 and 1985 amounted to 781 million yen, 1,671 million yen and 32,798 million yen respectively. The 1985 census expenses in 1984 were spent on the preparatory work such as delineation of enumeration districts and the pilot study. In addition, the budgets for tabulation and publication of the results will become necessary in the fiscal years 1986 to 1989.

Plans for the next census

The 1990 census will be a full-scale census, that is roughly comparable to the 1980 census in the number of the enumeration items. However, there will be a re-examination of the questions with a view to curbing public criticism relating to privacy issues and for improving the quality of data. In the 1990 census, a larger size of questionnaire, which can be folded, may be used to accommodate the large number of topics in the questionnaire and to protect privacy.

Quality control approaches have been adopted in tabulation work of the 1980 and 1985 censuses to assess the accuracy of data on industry and occupation, and obtain data useful for improving the accuracy and effectiveness of tabulation work in future censuses. But quality control approaches were not completely used in the field operation. The field work and the method of scrutiny of data entered in the questionnaires at the municipal offices will be re-examined so as to improve quality control.

17. KIRIBATI

The 1985 census

The most recent census of population was held in May 1985. The *de facto* population was some 64,000 persons living on 21 inhabited islands. Previous post war censuses held in Kiribati were in 1947, 1963, 1968, 1973 and 1978.

The Statistics Office began planning for the 1985 census in June 1983 but it was not until October 1984 that a Census Office was established. A Census Commissioner was recruited from the United Kingdom. He was supported by a Deputy Census Commissioner (locally recruited) who was responsible for preparatory work in the outer islands and for recruiting supervisors to conduct the enumeration. A New Zealand volunteer took charge of the data processing and a second volunteer was responsible for publicity and the enumeration of the Line and Phoenix islands as well as procuring materials for the enumeration. A typist and a clerk made up the rest of the team until after the enumeration when six coders and key operators were employed. Advisory visits were made by the demographer of the South Pacific Commission and the Commission's Population Data Processing Officer designed the system and wrote data entry and edit programmes.

The census was funded from outside Kiribati, the Government of the United Kingdom of Great Britain and Northern Ireland met all costs except data processing which was paid for by the Government of New Zealand.

A pilot census was mounted in December 1984 and the results assessed by the end of that month. The questionnaire and procedures were agreed by end January 1985. Preparations for the 1985 census were complete by 31 March. Supervisors were trained in Tarawa in April, returning to their islands to organize the enumeration during the school holidays. Census night was the 9/10 May, and 26 supervisors and 207 enumerators completed the field work by 17 May. Preliminary results were published on 30 May. Data Processing was begun on 3 June and finished on 30 August, and the tabulations were completed by 18 September. The data was made available to users and 11 tables of general interest were published a week later. Volume I of the Report on the 1985 census was printed in Australia and copies distributed about July 1986 both internally and to overseas organizations. Volume II of the 1985 census report is under preparation. That report will contain some analysis of the data including migration.

18. LAO PEOPLE'S DEMOCRATIC REPUBLIC

The 1985 census

The population census of 1 March 1985 was organized by the State Planning Committee. In January 1984 the State Statistical Centre (SSC), which is under State Planning Committee (SPC), undertook a pilot census in one district with an objective of looking into the problems of taking a census. Four months later another pilot census was conducted. After that, following a request of the SPC, the Council of ministers ordered a decree on 24 July 1984 for the conduct of a population census for the country. This decree provided the basis for planning the 1985 census.

The steering committee for the census at the central level, which had been created in July 1984, undertook a series of tasks such as: (i) holding a conference for announcing the census plan at the provincial level; (ii) preparing documentation; (iii) questionnaires design; and (iv) training combined with a pilot census for high ranked functionnaires of central and provincial levels in order to enhance the general understanding of a population census.

Between March to September 1984 sub-national steering committees were created in the provinces, districts and sub-districts levels. The committees had the following tasks: (i) to check the boundaries of each level of administration (especially at the lowest level); (ii) to prepare sketch maps of the population areas at different levels; and (iii) to make sketch maps of houses in villages and lists of families and family members. From these sketch maps and the list of families and family members, enumeration zones were fixed with an average of 400 persons for one enumerator. The local steering committees also set up the recruitment and training of supervisors and enumerators and publicized the census.

On 26 to 28 February 1985, the head of the village and the enumerator made a check on people in the village and arranged to meet them. The enumeration took seven days from 1 to 7 March 1985. On the 8 and 9 there was a 20 per cent post enumeration survey.

The data processing was done manually and by computers. Up to the end of March 1985 all the census materials were kept at the provincial offices for manual tabulation. By June 1985 the government issued the preliminary results. After that data processing by computer began and was completed by June 1986. The full census results were published by September 1986.

19. MALAYSIA

Historical background

The Federation of Malaysia comprises the 11 States in Peninsular Malaysia and the Federal Territories of Kuala Lumpur and Labuan (in Sabah), and Sabah and Sarawak on the island of Borneo. The first census of population covering all of Peninsular Malaysia was conducted in 1911. Earlier censuses were confined to particular States within the Peninsular. Subsequent censuses for Peninsular Malaysia were conducted in 1921, 1931, 1947 and 1957. The States of Sabah and Sarawak had their first censuses in 1901 and 1939 respectively, and their most recent censuses prior to joining Malaysia in 1960. The first census of population and housing covering the whole of Malaysia was conducted in 1970. The most recent census was held in 1980 and there are plans to hold the next census in 1990.

Design of the 1980 census

Under the Constitution of Malaysia, census taking is a federal responsibility and the legal basis for the census is provided by the Census Act of 1960 (revised 1969), which empowers the government to conduct a census from time to time. The responsibility for conducting the 1980 population and housing census was vested in the Department of Statistics, which implemented the project in collaboration with the State Governments.

The 1980 census was essentially conducted on a *de facto* basis. Thus persons were enumerated in the place where they were found on census night. Malaysians who were not in the country on census night were excluded. The enumeration of persons travelling by road on census night, as well as the homeless, was done with the co-operation of the police. Persons travelling by trains on census night were also enumerated and persons afloat were enumerated with the assistance of the harbour masters.

The 1980 census was conducted in two stages, and used the personal interview approach, but did not include a simultaneous sample survey. The first stage of the census consisted of listing all living quarters in the country, conducting a preliminary count of the population, and recording such housing characteristics as type of living quarters, type of material used for walls and roofs, toilet facilities and water supply. This first stage was carried out 17 to 26 May 1980. The second stage enumerated and recorded the characteristics of each individual present in the living quarters on census night, which was the night of 10 June 1980. This second stage was carried out 11 to 28 June 1980.

For the purposes of the census, the country was divided into separate enumeration blocks (EBs), each containing 80 to 120 households, or about 500 persons. These EBs were grouped into units of convenient size (eight to ten blocks) called census circles; a census circle constituted the area of responsibility of a supervisor. A group of eight to ten census circles formed a census district, which was put under the charge of a district superintendant. Two to three census districts generally made up one state administrative district, and an assistant commissioner, who was generally the district officer, was responsible for the census operation within a district.

The Directorate of National Mapping provided the base maps on which boundaries of enumeration blocks were demarcated. Subsequently, larger sketch maps of EBs were constructed with greater detail (extracted from the existing national sampling frame of enumeration blocks, which is regularly updated). When the first stage of the enumeration began, each enumerator was given a houselisting book together with a map and a description of his or her EB.

The content of the final questionnaire was the outcome of many proposals and suggestions that came from government departments, universities, and knowledgeable individuals. There was a tendency to wish to include as many topics as possible in order to satisfy the many demands for information. The topics finally selected are listed below.

Population

1. Place where found at the time of census
2. Sex
3. Relationship to head of household
4. Age
5. Year of birth
6. Ethnic group
7. Religion
8. Citizenship
9. Colour of Malaysian identity card
10. Physical handicap
11. Place of birth
12. Duration of residence
13. Place of last previous residence
14. Reason for migration
15. School attendance
16. Educational attainment
17. Field of vocational training
18. Ability to speak one or more languages

19. General literacy
20. Literacy by language
21. Type of activity
    Short reference period (seven days)
    One-year reference period
22. Employment status
23. Occupation
24. Industry
25. Marital status
26. Times married
27. Age at first marriage
28. Number of children ever born alive
29. Number of children living

Household

1. Number of persons in the household
2. Tenancy
3. Household items
4. Household income

Housing

1. Location of living quarters
2. Number of households in the living quarters
3. Number of occupants in the living quarters
4. Ethnicity of head (s) of household
5. Type of living quarters
6. Construction material of outer walls
7. Construction material of roof
8. Condition of structure
9. Occupancy
10. Ownership
11. Water supply
12. Lighting
13. Toilet facilities
14. Bathing facilities
15. Cooking facilities
16. Rooms
17. Year of construction
18. Builder

Census organization

Heading the 1980 census project was the Census Policy Directing Committee under the chairmanship of the chief secretary to the government. The members of that committee were drawn from key ministries, departments and central agencies of the government. The committee provided policy guidelines on financial and manpower requirements of the census as well as on its planning and execution.

The over-all census operation was headed by the commissioner of census, who is also concurrently the chief statistician of Malaysia. He was assisted by two teams of officials. The first team, at headquarters level, was responsible for planning, preparation of the census documents, data processing, preparation of reports, and dissemination of the census data. The second team was drawn from officers of each of the 13 states and the Federal Territory in Malaysia. These officers were primarily responsible for the organizational, supervisory and enumeration work at the ground level. A senior officer from each of the 13 States and the Federal Territory was designated as state deputy commissioner of census; a separate deputy commissioner of census was appointed for the Department of Aboriginal Affairs.

Altogether about 27,000 enumerators and 2,700 supervisors were recruited for the census project. The supervisors, who played a vital role in the project, were principally drawn from serving government officers. The majority of the enumerators were recruited from the open market.

Preliminary preparations for the 1980 census began in 1977. Work in earnest proceeded in 1978 with the formation of the Census Policy Directing Committee. A Technical Committee, comprising government officials of key user agencies, was also formed to examine the types of data needed by the government and to formulate the topics to be covered in the census. Data needs of non-governmental users were assessed from the data requests received from them for the 1970 census and were given due consideration in designing the census questionnaire. In addition, the recommendations of the United Nations were also taken into consideration.

Publicity

National publicity for the census was conducted by the Ministry of Information through a joint committee of the Ministry of Information and the Department of Statistics. Films were shown over the national television networks; slides were shown at local cinemas; publicity and feature write-ups appeared in the national and local newspapers; posters were distributed and displayed; talks and explanations were given by the information mobile units; postmarks were utilized. Small calendars promoting the census were distributed to school children and members of the public.

Training and fieldwork

The responsibility for recruitment of enumerators and supervisors was decentralized and assigned to district

officers who were provided with guidelines as to the type of qualifications required of supervisors and enumerators.

Generally speaking census enumerators needed to have at least a Sijil Persekolahan Malaysia (equivalent to the School Certificate), and it was preferred that they be from the area they were assigned to enumerate. In general, supervisors were required to have completed their post-secondary education. They were generally required to possess the Sijil Tinggi Persekolahan (equivalent to the Higher School Certificate). Supervisors consisted of school leavers as well as currently serving government officers and teachers.

The training of census personnel was decentralized. A group of about ten enumerators were trained by a supervisor. Supervisors in turn were trained in groups of about ten by a district superintendent. District superintendents, about 29 on the average, were trained by headquarters staff at each regional training centre. A total of 27,000 enumerators, 2,700 supervisors, and 295 district superintendents were trained for the census.

Enumerators were instructed to interview any adult or responsible member of the household present at the time of the visit. If no one was at home, the enumerator was to leave a call-back card indicating the date and time when he would call back. If the enumerator was not successful in getting a respondent after three call-backs, the enumerator was to obtain as much information as possible from neighbours. There were very few outright refusals and these were referred to the supervisors and district superintendents, who in most cases resolved the problems. The enumerator visited each house in their enumeration blocks and conducted face-to-face interviews with the respondents. Enumerators enumerated an average of five to six households per day.

Supervisors were instructed to meet each of their enumerators at least once while the enumeration was in progress to review the enumerator's fieldwork. During this field check the supervisor verified that: (i) the houselisting book was correctly filled; (ii) there were not too many cases of vacant living quarters; (iii) the enumerator had made call-backs in not-at-home cases and, after three recalls, filled in whatever information could be obtained from neighbours; and (iv) the questionnaires had been filled in completely.

After the enumeration was completed, the supervisor had to check the completed census forms handed to him by the enumerators. In addition to the checks stated in (i) and (ii) above, the supervisor had to: (i) check that not-at-home cases had been handled properly and the census forms had been marked properly; (ii) ensure that the population figures obtained from the first and second stages were not very different. If it was ascertained that the differences were the result of an increase in vacant living quarters in the second stage, a field recheck had to be made; and (iii) select a sample of the census forms for detailed scrutiny, and if a lot of forms were only partially completed, the supervisor had to instruct the enumerator to reinterview those cases.

Evaluation

A post enumeration survey (PES) to estimate the coverage and content errors of the main census was conducted some two months after the census enumeration. A one-stage 5 per cent cluster sample of enumeration blocks was reenumerated. In order to ensure the independence of the PES, the project was carried out by a different division of the Department of Statistics. The temporary staff recruited, if found to be former census enumerators, were assigned different areas from the ones they worked in for the census. Furthermore, information obtained in the census was only used at the reconciliation stage. All information for the PES was collected afresh. Different questionnaires were developed and used for the PES, although the concepts and definitions were maintained.

The information collected during the PES was matched with that transcribed from the census for the selected EBs. This was a two-way process, matching being done from PES to census and vice versa. Matching was done at three levels, namely, the living quarters (LQ) level, household level, and person level. For units that could not be matched at any of the three levels, field verification was done. Following the field verification, the final decision was made as to whether the PES records were matched, omitted from the census or erroneously included in the census. The PES showed that the over-all level of underenumeration was 4.4 per cent. The principal results from the PES were used to adjust the census counts and are incorporated in volume 1 of the General Report of the Population Census.

In addition to the PES, the population census counts for the age group 0-4 according to sex and ethnic group were also checked against independent estimates of the population in this age group obtained by forward surviving births occurring in the five years before the census using registration data. The results of that check suggested that the PES had failed to capture the full extent of underenumeration in that age group.

Data processing

To facilitate processing, the questionnaire was designed as an optical mark reading (OMR) form. Enumerators recorded the information they collected directly onto the forms, which after editing and coding, was read into the computer at census headquarters with OMR equipment. The raw data were thus captured directly on magnetic tape for subsequent processing before tabulation.

Completed census forms were first edited manually. They were checked for errors in geographic identifiers, and the number of forms was checked against control totals

to ensure that all the returns were accounted for. The census forms were then sent to the coding sections for the insertion of codes on ethnicity, place of previous residence, occupation, and industry. On completion of the coding process the forms were sequenced and batched for reading into the computer through the OMR equipment. The use of OMR in the 1980 census was implemented without any serious problems. However, the machines required special paper and good quality printing. The documents that were rejected because of incorrect marking or physical damage had to be corrected and reread into the system. That did not affect the speed of take-on.

When all the data had been read and stored on magnetic tapes the process of validation and imputation began. Missing information and inconsistencies were dealt with by the computer. When all the data passed through the validation and imputation processes, an acceptably error-free data tape was created, ready for the generation of tables.

Manual processing prior to reading the records into the computer was made more efficient by the extensive use of statistical quality control procedures. At each stage of the operation a sample of the census forms for each enumeration block was selected and inspected, and the number of errors found in the sample was noted. If the number of errors found in the sample was acceptable the form for that enumeration block was passed on for further operations. If not, the census forms for the whole enumeration block were rejected. These forms were then rechecked and all errors were corrected before the enumeration block was passed on to the next activity.

In order to process the 1980 census the existing electronic computer configuration of the Department of Statistics was upgraded substantially. Two ICL 2956 computers with 1.5 megabytes of core storage each were installed, and one was dedicated to census work. In addition, a separate take-on configuration was set up to read the OMR census forms onto magnetic tapes for further processing on the main computer. The take-on system consisted of one ICL 2903 minicomputer and three optical mark readers.

To reduce the burden of developing the systems and programmes to process the census data, the Department of Statistics resorted to the use of a standard software package (FILAN) provided by the manufacturer. The extensive use of this package was a satisfactory alternative since the department did not have the necessary manpower to develop its own systems and programmes. In the early stages of programme development, a set of sample data was used to test the validation, imputation, and tabulation programmes extensively to ensure that they were performing according to the specifications established by the statisticians. This procedure minimized the turnaround time of the final tabulations, and the over-all approach to data processing proved to be quite satisfactory.

Publications and analysis

Tabulations of the 1980 census data were produced at the following levels: administrative district, state, Peninsular Malaysia, and Malaysia. A field count summary was released in October 1980. A preliminary report, based on a 5 per cent sample, was completed in early 1982. A two volume main report based on the full census count was published in 1983. The first contained an account of the census procedures as well as an analytic commentary on a range of key topics. The second volume contained the detailed statistical tables. These publications were followed by a series of releases at the state, administrative district and local area levels.

Following each population census the Department of Statistics prepares and publishes mid-year estimates of the population by age, sex and ethnic group for each of the three regions of Malaysia. The final census based estimates are carried forward year by year by demographic flow methods using birth and death statistics. This enables the department to produce provisional population estimates. After the 1980 census the provisional intercensal estimates are revised to take account of migration. Apart from the general statistical reports, a series of analytic reports on selected topics were published. These include: (i) a census based study of fertility trends for 1970 and 1980 in every district in Peninsular Malaysia; (ii) reliable age and sex distributions of the population of Sabah and Sarawak and estimates of trends in fertility and mortality; (iii) revised intercensal population estimates; and (iv) estimates of the components of urban growth 1970-1980.

Costs

Census expenditure for the period 1979 to 1982 amounted to 49 million ringgit. The major item was salaries and allowances paid to temporary field staff and temporary census checkers and coders, amounting to nearly 30 million ringgit or 61 per cent of the total. Other major expenses were transport and travelling incurred during the census enumeration phases and the rental of the computer for census processing. These amounted to slightly over 8 million ringgit.

Plans for the next census

For the next census we are examining the feasibility of collecting some of the information on a sample basis only. That is, there could be two questionnaires, one containing a number of basic questions (for which the items of information collected are required for the entire population) and a second which, in addition to the same basic questions will include further items which will be asked of a sample of the population. The advantages of this strategy are that it would lessen the workload which may help reduce the rate of under-enumeration, reduce data pro-

cessing costs and help in speeding up the dissemination of the results. In anticipation of the projected increase in the number of records that will have to be processed the Department of Statistics at the technological advances that have been made in data entry equipment available for processing census returns.

The PES to the 1980 Census showed that the highest rates of under-coverage were found to be for new born babies, very young children and young adults. In an attempt to reduce some of the problems of under-coverage in the next census we have been conducting field tests using new types of questions that ask for the names of persons living in households by various age groups, rather than just asking respondents to list the names of every member of their households.

In a separate exercise we have been analysing the demand for census data made by users inside and outside government. Specifically, we have been looking at the requests we have received for published and unpublished census data by topic, the range of cross-classifications and the level of geographical disaggregation. This will help us in deciding upon the topics to be included in the next census as well as in improving the usefulness and timeliness of the range of tabulations that are specified in advance of the actual census.

20. MALDIVES

Historical background

Maldives is an archipelago of about 1,200 coral islands in the Indian Ocean. Only 200 of these islands are inhabited, of which two are subdivided into two administrative units. Thus, the country has 202 administratively inhabited islands or units. The first modern census was conducted in 1911. This was followed by decennial censuses in 1921 and 1931. These censuses coincided with those of Sri Lanka. Census taking was interrupted during the Second World War and was resumed in 1946. The first post-war census was in 1953 and then 1957. Thereafter annual censuses were undertaken until 1972. Since that time censuses have been conducted in 1974 and 1977. The 1985 census, which was the most recent, was conducted by the Ministry of Planning and Development. In all the past censuses except the latest, all Maldivian citizens were enumerated. In the 1985 census citizens of Maldives as well as foreigners were enumerated on *de jure* and *de facto* basis.

The 1985 census

Except tourists, everyone residing in Maldives was counted in the 1985 census. The census was divided into two main phases. First, a housing list was prepared and various characteristics of the structures were recorded. The second consisted of obtaining information about individual and household characteristics.

Although several censuses have been held in the past, modern concepts and definitions of census-taking were new. The need for proper training of enumerators and supervisors was considered to be of prime importance. Past experience suggested that by strengthening training activities the quality of the census would improve appreciably. Yet given the geographical spread of the islands over vast expanse of sea, transport and communication remain stumbling blocks for progress in addition to the acute shortage of qualified personnel on some islands.

The 1985 census was conducted from 27 to 29 March 1985, a period when weather conditions are favourable for travel between the islands. More than 2,000 enumerators and supervisors were trained for the census. Efforts were made to schedule training activities as close as possible to the census date. All the enumerators were government employees except in Malé where students participated very effectively.

Maps were drawn and updated for Malé the capital. All island maps were also updated. However detailed mapping was useful only in the case of Malé.

The core staff of the Ministry of Planning and Development remained the Central Organizing Unit for the census. A very significant feature is the close association of the Ministry of Planning and Development with the President's office. The senior Census Officials had frequent access to the President and all activities progressed under his close supervision and guidance. A high powered committee consisting of three Ministers was formed. The enumeration process was closely supervised by this committee.

Data processing

The 1985 census marked the first time that census data was processed electronically in Maldives. In previous censuses the data was processed in Colombo (Sri Lanka) or manually tabulated at Malé. A mini-computer, Data General Eclipse 120 was received from UNDP. This computer, however failed to meet the expected levels of performance. Although the computer had the capacity to work with 16 independent terminals, the speed dropped very sharply after the fourth terminal was hooked on. Excessive delays were experienced in data entry.

The data entry computer programmes were developed locally. Under the Japan-Maldives Volunteers Agreement, a computer programmer assisted the Ministry in developing programmes for census data processing. This was valuable assistance and the computer staff benefited. The questionnaire for the 1985 census was pre-coded as far as possible. However, there were certain area items like location, occupation and industry that had to be manually coded. That exercise was completed by utilizing students during their annual vacation. Qualified personnel for data entry are not readily available. Only after final examinations were the students available.

Preparations have been made for printing a report of the 1985 census. This report will contain the basic tables, and will be divided into three parts, population, housing and households.

21. NEPAL

Historical background

The first population census of Nepal was conducted in 1911. Since then there has been a trend of continued census taking every ten years. Most of the population counts taken prior to 1911 were meant to enumerate residents for purposes of securing military services, tax collection and other purposes. In almost all of the censuses excepting 1961 and 1971 there has been no housing censuses.

The post-war population censuses of Nepal have adopted internationally comparable concepts and recommendations and are more detailed than earlier censuses. There have been few changes in concepts in the population censuses of 1952/54, 1961, 1971 and 1981, except for minor modifications in questionnaire design and in field operation organization. The population censuses have been taken on the basis of a modified *de jure* count. Each and every person in the country is enumerated on the basis of their usual place of residence. Other homeless and institutional population were counted at the time of census wherever they were found.

Design of the 1981 census

The design of the 1981 census was similar to that of previous censuses and based on a full count. Two types of schedules were used. A household schedule for listing the households and an individual schedule for enumerating each member in the households. The household schedules for the 1981 population census were filled in within a duration of two to two and half months prior to the actual enumeration. This schedule was basically used only for listing households. This was followed by an individual questionnaires completed for a duration of two weeks. There was no sampling in either the housing or population censuses.

In 1981, for the first time in the history of census taking in Nepal there was a separate mapping project. The main objective of this project was to prepare population maps for 75 districts, 2,912 village panchayats and 23 town panchayats. Enumeration area maps at the smallest administrative unit (ward level) were produced only for the 23 town panchayats.

Committee structures

Decisions on basic issues of census planning and implementation were made by a Census Planning Group in co-ordination with a Census Advisory Committee. A steering committee was formed to advise the census planning group on different aspects of planning and execution of the census. This committee played a similar role as that of the Census Advisory Committee, and comprised representatives from various ministries, principal users of census data, and experts in statistical procedures.

Within the Bureau of Statistics a technical committee was formed and was responsible for preparing the questionnaires, instructions and tabulation plan. This committee group was also in close affiliation with the census planning group.

Training and fieldwork

All of the district officers, assistant district officers and accountants were recruited and trained at headquarter. The duration of training for these staffs was three weeks. During this period they were given intensive training on the household scheules, the individual questionnaires, mapping, over-all administration, accounting and other related fields. After the training teams were sent to each of the 75 districts covering the whole country where district offices were established. All of these district offices recruited and trained 1,500 supervisors and in turn trained 15,000 temporary enumerators.

For the household listing the supervisors filled in the household schedule during a period of two to two and half months prior to the actual enumeration. After completing the household listing the enumerators filled in the individual questionnaire for a period of two weeks.

Evaluation

Just after the completion of the actual enumeration of the 1981 census a Post Enumeration Survey (PES) was conducted. The purpose of this PES was to check the quality of the 1981 census data, focussing especially on the coverage error. The PES was conducted during the period 1 to 14 August 1981. For the selection of the PES sample the whole country was divided into ten strata, of which two were urban and eight rural. The PES was confined to one way matching of events found in the PES but not in the census. This showed an undercount of 16.6 per cent for all rural areas and 19.5 per cent for all urban areas. Unfortunately, due to coverage problems and methodological problem of one way matching these estimates could not be relied upon.

Data processing

After the completion of the field work for the 1981 census the district officer, together with his two subordinates, brought all the census questionnaires to the central

office. The completed schedules received in the central office were once again carefully checked and kept in order of the administrative units of the country. If any inconsistencies were observed the problem was resolved immediately with the district officer. In this way, before processing the actual data, the forms were kept up to date for data preparation.

Before editing and coding the household and individual schedules, separate instructions manuals for editing and coding were developed. The schedules edited and coded by coders were rigorously supervised by the coding supervisors so as to minimize errors. After the completion of editing and coding of the household and individual schedules the data entry operation was done with the help of key punch operators. Use was made of 48 data entry terminals at the National Computer Center. The data entry was also performed in two consecutive shifts of day and evening. There were separate verification groups who verified the key punched data from the diskettes. The data punching and verification took around 12 months. The clean data from the diskettes were then processed using an ICL 2950 mainframe computer.

Analysis and dissemination

Several analytical commentaries have been prepared using the 1981 census data which also include comparative study with the results of previous censuses. There were two users' seminars conducted in 1985 for disseminating the analytical results of the census. Two analytical reports based on these two seminars have been produced.

The final results of the 1981 population census have been produced in ten separate volumes. They include more than 100 tables covering different socio-economic topics as well as fertility, mortality and the migration status of the population. There are also two analytical reports of the population census data of 1981 and its comparative study with previous censuses. The 1981 census data and final tabulations are kept in tapes and disks with proper security at the National Computer Center for future use. The computer records of the 1981 census are readily accessible.

Publicity

Before the census a communication and publicity project was started in mid-1979. The main objective was to make the public aware of the 1981 census. Intensive publicity programmes, ranging from radio broadcasts to regional communications seminars were held in the country. Census posters, logo stickers, calendars, leaflets and pamphlets were also distributed.

Personnel and costs

For the 1981 census all the field workers and data processing personnel were freshly recruited. Among the newly-recruited personnel there were 75 district officers, 75 assistant district officers, 75 accountants, 1,500 supervisors and 15,000 enumerators. For the purpose of data processing 200 editors and coders, 120 key punch operators, 20 coding supervisors and 20 key punch supervisors were centrally recruited.

The estimated total cost incurred for the 1981 census was $US 5.4 million. For the over-all activities of the census programme was the UNFPA provided external assistance of $US 2.4 million. The budgetary contribution of His Majesty's Government of Nepal was estimated as $US 3 million.

22. NEW ZEALAND

Historical background

Rapid immigration into New Zealand in the first half of the nineteenth century led to the passing of an ordinance in 1851 requiring national censuses within three years of each new decade, commencing in 1851. This ordinance was invalidated by the establishment of provincial governments in 1853. However, national censuses were restored in 1858 with the 1877 Act introducing a quinquennial census cycle, which has been maintained ever since with the exceptions of 1931 and 1941. The Census Act of 1910 created the Census and Statistics Office which was extended in 1955 to become a department of state under a Government Statistician.

The Statistics Act of 1975 and its amendments have governed the conduct of recent censuses. Section 23 provides for a census of population and dwellings to be taken in the year 1976 and in every 5th year thereafter. The Act requires certain particulars to be obtained at each census, including: the name, address, sex, age and ethnic origin of every person in New Zealand on census night, and the location, number of rooms, ownership and number of occupants for every dwelling occupied on census night. In addition the Government Statistician is entitled to obtain particulars relating to whatever additional matters he considers to be in the public interest.

The 1986 census included all persons in New Zealand, at midnight on Tuesday 4 March; it was conducted as in past censuses, on a *de facto* basis. Members of the armed forces of foreign (non-Commonwealth) nations on warships or in military camps in New Zealand were excluded, as were New Zealand residents who were overseas at that time. All other persons were enumerated.

Following the 1981 census of population and dwellings, a comprehensive review of procedures was initiated. With the requirement to reduce expenditure in real terms, a number of significant operational changes were introduced for the 1986 census. These changes included the full management and conduct by the department of the field data collection process, the enhancement of the questionnaire development programme and the utilization of recent advancements in computer technology to process the questionnaires.

From 1916 to 1981 the field enumeration was conducted by the Post Office. In recent censuses, however, staff delegated to these duties were also required to undertake their normal Post Office duties. The decision by the Department of Statistics to undertake the field data collection exercise required the setting up of a temporary management structure. Their employment of 220 such staff on a full-time basis enabled the contraction of the field enumeration timetable and a 30 per cent reduction in the number of census enumeration districts.

A total of 257 submissions were received on the content of the 1986 census questionnaires. The suggested topics in these submissions were carefully evaluated for suitability in the census and where appropriate underwent field testing. Users were given guidance on suitability of topics by way of a bulletin on the subject and a specially formulated submission document.

With the decision to use the questionnaire as the data capture document, precoded response boxes were employed wherever possible. The effective use of colour and shading greatly enhanced the design of the questionnaire. Language experts were utilized to ensure the wording was simple and easily understood by the public.

Whilst single pilot tests were undertaken prior to the 1976 and 1981 censuses, the 1986 census saw the introduction of a comprehensive testing programme with a total of eight question content tests being conducted between August 1983 and November 1984. The test programme included four pretests focusing on a limited number of topics (usually less than five), two skirmish tests which attempted to develop the best wording and layout for a single question, and two pilot tests which contained the full range of census questions.

The traditional labour intensive methods of coding, transcription of answers to coding sheets and subsequent editing were replaced at the 1986 census by a process whereby respondent coded boxes were captured directly off the questionnaire with the remaining descriptive answers (hard-to-code questions) being captured through an interactive computer system.

Design of the 1986 census

Field sampling has never been used in the New Zealand census. In 1976 and 1981, a sample was selected during the questionnaire processing operation to provide early statistics within nine months of census date. These sample files were subsequently available for *ad hoc* analyses. For the 1986 census, the processing and data capture systems allow for the production of early results based on a full file of population and dwelling records. A random sample of dwelling and personal records will be selected for subsequent *ad hoc* analyses.

Map requirements for the census are specified by the Department of Statistics for preparation by the Department of Lands and Survey having regard to the type and scale

of maps currently available. Map sets for Area Managers and Regional Controllers consisted of sets portraying census district boundaries. Census district, or supervisor maps, were ordered using topographical maps for rural areas, and electoral series street maps for urban areas.

Following the receipt of the Census District Maps, a review of the sub-districts was made. Utilizing reports from the previous census, estimates of Population and Dwellings at 1986 census, building permit data, aerial photography and other relevant information, each sub-district was assessed for growth and where necessary, split into two or more sub-districts as appropriate These revised boundaries were drawn on to the Census District Maps and returned to Lands and Survey for the preparation of more than 4,500 sub-district maps.

Sub-district maps for urban enumerators were specified showing streets, street names, property boundaries, streams, bridges and other physical features. For rural enumerators, a topographical map was specified, and supported by enlargements or aerial photographs of densely-populated areas and smaller townships, or electoral series street maps.

Committee structures

There were three steering committees. A Senior Management Committee chaired by the Government Statistician (GS) made policy decisions on reports and submissions forwarded from or through the Census Management Committee (CMC) and the Submission Evaluation Committee (SEC). The CMC was the principal executive committee for the census, and operated from April 1983 to December 1985, after which its functions were assumed by a Population/EDP Steering Committee. The SEC controlled and directed the work of topic and question evaluation, with a reporting function to the CMC on adminstrative and management issues, and a reporting function to the SEC for policy decisions and directives.

Technical Committees were in the form of Project Groups, each with a nominated convenor, whose function was to undertake specific tasks such as the development of imputation or confidentiality procedures, the setting up of an automated payroll system.

Training and fieldwork

Manuals of instructions were prepared for enumeration staff at each level covering the specific duties, responsibilities and methods to be employed in carrying out their duties. Those for supervisor and above also contained new material pertaining to financial accounting and administrative functions in the field. Training of Regional Controllers, Regional Training Officers and Area Managers was carried out by Population Census Division staff. Five one-day courses for District Supervisors were undertaken, and each course was repeated in different centres within each region over a two-week period. Census supervisors ran two training courses for enumeration staff, one just prior to commencement of questionnaire delivery and the other just before collection began. Training packages had been prepared by Regional Training Officers, and the Video Training Unit of the State Services Commission had made two training films, one covering preliminary duties of the enumeration and questionnaire delivery, and the other covering questionnaire collection, and the final duties of the enumerator.

The enumeration of New Zealand's population and dwelling census was undertaken on a *de facto* basis. The census was officially taken 4 March 1986. Separate questionnaires were supplied for each person in a dwelling, while the occupier, or person in charge of a dwelling, was also required to complete a questionnaire for the dwelling.

Enumerators commenced delivery of questionnaires to each occupied dwelling 11 days before census night. Every dwelling on the route was recorded in a fieldbook. At each occupied dwelling a record was made of the name of the occupier and the questionnaires issued. If contact was not made with occupants at the first or second visit, neighbours were contacted for details including the approximate number of occupants. Questionnaires were then left at the dwelling together with a specially prepared notice.

Collection of completed questionnaires commenced on the morning of 5 March. Accomodation houses were visited first to collect from departing guests. Private houses also had to be visited as soon as possible and, if contact was not made, a postal return envelope was left after three unsuccessful calls. Detail of questionnaires collected were entered in the fieldbook beside the delivery entries, together with explanations of discrepancies.

Evaluation

All aspects of the census were considered following the 1981 census and the recommendations of these evaluations were utilized in preparing the "Plan for the 1986 census". The Questionnaire Development Process for the 1986 census invited users of census statistics and the general public to make submissions on the content of the census questionnaires. Reports evaluating the user's submissions were prepared on each topic following an exclusive evaluation and testing process.

The in-depth evaluation of the 1986 census includes an analysis of debriefing reports from regional controllers, area managers, census supervisors and enumerators. These reports and other documentation provide the basis for an evaluation of organization, financial controls, enumeration procedures, field staff contracts, publicity, documentation and training, with supporting provisional recommendations for the 1991 census.

Four subjects in the post-census research programme were concerned with data consistency for selected topics

between the 1981 and 1986 censuses. These were firstly, a general consistency study involving comparison of responses to selected questions from a representative sample of 1986 census questionnaires (both dwelling and personal) with responses on the 1981 census 10 per cent samples files. Secondly, a labour force statistics consistency study involving the matching of a sample of 1986 census individual records with corresponding records from the Household Labour Force Survey and the analysis of aggregated labour force data from the census and the Department of Labour's Quarterly Employment Survey. Thirdly, an unemployment statistics consistency study involving similar data sources to the above. Fourthly, an analysis and comparison of errors in age reporting at past censuses (1976, 1981 and 1986).

Research into different aspects of coverage of statistics obtained from the 1986 census was the aim of another four specific projects. These were, firstly an evaluation of census coverage of private dwellings involving checks of census address lists in sample areas adopted for Household Labour Force Survey and Household Expenditure Survey. Secondly, estimation of the census night underenumeration of occupied private dwellings based on a post-census sample survey of unoccupied dwellings by type to check for misclassification. Thirdly, a general study involving analysis of the incidence of non-response and inconsistent answers selected questions from the census. Fourthly, an "error-of-closure" estimation involving comparison of the "expected" usually resident New Zealand population by age and sex (based on intercensal estimates) with the corresponding enumerated populations in the 1986 census.

Data processing

The processing unit comprised three separate operations, namely, data preparation (or precapture), data capture and computer-assisted coding and editing.

Following the receipt of the questionnaires from the field, Outstanding questionnaires were followed up and "dummy" questionnaires inserted where necessary. The enumeration fieldbook totals and questionnaires were balanced. Fieldbook entries and counts were then checked for errors following which a computer record counts file was set up. The questionnaires, were then issued to teams to check and manually code responses to Dwelling Type and Absentees on the dwelling questionnaire, and relationship/family number on the personal questionnaire. The personal questionnaires were then sorted into family, related, unrelated and visitor order and serially numbered within the household.

The data capture pool comprised some 48 Inforex stations. Temporary staff were hired for this work. All precoded responses were captured on Inforex key-to-disk equipment and the data entered into the computer records.

Range checks were performed on four dwelling fields and four personal fields only – this being a limitation of the Inforex system. Initially, all questionnaires were fully verified; as operators reached the required punching standards, partial and nil verification was introduced.

Some 85 staff have been employed for a period of 14 months to undertake computer-assisted coding (CAC), (see appendix A). CAC is the automation of the process of matching a question response with a reference file of descriptions and codes. The CAC operator enters a respondents answer into the computer, through a video display unit (VDU), in an interactive mode. The appropriate file of descriptions is searched and those descriptions which match most closely are displayed on screen along with their applicable codes. The main fields coded using CAC include: usual residence, residence five years ago, birthplace, ethnic origin, occupation, industry, sector, place of work, religion, social welfare payments and tertiary qualifications.

A quality control team was set up to check the precapture work and subsequent CAC workphase. Quality control procedures for the pre-capture processing operation were where possible, independent of the clerical process itself. Quality control procedures in the CAC work area were totally independent of the initial coding. Generally the coding process was emulated without recourse to the original coding decisions and, subsequently, a printout was generated which indicated all discrepancies between the coder's work and that of the quality control clerk.

In the data capture pool, batches of work were repunched and cases of disagreement checked out, in order to ascertain the cause of the error. These checks were undertaken for each operator on a regular basis, the frequency being dependent on the quality of each operator's work. The statistics generated were utilized to determine the level of verification for each operator and the over-all quality of the punching being undertaken.

Provisional counts of population and dwellings began to be released a few weeks after census date and were completed in May 1986. From September 1986, the Department commenced releasing for the first time provisional summary tabulations based on the characteristics included in the first stage of data capture. These "Key Statistics" cover basic demographic, social and economic characteristics of the population and are being produced for each local government region as the data becomes available. The series will be completed in December 1986 by the publication of national summaries. This approach to the production of provisional statistics obviates the need to produce early sample-based statistics.

More substantial time savings will be made in the release of final 1986 census statistics following final data capture. Final regional statistics, will start to be released on a regional basis within nine months of the census date. These will be followed in July 1987 with the production of subject-matter statistics, plus the range of summary, sample and matrix files for use by *ad hoc* users.

There are three factors which will enable these improvements in timeliness to be made. First, an earlier start in determining the statistical content of census publications had enabled table programming to commence at a much earlier date. Second, the use of a table generating facility (TPL), which allows tabulations to be suitably formatted for subsequent publication. Thirdly, new technology, which will enable the production of publication quality copy directly from computer files with minimum manual intervention.

The initial phase of data entry uses 48 key stations of Inforex key-to-disk equipment connected in three groups to key-to-tape capture and transfer units. Data is then transferred by tape to an IBM 4361/4 mainframe computer having a main storage capacity of 12 megabytes. Final data entry and editing is by way of 30 visual display units in an on-line operation which utilizes the computer-assisted coding facility.

The computer software to operate the CAC system was developed by the Department of Statistics during the period 1983-1985. Testing was undertaken in conjunction with the first and second pilot test of questionnaires. "Statistical Analysis System" (SAS) is used for in-house analysis including Quality Control analysis and the evaluation of data from the questionnaire tests. "Table Producing Language" (TPL) is used for most tabular production of data for publications and *ad hoc* production for users, including the regional and subject matter reports from the 1986 census.

Analysis and dissemination

Summary analyses from the 1986 census are provided in the form of News and Information releases, and cover the provisional and final counts of population and dwellings, key statistics for each of 22 Local Government Regions and the provisional national summary. Twelve further releases will also be produced as soon as the final detailed subject matter statistics (for example, labour force, ethnic origin) are available. A general report ("Profiles of New Zealanders") will complete the range of 1986 census publications. This publication will deal with a selection of topical areas rather than attempting to summarize all the material in the census.

The output policy for the 1986 census has three principal objectives. These include (i) the release of statistics in a more timely manner; (ii) the availability of data to users in a computer readable form; and (iii) an enhancement of the range of available informaton on census procedures and terms.

The publication programme for the 1986 census has three main phases: (i) the release of basic population and dwelling counts; the release of provisional statistics (including key statistics for the first time ever); and (iii) the publication of final population and dwelling characteristics.

The first release of statistics from 1986 census took place between April and June 1986 and contained provisional counts of population and dwellings for each local authority area. The production of key statistics for each Local Government Region commenced in September 1986. By the end of 1986, two reports containing more detailed provisional results will also be published. The provisional regional summary will analyse the population and dwelling characteristics of each statistical area, Local Government region and urban area, while the provisional national summary will provide cross-classifications of selected variables.

Prior to determining the contents of the census reports, known users of census statistics were requested to advise the department of their specific needs from the census. These requests were grouped into two categories namely: those statistics which were of community value and which would be produced at no cost and statistics which were of value to the user only, in which case the user would meet the full production costs.

Users also have the option of purchasing the range of summary files. However, these data sets will be subject to random rounding and possible aggregation depending on the type of file. The department also permits users to write their own programmes and submit these for running against the census data files or sample files. Either TPL or SAS may be utilized to produce tabulations of the data.

Publicity

The goal of the promotional programme for the 1986 census was to reach the total population with a series of convincing and persuasive messages aimed at motivating them towards full co-operation. Particular objectives of this programme were; (i) to make the public aware that a census was to be held, and when; (ii) to ensure that all respondents were aware of their legal obligations to the census; (iii) to promote public confidence in the confidentiality of information gathered in the census; (iv) to provide information about the census organization and the procedures used; (v) to explain the importance of the census, the value of each question, and the uses to which the information is put; and (vi) to advise where questionnaires could be obtained by those requiring them, and where to get advice regarding their completion.

Personnel and costs

The five-yearly census is the responsibility of the Population Census Division of the Department of Statistics. The Director, controls enumeration, input and output development. The Enumeration Section has a permanent staff of eight and is responsible for the planning and development of field enumeration schemes, including personnel, accommodation and stores, instructions and manuals, timetables, training programmes, mapping, publicity, non-

response follow-up and subsequent evaluation of all procedures and method. During the intercensal period, the section is also responsible for the fieldwork associated with the questionnaire testing programme. In the lead up to and during the enumeration phase, a small number of temporary staff are also employed to assist with administration functions. For the purposes of the field enumeration a temporary establishment of approximately 5,500 persons is employed for periods ranging from three weeks to 11 months.

The Input Development Section has a permanent staff of 18 persons, although the majority of these staff are transferred for approximately 12 to 14 months to the temporary processing unit which is set up to process the census questionnaires. The Population Output Development Section has a permanent staff of 11 persons who are involved in the development, testing and production of statistical output and the subsequent publication and analysis of the data.

The total cost of holding the 1986 census of population and dwellings is estimated to be just under $NZ 21 million, a reduction nearly $NZ 4.8 million from that incurred at the 1981 census, or a saving of 18.6 per cent. The major technological advancements in the computing environment would result in major savings given the significant reduction in temporary staff required to process questionnaires and prepare the statistical tabulations for publication. The strategy adopted required the questionnaire to be designed to permit respondents answers to be predominantly self coding and enable direct entry into the computer. Data coding and editing (where necessary) would be almost entirely done by computer, while computer-based publication methods would be utilized to produce the large volume of census reports.

Appendix. Computer-assisted coding

The processing system used for the 1986 census has altered dramatically from the systems used to process previous censuses. The processing system involves an initial clerical processing phase to ensure questionnaires are in a format suitable for key-to-disc capture, followed by an automated coding and editing phase. Computer- assisted coding (CAC) involves the entering of descriptive responses (sometimes referred to as hard-to-code responses) through a computer terminal and the matching of these responses with those stored in the appropriate data file of codes and descriptions pertaining to a particular question. Matches are displayed on screen for selection and transfer to the appropriate record. CAC is undertaken in conjunction with out-of-range and interfield editing with edit errors being displayed and corrected on screen.

The 1986 census processing system replaces the clerically intensive method used for the last two censuses. The CAC/edit system that has been developed has a number of significant advantages; it is more efficient as the questionnaires are used as data input documents. Processing staff numbers are, therefore, considerably reduced with approximately half the number of staff being required to process the 1986 census compared with the 1981 census. This resulted in savings in accomodation and more timely production of output.

A perusal of preliminary results indicates that the 1986 census processing system has improved data quality. The same computer files of codes and descriptions are used throughout the operation, thus promoting consistency of coding. These coding files are also easily and uniformly updated while transcription errors are avoided with the use of the CAC/edit system. Staff generally found the work more varied and interesting as each operator is responsible for actioning all the hard-to-code fields plus editing a complete batch of questionnaires.

The 1986 census processing system was reliant upon an efficient reliable computer that accommodates the volume of processing required. Its success is also highly dependent upon the computer files of codes and descriptions which must be comprehensive and as far as possible match those stated by respondents.

The CAC/edit system requires CAC/edit operators to have a detailed knowledge of all coding and editing instructions, which in turn, required extensive training. This knowledge, however, has made operators aware of the interrelationships between questions which has assisted them when allocating codes and correcting edit errors.

Completed questionnaires were used as data input documents. Questionnaires design, therefore, focused on ensuring that the question formats were both suitable for data capture and were easily coded by the respondent by ticking the appropriate answer box or writing a numerical or descriptive answer in the panel provided.

Following the receipt of the questionnaires and associated documents at the processing centre the precapture processing phase commenced which involved checking that each dwelling had the correct number of personal questionnaires and ensured that responses were in a format suitable for later processing. Code numbers were also inserted on the questionnaires for questions such as relationship to occupier as this information could not be easily actioned during later processing.

The questionnaires then underwent data capture using key-to-disc equipment with the codes alongside ticked boxes and numeric responses being captured at this stage. Following this the questionnaires underwent the final stage of processing – that of CAC/editing. At this stage, descriptive responses that could not be captured using key-to-disc equipment were processed. These descriptive re-

sponses occur in two types of question format. The first involves questions which incorporate tick answer boxes but instruct respondents who do not fall into any of the categories listed to specify their answer. The second type of format relates to questions which are not suitable for the inclusion of tick answer boxes and require all responses to be in a descriptive format. The CAC/edit process is initiated when the operator loads a batch of work into his or her computer work space. The system then proceeds through each record (a dwelling or personal questionnaire) displaying on screen those questions that require either the coding of descriptive responses, or, the correction of code values which were entered out of the acceptable range during key-to-disc data capture.

Two distinct types of data files are incorporated in the processing system. The first involves the operator entering a descriptive response and the system searches the appropriate file and presents matched descriptions and their codes on screen. If a match cannot be located, the system truncates the description backward letter until a match, or matches, are found and displayed on screen. This facility also allows the operator to enter a truncated description and still obtain a desired match. When a match, or matches, are displayed on screen, the operator can select one of the matches and transfer the code to the record using cursor placement. If an appropriate match is not obtained the operator may enter an alternative description.

A number of departmental files containing standard classifications have been adopted for CAC. These include the standard classifications of occupations, industries, sectors of employment and countries. These files have been further adapted for CAC by incorporating responses which are likely to be stated on questionnaires.

The second type of code list embodied in the CAC system is the short code lists which are used for coding questions that have relatively few codes and do not require the system to automatically search the code file. These short code lists display on screen all the codes and descriptions applicable to a particular question. The operator selects one of the descriptions displayed and transfers the code value to the record by cursor placement. The short code lists are used to correct values which have been either entered out of the acceptable range during key-to-disc capture or to enter codes for questions such as sector of employment when a match is unable to be made using the Business Census Directory.

Edit corrections are made by using one of the two types of code files or by entering numeric responses. When all edit corrections have been, the processing system automatically proceeds to the next record and the CAC/edit procedure is repeated. When all CAC and interfield editing of a batch of work has been completed interrecord editing is actioned for each household and edit failures are shown on a computer printout. Edit corrections are then carried out by the operators during their next on-line session.

At any stage during processing it is possible to access a screen display of the code values allocated to each field of a record. It is also possible to access the code list applicable to a particular question through this screen.

The CAC/edit processing system also allows the operator to move to selected records as desired. During processing the operator can "expand" a code on occupation, industry, country of birth, ethnic origin, religion and tertiary qualifications so that they can observe all the descriptions applicable to a particular code.

A comprehensive training programme was undertaken by operators for a period of four weeks and incorporated both theoretical and practical sessions to ensure that all operators were able to make effective use of the processing system. A quality control scheme was established whereby a sample of each operators work was independently recoded, the two codings compared and subsequent discrepancies analysed. The over-all error rate was 0.9 per cent. Overall, CAC/edit staff have found the processing system relatively easy to understand and operate. The system prompts the operator for the coding required and displays on screen instructions of the actions available during all stages of the processing. An analysis of the results to date indicate an improvement in coding quality and quantity compared to that achieved during the processing of the 1981 census. The quality obtained is largely a reflection of the data files incorporated into the system. All data files are readily and uniformly updated during processing all CAC/edit operators accessing the same data files.

It is planned to adopt this method of processing for the next census. Prior to that, the CAC/edit system will be evaluated and any modifications incorporated and tested. All data files will be updated to make them as comprehensive as possible. Further enhancements to improve efficiency include the incorporation of a facility whereby direct matches are accepted without the need for the operator to select a code.

23. NIUE

Historical background

The first Niue census of population was conducted in 1902 and thereafter censuses were held at five-yearly intervals. The sequence was broken after the 1936 census and it was not until 1945 that a regular five-yearly census was once again reintroduced on a more permanent basis. Previous population counts have been restricted in scope and the results were compiled as simple tabulations but were never published in any set form until the 1971 census. The 1971 population count was the first to result in a published report. It was also the first to be conducted more or less along the line of that of New Zealand. Between 1971 and 1986 there were two censuses (1976 and 1981); and two intercensal counts (1979 and 1984). Reports were prepared for each census (except the 1981 census) with some advisory assistance from outside agencies.

Design of the 1986 census

Responsibility for the initial preparations for the 1986 census rested with the Statistics Unit in the Administrative Department, formerly in the Department for Economic Development. A census Committee was formed and decided that preliminary fieldwork would consist of a listing/mapping exercise. A full pilot survey was also considered, but in view of the time constraints it was later decided that a pilot survey was not required.

The questionnaire for the 1986 census consisted of two parts. One part was a Population Schedule and the other a Household/Dwelling Schedule. The design of the Population Schedule differed from that used for the 1976 and 1981 censuses where the characteristics for each person in a household had been collected on separate forms. For the 1986 census all the members of a household were listed on the same form. The 1986 form was designed with the questions down the left-hand side and with seven columns to the right, allowing enumeration of up to seven persons on the one form. This design was not only a cost-saving measure but it was also seen as being necessary, based on the experiences of enumerators on past censuses who had had difficulty in coping with so many forms. The Household Schedule was printed on the back of the Population Schedule, thus reducing costs and minimizing further the amount of materials an enumerator had to carry.

The Population Schedule was divided into three parts. The first part contained 12 questions on the general characteristics of respondents: person number, name, relationship to head of household, sex, date and place of birth, whether lived in any other country continuously for three months or more, descent, home village (for Niueans only), religion, highest level of education attained and qualification obtained since leaving school.

The second part contained seven questions directed at persons aged 15 and over: marital status, main activity status last week (from a list of precodes), hours worked last week, kind of industry etc., principal occupation, type of transport to work and, for those unemployed or doing domestic duties, whether available for work last week.

The third part contained four questions directed at females aged 15 and over: number of children born alive, date of the last live birth and information on how many of the children were still living and how many had died.

A mapping/listing exercise was carried out in August 1986 by staff from the Lands and Survey Office. It was fortunate that their office had recently come under the Administrative Department. The mapping/listing exercise was restricted to two items: the geographic location of the houses and the name of the head of household. No lists of usual residents within each household were prepared, which is usually done as a preliminary step before defining the boundaries of the enumeration areas, since it had already been decided that the same enumeration boundaries would be used in this census as had been used in the 1981 census.

The mapping and listing of households was greatly assisted by the existence of village water reticulation maps held in the Public Works Department. The listing exercise was fairly straightforward since very few new houses had been built since the original reticulation maps were drawn.

A pre-test of the questionnaires was carried out in mid-August 1986. Two supervisors undertook this exercise covering five households each. In selecting households for the pre-test, efforts were made to pick households with more than average numbers or members, so that any special problems in covering larger households could be identified. The findings of the pre-test indicated that the new question on migration presented problems to some respondents in recalling the year of their arrival/return. To improve response, a note was made to advise enumerators at training sessions to use historical events, in order to assist respondents in recalling their year of arrival/return.

It was also found that some respondents did not know their age or date of birth or, in the case of childbearing females, did not know the date of their last live birth. Requests were therefore made to the authorities responsible for civil registration to urge people to ask for slips verifying their date of birth, which could be obtained free of charge.

Training and fieldwork

The Team Leader was in overall charge of the census fieldwork. The enumeration areas were grouped into three supervision areas. One area was placed under the supervision of the Team Leader, a second was placed under the Statistics Officer and the third under the Deputy Registrar of the High Court. A total of 40 enumerators were sought from various government departments as well as five enumerators from the private sector.

Since the questions on the census form were worded in English it was necessary to select enumerators on the basis of their ability to translate English into Niuean. Enumerators were recruited from the junior ranks of the Government sector. It is interesting to note that the commitment and performance of those selected from the junior ranks compared very well against the commitment and performance of those who had had some past census experience.

Training sessions were held in the Fale Fono, the Legislative Assembly building. Training was restricted to afternoon sessions in order to allow the recruits to attend to their normal duties in the mornings. The sessions were conducted in both English and Niuean in the week prior to the actual enumeration. Training manuals were prepared and distributed on the Friday prior to the training week. The training commenced with a lecture explaining the objectives of a census, what a census is and how this census was going to be conducted. Sample questionnaires were distributed to recruits; who were required to enumerate two households: their own and one other. In the following session the supervisors had to check each questionnaire with their respective enumerators.

The country was divided into 30 enumeration areas (EAs) and these were grouped into three supervision areas. EAs varied in size, in terms of geographical area and in terms of the number of households they contained. In cases where an EA covered a larger geographical area or contained a large number of households, an assistant was employed to help the enumerator. The enumerators were given the option of carrying out the enumeration commencing on 28 September, but most small enumeration areas were in fact enumerated on 29 September.

Supervisors were allocated government vehicles to enable them to call on their respective enumerators. Spare materials were carried by the supervisors for their enumerators. The supervisors were expected to call on their enumerators at an early stage in the enumeration, in order to check on their methods of approaching the households and on the accuracy of data collected. The role of the supervisors was essentially a mobile one. They were to call on their own enumerators as often as they could. Minor problems encountered by enumerators were sorted out and in some cases enumerators were transported to households where there was a need to clarify data which had already been collected.

Enumerators were required to call back on their households on 30 September, to re-list members within households, in order to check whether a new member had moved in after the first enumeration or someone had spent census night elsewhere; that call-back helped to reduce the risk of under-enumeration or double-counting.

Publicity

Different media were used for publishing the 1986 census, namely the radio, government newsletter and a household publication. The first effort to advise the public of the forthcoming event was by way of a household publication distributed in July 1986. This was published in both Niuean and English. This publication touched on the requirements as set out in the Census Ordinance of 1971, gave a brief history of censuses and the reasons for carrying out this census, emphasized the importance of co-operation from the public and indicated the questions that were likely to be asked. It also urged the public to be prepared for the census.

Data processing

It was originally intended that the initial data processing would be done manually. However, computer processing was decided upon. The editing part consisted of two stages. The first editing procedure was during checking-in of the census forms and most of the reconciliation was done at this stage. The next stage of editing was reconciling differences between supervision areas using notes prepared by each supervisor during check-in.

The coding stage involved a team of two supervisors and four enumerators. Four coders were responsible for coding all questions apart from questions on migration, occupation and industry. The Statistics Officer and Data Collecting Officer were responsible for the coding of these questions and also for the final checking of the coded forms. With only five days to carry out the task the coding was not completed prior to the departure of both the Statistics Officer and Data Collecting Officer to Samoa. The remaining questionnaires were therefore coded and checked in Apia.

Using the U-SP survey package, two key punch operators of the Statistics Department of Western Samoa entered the data using two IBM-XT computers. In addition as it was decided to enter the data once only, rather than use double entry, the Niue team were required to check printouts against the schedules. Data entry was completed in one week. The next stage involved cleaning and editing the data. This was carried out by the supervisor and the Niue team. The Data Collecting Officer was able to return to Niue after two weeks with 20 provisional tables on Households and Dwellings while the Statistics Officer was required to remain for another two weeks to assist with further cleaning, editing and tabulation. The Statistics Officer was able to return with final tables for households

and dwellings, together with 30 provisional tables on population characteristis.

Dissemination

The results of the 1986 census will be published in a single volume which will consist of an administration report and an analysis of the data. It is anticipated that this main report will be ready for distribution by the end of 1987. However, two provisional reports, giving simple analysis of census data on unemployment and on housing characteristics were prepared by the Statistics Unit at the request of policy makers. Data contained in the computer records are available in the Statistics Unit and suitable tabulations can be prepared on request.

24. PAKISTAN

Historical background

The history of population censuses in the area now comprising Pakistan dates back to the period of 1865 to 1872 when a census was taken covering most of the country but at different points of time in this period. That census is commonly known as the 1872 census. It paved the way for the first simultaneous census in 1881 which was followed by regular decennial censuses in the years ending with one. The most recent census was held in 1981. That was the fourth census of population conducted in Pakistan since independence.

No complete housing census in terms of topics and area coverage was undertaken till 1980. However, some data on housing characteristics were collected in the household listing operation in the 1961 census and data on all usual housing topics were collected on a sample basis in a follow-up survey of the 1972 census.

Design of the 1981 census

The 1981 census was conducted during 1-15 March 1981. This period was extended in a few inaccessible areas. It was preceded by the 1980 Housing Census which was carried out from 1 to 15 December 1980. The 1981 census was conducted on both *de jure* and *de facto* basis. As such a question on residence status obtaining entries on household members present or temporarily absent and guests/visitors staying with the households on the census date, was asked.

The 1981 census covered all persons found living within the limits of Pakistan. This included all Pakistanis and foreigners with the exception of diplomatic personnel and their family members. Afghan refugees were also excluded.

The Federally Administered Tribal Areas, an administrative unit, other than the four provinces of Pakistan and Islamabad have a special status. In earlier censuses, data in these areas used to be collected mostly through group enumeration, for households and tribes. These areas were fully covered in the 1981 census on an individual enumeration basis.

Questionnaires were completed by direct interview with a household member. The population census questionnaire was a single household type of questionnaire, while in the housing census the multiple household type of questionnaire was used. Two population census questionnaires were used, a short one with a few questions on age, sex, marital status, religion and education and a long one containing questions on details of educational attainment, migration, economic activity, fertility, child mortality and disability. The long questionnaire was administered in sample areas. The questionnaires were canvassed simultaneously unlike in the 1972 census when sample data were collected about one year after the census.

The sample design used for selection of households for which the long questionnaire was used, was a stratified single stage sample design. The census blocks in the whole of Pakistan, excluding the Federally Administered Tribal Areas, constituted the sampling frame. Rural and urban areas were considered separate domains. Each administrative district within a province was considered a stratum, except large cities which constituted separate stratum within urban domain. The census blocks constituted single stage sampling units and were selected within each stratum with probability proportionate to number of households listed in the housing census. The sample size was determined keeping in view the level of geographical tabulation for which estimates were required and the permissible level of significance of estimates of some key characteristics. The sample was 9.2 per cent of the total population, 6.8 per cent in rural areas and 15.2 per cent in urban areas.

For the purpose of enumeration, the country was divided into census districts, census districts into charges, charges into circles and circles into blocks, that is the area assigned to one enumerator. Maps were prepared for all census districts, charges and circles in urban areas. Though no separate maps were prepared for census blocks in urban areas these were shown in each census circle. Rural area maps were prepared for census districts only, in which boundaries of charges and circles within charges were given. The circle supervisors were, however, asked to draw sketch maps of their circles incorporating therein the boundaries of blocks. The rural area maps were not adequate to provide sufficient details for enumeration purposes. It may be added here that a greater part of the country is covered by a revenue settlement system which provides delineation of rural areas upto the smallest revenue administrative level. These areas are called Revenue Estates, the maps of which are available with the revenue staff. These maps and the local knowledge of the circle supervisors and enumerators helped to overcome inadequacy of the rural area maps. The urban area maps were collected from the concerned urban authorities which were updated and reproduced for field use. The mapping in urban areas did not present any serious problem except in large urban areas which are developing rapidly. The local city development authorities helped overcome this difficulty.

Committee structures

Formation of a Census Advisory Committee has been the usual practice in each census. Accordingly, for the

1980 census, Census Advisory Committee was constituted representing all concerned Federal and Provincial Government Departments, economic and demographic research institutions, concerned departments of universities and data users. This committee was entrusted with the responsibility to recommend combined or separate population and housing censuses, use of sampling in census enumeration and topics of information to be covered in both the censuses. This committee held four meetings for finalization of their recommendation. A sub-committee of experts was also formed by the Census Advisory Committee to assist them in its task. The Census Advisory Committee recommended separate censuses for housing and population and the use of sampling for enumeration of those population census topics on a sample basis which were considered difficult to be enumerated by an average type of enumerator. The questionnaires covering the topics recommended by the Census Advisory Committee were pretested before finalizing these. Besides this Committee, services of a local expert having international experience were acquired to assist the Population Census Organization in designing its population and housing censuses.

Training and fieldwork

Beside preparation of enumeration and supervisory manuals, training manuals were prepared which were extensively used during the various phases of the training programme. They contained questions and answers pertaining to each topic in the census questionnaire, along with likely difficulties and their solutions. In the first phase, senior field officers of the Population Census Organisation were trained at its headquarters. In the second phase, a corps of trainers who were usually college lecturers, headmasters of high schools and the same level officers of the provincial and local governments were trained by the senior officers of the Population Census Organisation. These trainers were extensively trained through a series of lectures followed by question and answer sessions. In these lectures, beside training in filling of census questionnaires and field use forms, they were told about importance and use of censuses and their data, the role of enumerators and respondents, interviewing techniques and field work procedures. In the final phase, these trainers trained the enumerators and their supervisors. They covered the same subjects in which they were trained. Besides, the trainees were also asked to enumerate a few households and discuss the problems of enumeration, if any, faced by them and seek their solution.

The census field work was organized at the provincial level through the provincial offices of the Population Census Organisation which were located at the provincial capitals. They were responsible for organizing and carrying out the census according to the census plan. Below the provincial level, no offices of the Population Census Organisation were established and the census was organized and conducted through the provincial and local government channels. For this purpose, the administrative districts in the provinces were divided into census districts, census districts into charges, charges into circles and circles into blocks. The Census District Officers, Charge Superintendents, Circle Supervisors and Enumerators were drawn from the local government departments and teachers. The Deputy Commissioners of districts and the Local Government Department of the provincial governments were responsible for over-viewing the whole field work in their respective areas.

A manual of field operations was prepared and distributed among all supervisory staff for guidance in their work. It covered all aspects of census field work as well as the legal provisions of the census. It also included the census activity calendar to emphasize the timely completion of the census field work.

Evaluation

A post enumeration survey was conducted soon after the census enumeration. Its basic objective was to estimate level of under-enumeration (over-enumeration) of population and households missed or erroneously enumerated in the population census. However, the survey did not include the Federally Administered Tribal Areas and the province of Baluchistan because of vastness and inaccessibility of areas in these regions. The field work was carried out in two phases. In the first phase households were listed in the sample census blocks and re-interviewed on a specially designed questionnaire. The particulars of re-interviewed households were matched in the office with the households enumerated in the census. In the second phase non-matched households and non-matched people in households enumerated both in the census and the census evaluation survey, were re-visited for re-conciliation. After this visit final matching was done in the office for further processing of data. The results of this survey showed an under-enumeration of 4 per cent.

Data processing

Completed census block registers were retrieved in the provincial offices of the Population Census Organisation. The census schedules in these registers were manually edited and coded by Statistical Assistants under the direct supervision of their officers. The scope of editing was restricted to usual editing procedures. However, any correction in the recorded entries was required to be carried out only in consultation with their supervisors. As most of the census schedule was pre-coded, coding was done only for occupation and industry.

Data entry was done in an IBM 5280 and 3742 Dual Data Stations. Though all schedules had been manually edited, computer editing was also carried out to overcome punching errors beside detecting other errors which may have not been looked into in manual editing. Error lists were obtained in the earlier stages of data entry but these were stopped latter because of too much manual work in

providing corrections. In order to tabulate the data at the earliest, it was decided latter to prepare computer edit specifications along with their corrections for missing and inconsistent entries. The data were processed on an IBM 370/148 computer under DOS/VSE using specially written programmes in COBOL.

Analysis and dissemination

Analysis of the census data during past censuses has not been properly carried out because of lack of continuity during intercensal periods, resulting in a loss of the expertise. It is now fully realized that beside other advantages census data analysis helps in determining the limitations of the data. Thus disclosed the weaknesses of data can lead to further investigation into their causes.

The 1981 census data were disseminated through a series of bulletins and reports for information and use by government and private sectors, international and regional organizations, researchers and other users. The whole set of census data are available on computer tapes for users in government departments who can request special tabulations without charge. Users in the private sector must pay for the computer time.

Publicity

In order to obtain co-operation for the census a massive publicity programme was carried out in consultation with the Ministry of Information. Radio, television and newspapers were extensively used for this purpose. Census messages were issued by the President, Governors and other dignitaries highlighting the importance of the census and the need for public co-operation. During the census enumeration period, newspapers published special articles. Advertisements highlighting the importance of the census and seeking public co-operation continued appearing in most newspapers in the country. Jingles were prepared and telecast/broadcast on all television and radio stations. Panel discussions were held on radio and television. A documentary film on the national census was prepared and displayed in all cinema houses of the country. Posters and leaflets were also prepared and widely displayed in circulated.

Personnel and costs

The field force, which was hired from the local government functionaries and teachers, comprised 272 Census District Officers, 1,647 Charge Superintendents, 11,149 Circle Supervisors and 80,215 Enumerators and 544 Trainers, in addition to the regular personnel involved in census activities at the national and local levels.

The budget spent by the Population Census Organisation for the years 1980/81 to 1983/84 was 67.5 million rupees.

Issues

The recruitment of enumerators, particularly willing and motivated persons, was a matter of great concern. Their performance contributes significantly to the quality of a census. They are required in large numbers and it is not always easy to recruit them. Teachers and local government functionaries are usually hired for this purpose. They are required for a short duration of time and are required to do the census work in addition to their usual duties. They thus consider the census job to be an extra burden on them.

The Population Census Organisation has to depend upon the maps of areas already available with the respective authorities. The organization is not in a position to develop these. Consequently the available maps, which lack detail for identification of living quarter, have to be depended upon and the enumerators have to make extraordinary efforts to ensure the proper coverage of all living quarters in their areas.

Because the census is only held every 10 years, the Census Office tends to have severe staff cut-backs in intercensal periods. As a result, there is a loss of trained and experienced manpower, and a lack of continuity.

25. PAPUA NEW GUINEA

Historical background

Prior to 1966 there had been two distinct types of censuses conducted in Papua New Guinea. Administration censuses of the indigenous population. These censuses collected a considerable amount of information for administrative purposes and usually a summary of population figures for each census division. The second type were of the non-indigenous population. There were taken at the time of the Australian census.

The 1966 census of population was the first to cover the total indigenous population at one point in time. A complete enumeration was conducted in all urban areas and rural non-villages (RNVs), that is missions, plantations and similar non-traditional rural settlements. A 10 per cent sample was taken of the traditional villages.

In 1971 a repeat of the 1966 census was attempted. However, because of the uncertain social and political climate the time was not suitable for conducting a census. The results of that census showed a major undercount.

Proposals were put forward in early 1975 to continue a five-year census cycle by having a 1976 census. However, there was little support. Proposals for a census were deferred each year until a firm date was finally fixed for 1980 to be the first post-independence census.

Design of the 1980 census

The 1980 census covered both citizens and non-citizens. It differed from the earlier national censuses in many ways. In the earlier censuses, people living in towns and RNVs were fully enumerated, but only a sample of rural villages were enumerated. The sample results were then used to calculate estimates for all rural villages. In this way, it was possible to carry out the enumeration over a period of about two weeks. In 1980, however, an attempt was made to enumerate every person in the country. In order to do this, it was necessary to spread the rural enumeration over several months leading up to the main enumeration period of about two weeks in September/October, when the people in urban areas and some other easily accessible areas were enumerated.

The agreed questions (topics) were divided into two groups: the basic ones, about which data were required for every person in the country; and additional ones, about which data would be collected in respect of only some persons. The basic questions were printed on a questionnaire, known as the short form; another questionnaire, known as the long form, included both the basic questions and the additional ones.

Because of resource limitations, a two-phase census was conducted, the first phase being held in 1980 and the second in 1981 (about 12 months later). In 1980 the long form was used to collect data for all persons in the urban and rural non-village sectors and for all persons in a few selected parts of the rural village sector. The short form was used in 1980 to collect data for all persons in the remaining part of the rural village sector. In 1981, the long form was used to collect data from a sample of the villages in the areas where the short form had been used in 1980. This sample data is used to calculate estimates for each province relating to the additional topics on the long form, particularly fertility and mortality.

It is not possible in Papua New Guinea to use a single night as a reference point for census enumeration purposes. This applies even in urban areas where for almost every household, information was collected in the 1980 census by means of a personal interview, rather than by members of the public filling in forms themselves. It has therefore been necessary to devise coverage rules to ensure that a reasonably accurate count of the population is obtained, even though some people are moving from one place to another during the enumeration period.

In urban areas, an interviewer conducting an interview at a dwelling was instructed to count everyone who spent the previous night there. At a rural non-village establishment, interviewers counted everyone who had spent the previous night at the establishment. In a rural village, interviewers counted everyone who usually lived in that village except those who had spent the previous night in an urban or rural non-village area.

Under these rules, it was, of course, quite possible for a person who moved about during the enumeration period to be counted more than once (at various places) or not at all. However, assuming that population movements are fairly uniform over time, the application of these rules should have given an accurate count of the total population.

The basis for the rural village sample were village census books. These books, which were originally updated regularly during administrative patrols, had fallen into disuse in many provinces during the 1970s. They were reactivated in all provinces during the period 1977-1980. Census divisions (CDs) were placed in two to five strata, depending on the size of the province. A two-stage selection method was then grouped into clusters of approximately 1,000 inhabitants and one cluster selected from each CD.

The first basic step in the rural mapping programme was a thorough stocktake of available base maps. As there

was no comprehensive set of maps available of village locations, it was decided that the major initial effort for rural mapping would be directed at producing a series of maps showing the location of every village. The same initial tasks had to be done for RNVs as for villages. A comprehensive list had to be drawn up and the location of each unit plotted. Listing of RNVs was more difficult in that they were not originally covered by administrative census patrols and thus there was no established list to use as a base.

Census divisions were the accepted divisions of provinces into groups of villages. CDs were usually only defined by the villages in them and no accurate mapping had ever been done to locate boundaries. Each CD usually contained people of a similar cultural and linguistic group. They were usually defined so that an administrative patrol could cover the whole CD during one continuous (originally walking) patrol. One of the major tasks of the base rural mapping was to show the CD boundaries for the first time. Attempts were made to follow geographic features wherever possible, that is rivers, ridge tops.

As part of the listing and locating exercise, a unique number was allocated for each census unit. Considerable developmental work went into the derivation of this numbering system as it was realized that, once developed, it would be used for a considerable number of other purposes beside the census. An attempt was also made to ensure that the system was the same or at least compatible with any existing numbering systems.

The resulting rural location maps were a major advance. Copies of the relevant section of the provincial map were supplied to the census patrol going to that area. In practice, local knowledge was used more often than the map. The standard of map reading of field staff was very low. It had been hoped that field staff would supply corrections to the maps. In practise very few corrections were made.

It was decided to separate urban preparations from rural preparations and place urban mapping and listing under the control of a special section located at Headquarters in Port Moresby. This sections' first task was a complete stocktake of all available base resources. Some records and maps were available from the 1971 census but the boundaries of both the total urban areas and each Census Unit (CU) were not at all clear. It was decided to embark on a complete exercise of clearly defining every urban area and redrawing CU.

Sub-divided areas were completely prelisted during 1979 and 1980. Each interviewer was then given a folder showing his area clearly defined and an accompanying list of the dwellings starting from a clearly marked start point. An enlarged aerial photo of his CU was also supplied wherever possible. Only the boundaries of settlement or village areas were defined early. In the week prior to the census, the supervisor had to put a census sticker, showing the CU and consecutive dwelling number, on each dwelling. He drew up a listing at the same time. The dwellings were then allocated to interviewers. Non-private dwellings, which include hotels, hostels, communial workers quarters, jails and single barracks, were enumerated by a special team using a sketch map for each of the dwellings. They were extracted from normal CU workloads.

Committee structures

The 1980 census was the first census to be fully organized and processed within Papua New Guinea. In the early stages, the scale of the project was severely underestimated. As planning progressed, the project was upgraded and enlarged. It was realized that the project would need the resources of many branches of government if it was to be a success. Thus a high level co-ordination body was essential. It was decided that a national Steering Committee would be established at Department Head level under the Chairmanship of the Secretary, Prime Minister's Department. It only met twice and gave the authority necessary to the working sub-committees and to the day-to-day operations of the project itself.

A users' Advisory Committee was formed quite early and submitted proposals on coverage and topics for the census. It and its subcommittees met more often during the stages of development and in the post-enumeration stage as tabulations and publications strategy were being firmly decided.

During the early stages of development of the census project, the national government decided to establish 19 separate provincial governments in the country. The provincial governments were to take control of most government functions in their respective provinces. Thus it was essential to have separate Provincial Steering Committee in each province. These were established.

Training and fieldwork

Considerable attention was given to training throughout the census. Very few staff, from the highest to the lowest levels, had any previous census experience. At headquarters, every possible advantage was taken of international training opportunities. This was considerably supported by in-house formal and on-the-job training. All pretests and the pilot tests were particularly viewed as training exercises. For provincial staff, four-week long Provincial Census Officers' conferences were held.

The major feature of the field staff training was the use of guides and workbooks. Verbatim guides were used in previous censuses and it was thought they were essential to ensure uniform application of the questionnaires. The workbook was an innovation for the 1980 census and proved highly successful.

Training of processing staff followed a similar pattern to that of the field staff. However, no verbatim guide was

necessary as all staff were trained at the one central location. Quality control measures were kept for all processing staff and retraining done whenever necessary.

The operational structure adopted in each province was as follows: interviewers were grouped into teams under the leadership of team supervisors; each team supervisor was responsible to a District Census Officer (or a Town Supervisor in urban areas), who was, in turn responsible to a Provincial Census Officer; quality controllers in each district or town were responsible to the District Census Officer or Town Supervisor. The structure functioned in a different manner for differing aspects of the census in each province.

Because of security problems in towns, most interviewers and supervisors were male. The majority of quality controllers were females. Supervisors were selected from a pool of available public servants and teachers. Interviewers principally came from high schools or teachers' colleges. If possible, teachers were teamed with their own students as they already knew each other well. Some unemployed school leavers were also selected. Interviewers were of at least grade 10 level or students currently studying grade 10.

All enumeration was house-to-house. Interviewers worked their way progressively through their workload of approximately 50 dwellings. Non-citizens, who often live in houses surrounded by high wire fences with dogs, were a problem to contact and were generally less co-operative. A careful check was kept on vacant dwellings and non-contacts. Supervisors were to re-check all vacant dwellings and help resolve non-contacts. Quality controllers kept tallies of non-response and high rates were investigated by the town supervisor or his assistant. Towards the end of the main enumeration period, publicity was directed at getting people who had not been canvassed to ring certain contact numbers.

Evaluation

No full post enumeration survey (PES) was possible. The 1981 sample survey partially functioned as a PES. However, it was found that differing seasonal conditions had produced different migration movements between several provinces. The 1981 survey did locate some cases of both under-enumeration and over-enumeration and gave an additional insight into the quality of the data.

Data processing

In 1978, when serious planning for the census processing commenced, data processing was in a relatively undeveloped state. The government's National Computer Centre (NCC) was the major processing installation in the country but had experienced considerable staff and other problems. An urban pretest in Lae in late 1978 provided a reasonable volume of data for a processing test which would answere some of the design questions. It was decided to establish a mini-processing centre in early 1979 and process the Lae questionnaires through all stages of editing, coding, transcription, data entry and production of tabulations. Data entry was done at the NCC on blind key boards. The data entry rates were found to be relatively low and error rates relatively high. This gave firm basic figures for through-out calculations but raised many queries on possible alternative equipment. Tables were successfully produced using COCENTS on the NCC computer.

It was found that work rates for editing and coding and data entry had been considerably under-estimated from the Lae processing exercise. However, several new data items and codes had been added to the final questionnaires since the Lae census. An important two-way test was made of the editing system to be used in processing the short form data. The data was processed once using automatic imputation and once using manual correction of computer-identified edit queries. It was decided to adopt automatic imputation for the main census for the short form data. This decision caused major problems, which are discussed later. It had been planned to commence manual processing of the data in October 1980; this proved impossible and the first processing (of short forms) began in early January 1981. Separate teams were established for editing, check-editing, coding and check-coding. The basic flow of documents went quite well and work rates were higher than anticipated. Long form processing started in April 1981 and the same basic system as for the short form was used except that coding was split into two areas with the more difficult questions being coded by a specialist group. Better staff were used on the long form manual processing because of its greater complexity.

After the pilot test, it was decided to use automatic imputation for several items of the short form data. For the main census, it was noted that the rates of imputation were higher than what was regarded as acceptable. The main problems arose with age not stated corrections for not stated ages were to be imputated largely based on relationship. On checking the basic data it was found that coding and field errors in relationship were causing more distortions in the data than they were correcting. The major problem was adopted children being identified as true children.

For the more complex long form it was decided to rely mainly on manual correction of computer-identified edit errors. When first tabulations were produced, several consistent errors, either in the field, coding or data entry, were identified. Some of these were caused by the poorly planned coding systems. Special edits were designed and applied to the data to identify records with these errors. These were checked manually and corrected if necessary.

Analysis and dissemination

Analysis of data collected should have proceeding through all stages: pretests, the pilot test, during the main

processing operation and after the publication of basic results. However, analysis of data collected during the pretests and pilot tests was very limited.

Analysis of the data was also very restricted during the main processing operation. The major means planned to do this was by reviewing the marginals. The marginals are simple one-way frequency distributions of the answers for each question for each CU and each work unit. The marginals were produced before and after imputation and been done. The aim was to check on quality and the effect of imputation. The marginals were far too detailed for their purpose and simple basic tables for each CD or district would have been far better.

Analysis of the urban data started in 1981 and the first research monograph published: Urban Growth 1966-80. Several researchers have since contributed to this series. Our demographic unit has also produced two monographs.

The first major publication was the Pre-Release: Summary of Final Figures, giving major summary tabulations at the national level. A summary publication called Census Division Population which shows the population of every CD in the country, is also available. A set of final figures: Provincial Summary Bulletins (one for each province) have also been published. A national bulletin, which corresponds to the provincial bulletins, will be published.

Publicity

The publicity campaign for the 1980 census was the most comprehensive and the largest single campaign to publicize a government project since independence was achieved in 1975. The diversity of Papua New Guinea's population presented a special challenge. The high illiteracy and the variety of languages spoken presented special problems.

A major target of the publicity campaign were teachers and students. The schools provided the best means of spreading information throughout the country. Pamphlets and other material were distributed to teachers at in-service training courses in 1979 and 1980. The press responded well to census releases and helped to achieve the aim of keeping people aware of census planning and of the main enumeration period.

As well as general awareness, the publicity programme focused on publicizing the need for a national census and the uses to which the data could be put. Special pamphlets were prepared for public servants, women, census workers and teachers. A more restricted target group for publicity were the higher-level policy makers or implementers at the national and provincial level.

Personnel and costs

Plans made in early 1978 assumed that most of the senior headquarters positions and all the Provincial Census Officer (PCO) positions would be filled in the second half of the year, preferably in July 1978. The delay by the Public Services Commission (PSC) in establishing the positions at suitable levels was a major problem but there were recruitment problems as well, once the positions were approved.

Recruitment for the PCO positions was a special problem. As the positions were situated in provinces, anyone appointed had to be acceptable to provincial authorities and there had to be suitable housing for them. Thus initial approaches were made to provincial authorities to find out if they had a suitable nominee in the province whom they were willing to second into the position. They were particularly asked to nominate competent, experienced administrators, preferably persons who were already DOs or at least Assistant DOs. When provincial authorities finally replied in late 1978, only seven were able to locate suitable nominees and two of these stayed on the provincial payroll only partially doing census duties. Provincial authorities also generally underestimated the task facing the PCO.

The total expenditure on the 1980 census was K 5.8 million over the 1978-1982 period. UNFPA contributed K 626,905 to the census project as well as the services of a UN advisor in 1978/79 and several visiting consultants. It was decided to concentrate UNFPA aid on the processing aspects (equipment and staff) of the project.

Issues

Some issues which have been identified in census related work in recent years are: (i) the 1980 census continued to rely quite heavily in most rural areas on the line-up method devised for censuses during the colonial period. In this system people from a CU, line to be enumerated at a certain point which has been located on a map. The percentage turnout for these line-ups is steadily decreasing; (ii) it is difficult to map the boundaries of rural CU areas because of land disputes, rugged topography and other reasons; (iii) the extended enumeration period and the use of coverage rules causes problems and casts doubt on the reliability of the coverage.

Plans for the next census

The next census of population is planned for 1990. Some proposals being considered are: (i) an earlier and more systematic approach should be taken towards planning; (ii) the enumeration period should be reduced substantially; (iii) the boundaries of as many rural CUs as possible should be mapped and enumeration should be done by the house-to-house method wherever feasible; and (iv) the NSO may re-equip itself with microcomputers to process the data. All office processing operations should carefully planned and fully tested well in advance of the enumeration.

26. PHILIPPINES

Historical background

The first census in the Philippines was authorized by a Royal Decree of Spain which mandated a count of the population who were alive as of midnight 31 December 1877. That census was, however, limited to the Christian population. Subsequently, the population was counted in 1903, 1918 and 1939. Unlike previous censuses, coverage of the 1903 census and those that followed was of the entire country and of all communities.

The first post-war census in the Philippines was held in 1948. The Philippine Republic Act No. 36 (otherwise known as Census Act of 1946) authorized the 1948 census. That act mandated the creation of a special unit within the Bureau of the Census and Statistics to oversee the entire process of census-taking, from the preparatory phase up to the publication of results. After the 1948 census, four other population censuses have been conducted, in 1960, 1970, 1975 and 1980. The 1960 census combined the enumeration of population and housing which has become the usual practice in succeeding censuses. For cost considerations sampling techniques were applied.

By 1970 the census field operations had improved organizationally. Census offices were established in nearly all the provinces. Modern computer technology was applied for the first time and indeed the design of the questionnaire itself, with most of the items precoded, was suited to computer processing.

The 1975 census was the country's first attempt at a quinquennial population census. The population count was actually the first phase of an integrated census, the second phase being a census of the population's economic activities. The most recent census of population in the Philippines was held in 1980. The topics on which data were collected are shown in appendix.

Design of the 1980 census

The 1980 census combined a complete and sample enumeration. All information, except demographic and basic housing characteristics, was obtained on a sample basis. Two questionnaires were devised, the Common Private Household Questionnaire and the Sample Private Household Questionnaire.

The main consideration in the choice of the sampling fraction, apart from cost, was the requirement for accurate and reliable estimates of population characteristics at the city/municipality level. Based on data from previous censuses, a study of the variances of the more important variables suggested that a sampling fraction of 20 per cent would suffice and was within budgetary limitations. The sample was chosen by the interviewer from a listing of all households in the enumeration area assigned for him. The enumerator interviewed every fifth household using the Sample Private Household Questionnaire. Other households were interviewed using the common questionnaire.

The selection procedure gave rise to some interviewer bias. There was a tendency of enumerators to select small-sized households for the long questionnaire. The enumerators simultaneously listed and selected sample households, so they were easily able to switch the order of listing so that small households could be selected thereby saving them work.

The preparation of geographic listing of areas, and enumeration area maps, were among the most important aspects of the preparatory work for the 1980 census. Enumeration areas coincide with political and administrative subdivisions. Thus the continuous creation and dissolution of these political and administrative units requires the continuous revision and updating of maps.

The National Census and Statistics Office (NCSO) had been continuously updating its geographic lists and maps since 1960. However, the lack of cadastral surveys, the lack of funds, and the fast rate of changes in political boundaries have set back the Office in regard to the preparation of maps for census purposes. So much so that at the time of the 1980 census only sketch maps were available to the enumerators, most of which were not drawn to scale.

During the field work, enumerators and supervisors were instructed to perform pre-enumeration activities like updating of barangay or village lists, updating of city/municipality scaled maps, map verfication and occular inspection of the barangay assigned to them. Enumerators were likewise required to update their enumeration area maps in the course of their field work and to prepare barangay or enumeration area maps if such were not available.

Committee structures

A Technical Committee for the 1980 census was formed towards the end of 1977. The Technical Committee directed the activities of two sub-committees. It laid down the general programme for the census and plans for the various phases of the census operation. The two steering committees, whose task centred on census planning and other preliminary work, were the sub-committee on Population and Housing Census and the sub-committee on Operations and Logistic Support. The first was made up of

ranking NCSO officials under the chairmanship of the Chief of the National Census and Household Surveys Department (NCHSD). The sub-committee developed the census questionnaires, prepared manuals of instructions and tabulation plans, conducted pre-test, and planned the census operations. The sub-committee on Census Operations and Logistics, likewise chaired by the NCHSD Chief, prepared and implemented field operation plans, allocated personnel and funds for the field operations and made available to field offices census materials necessary for the undertaking. The NCSO Technical Committee for Censuses also coordinated with the Inter-Agency Committee (IAC) on Population and Vital Statistics in resolving the technical aspects of the census. The IAC reviewed almost all aspects of the census-taking such as its sampling design, the proposed questionnaires, terms and concepts, and the proposed tabulations on population and housing. It submitted recommendations to the NCSO Technical Committee for final consideration.

Training and fieldwork

All personnel utilized during the census were given special training. Four levels of training were conducted in connection with the enumeration phase namely: (i) Task Force training, (ii) training for regional census officers, provincial census officers and statisticians; (iii) training for municipal census officers (MCS) and city/municipal census supervisors (CCS); and (iv) Enumerators' training.

The first level of training was held in Manila about two and a half months prior to enumeration day. NCSO personnel who had been involved in the planning of the census were the trainers at this level. Senior staff from the Central Office made up the Task Force who themselves became trainers for the second level of training.

The second level of training was conducted in selected training centres on a staggered schedule. The regional/provincial census officers and statisticians, who were the target for the second level training, were assigned to the centres nearest or most accessible to their area. The training was conducted simultaneously in three centres. The trainers at this level were the Task Force members.

The third level of training was conducted in two sessions. The first session was attended by the municipal census officers/assistants and the second, by the city/municipal census supervisors. In addition, other staff member of the provincial office were trained to serve as back-up supervisors in case the city/municipal census supervisors could not serve during the actual enumeration period.

The final level of training was conducted in every municipality a week before the enumeration was to start. In general, one class was organized for each municipality/city and was conducted by the supervisors.

The Census Operations Center (CENOCEN) at the Central Office had prepared a day-to-day schedule of training which was followed at all levels of training sessions. The training for the central office task force and that for the CCS/MCS lasted for seven days while those for the third and fourth levels lasted for six and five days, respectively. The basic training material at all levels was the enumerator's manual. Training included discussion of definitions and concepts, procedures for listing and sample selection and techniques for interview. Mock interviewers were likewise essential features of the training programme. For supervisors, additional days were devoted to discussions of their tasks as trainers and supervisors.

The assignment of enumeration areas (EAs) was planned before the enumerator's training. The EA was a delineated geographic area usually consisting of about 300 households. An entire barangay, which is the smallest political unit of the country, generally comprised one EA. However, barangays with a large population (more than 350 households) or area were usually split into two or more manageable areas. The population size of an area, the dispersion of houses, terrain, means of transportation and other factors were considered in the allocation of areas to enumerators.

The period of field enumeration covered 20 days in most areas. Supervision plans were prepared much ahead of the enumerators' training. In general, there was one supervisor for every eight enumerators. The duties of the supervisors were to check on the enumerators work, solve their problems, record their daily accomplishments, report their accomplishments to the next level of management and give assessment of the progress of the enumeration. Collective households were also enumerated by the Team Supervisor if there were a substantial number of these in his area.

Evaluation

The first attempt to evaluate the results of the 1980 census was on the total population counts based on summary reports submitted by the field personnel soon after the enumeration was completed. For each province, the 1980 counts were compared with those of the previous censuses to arrive at indications of growth during the intercensal period. For quite a few of these provinces, the implied growth rates had been unreasonably high. Known facts about the demographic patterns in these provinces provided no clues as to the reason for what appeared to be excessive growth in population. This gave rise to suspicions about possible manipulation by some interested parties given the widespread belief that the results of the census would be the basis for allocating seats in the national assembly. Evidence of similar manipulations had been uncovered in previous censuses. For the 1980 census, where an over-count of the population was clearly evident, adjustments were made by providing estimates based on careful analysis of demographic trends.

In areas where inflation or padding of numbers was suspected, several observations were made after scrutiny of

the questionnaires for example: (i) most questionnaires had all lines for household members filled up; (ii) age differences between siblings were usually just one or two years; (iii) many of the children listed were menopausal babies; (iv) some women were too young to be reported as mothers; and (v) the number of household members in the questionnaires was larger than those reported in the listing sheets.

Data processing

Editing and coding were done in the field. Each provincial branch office was instructed to edit, code and verify the questionnaires from their area before submitting these to the Central Office. From the field, the census documents were to be transmitted to the Key-punch Division of the Central Office for data entry. The key-punchers, however, complained of numerous error, inconsistencies and incomplete responses in the questionnaires which slowed down their activity considerably. Hence, it was decided that the questionnaires would have to be subjected to further editing, coding and verification.

The Central Office procedures called for editing and coding of all questionnaires received. Verification, however, was done on a sample basis. Sequential sampling of 10 per cent of the total number of questionnaires in each folio containing about 300-350 questionnaires was carried out. However, verification was limited to 6 out of 25 population characteristics for every member of the household in the questionnaire selected as a sample.

A quality control scheme, requiring for acceptance a maximum of two defective questionnaires out of those verified in a folio, was instituted. The unit of analysis was the questionnaire. One error in the questionnaire meant the whole sheet was defective. To determine acceptance or rejection of the folio a minimum of eight questionnaires were verified. If the folio contained fewer sheets, the verifier went back to the eighth sheet to complete the required sample sheets. Defective or rejected folios were re-edited, after which another random sampling number was used to verify the folio.

The computer processing of the private household questionnaires entailed: (i) data encoding of the Sample Private Household Questionnaire with 100 per cent key verification; (ii) sorting of records by province, municipality, barangay, enumeration area, household number and line number to facilitate completeness check of barangays; (iii) completeness checking of barangays within the province and of sample households in each barangay; (iv) updating of barangay lists to ensure completeness of samples; (v) listing of marginals before and after edit for evaluation purposes; (vi) editing and imputation; (vii) duplication of records to represent households that were not enumerated; (viii) generation of raising factors for the household and for every member of the household; (ix) urbanity checking; and (x) creation of three subfiles, the private household population file and subfile, and the housing file.

Analysis and dissemination

The analysis of the 1980 census data included descriptive analysis which was included in the final reports along with the tables, and a few analytical studies most of which have remained unpublished. The final report featured a textual analysis for each province, accompanied with charts and graphs and a trend analysis of selected social, economic and demographic characteristics of the population from 1970, 1975 and 1980.

The final phase of the 1980 census was the publication and dissemination of the results. Since publication of census results entails huge budgetary outlay, only important statistical tables were published. Other statistical tables were prepared and made available to users in the form of computer printouts. Four kinds of publications were prepared as follows:

1. Preliminary report by sex at city/municipality level;

2. Final report by barangay – published as Special Report No. 1 (summary report of the sex distribution of the population and number of private households by region, province and city/municipality) and Special Report No. 2 (population by sex and number of private households, by barangay for every province);

3. Volume I – Final report for the National Capital Region (Metropolitan Manila) and for each of the 73 provinces containing ten population and nine housing tables;

4. Volume II – National Summary, presented summaries of Volume I by region and contained the same tables as Volume I.

Three other special reports were published namely:

1. Special Report No. 3 – Population, Land Area and Density: 1970, 1975 and 1980;

2. Special Report No. 4 – Urban Population of the Philippines by Category, Region, Province, City/Municipality and by Barangay: 1970, 1975 and 1980;

3. Special Report No. 5 – Housing Characteristics of Occupied Dwelling Units by Region, Province, City and Municipality in 1980.

Publicity

The publicity programme for the 1980 census utilized all channels of communication. Two publicity programmes were developed, one on the preparation and distribution of information brochures and the other on audio-visual coverage. Fifteen-second spot announcements in radios and 10-second TV plugs were given in English or Filipino. Movie slides were also shown daily in many theatres all over the country. Accordion type handouts were prepared by CENOCEN and distributed to various dailies, TV and radio networks, ministries and personnel involved in the undertaking. For over a month leading newspapers and TV/radio

networks gave full publicity to the census, with the main objective of ensuring the public co-operaton.

Personnel and costs

The recruitment of supervisors and enumerators for the 1980 census was limited to school officials and classroom teachers of public elementary schools. Aside from the 24 Central Office staff who acted as members of the task force and supervisors-at-large during the enumeration, the total field personnel complement was provincial census officers/OICs 72; regional/provincial statisticians 92; municipal census officers 972; municipal census supervisors 1,105; team supervisors 3,748, and enumerators 27,986.

A budget of ₱29.4 million was approved for the 1980 census to cover printing cost, enumeration, supervision, processing and other incidental expenses. No external assistance was received.

Issues

Although well-planned, the 1980 census was not without problems at many stages. The basic problem was financial. The appropriations for the census were uncertain, even a few months before the actual field work was due to begin. Census planners know the programme cycle of a census undertaking requires several years from the preparatory phase to the post-enumeration phase. To guarantee accuracy of data, modern methods of census-taking have to be adopted, but in the face of the budgetary cuts, alternative methods were adopted, even if less effective, so as to fulfill commitments. The zero-base budgeting system instituted by the Minsitry of the Budget was not conducive to a well-planned census. Technical personnel were frustrated that this plan which took two years to prepare, had to be revised haphazardly just a few months before the actual census due to lack of budgetary support.

The lack of availability of experienced technical personnel, such as subject matter specialists and electronic data processing system analysts and programmers to prepare and carry out plans up to the publication stage was another problem. The fast turnover of personnel can be attributed to the relatively low salary of some government officials whose expertise is essential to census-taking.

Appendix. Information collected in successive censuses

Topics	1903	1918	1939	1948	1960	1970	1975	1980
Geographic identification								
Census Building No.	–	–	–	–	–	x	x	x
Enumeration District/Barangay No.	–	–	–	–	–	x	x	x
Urban/Rural	–	–	–	–	–	x	x	x
City/District/Poblacion/Barrio	x	x	x	x	x	x	x	x
City/Municipality	x	x	x	x	x	x	x	x
Province	x	x	x	x	x	x	x	x
Island	x	x	x	x	x	x	–	–
Personnal Characteristics								
Name	x	x	x	x	x	x	x	x
Sex	x	x	x	x	x	x	x	x
Date of birth	–	–	–	–	–	–	x	x
Age	x	x	x	x	x	x	x	x
Marital status	x	x	x	x	x	x	x	x
Citizenship	x	–	x	x	x	x	–	x
Race	x	x	x	x	–	–	–	–
Color	x	–	–	–	–	–	–	–
Place of birth	x	x	–	–	x	x	–	x
Household/Family Information								
Relationship to Head of Household	x	x	x	x	x	x	x	x
No. of families in the household	–	x	–	–	–	x	–	–
Housing facilities								
Ownership of:								
Radio	–	–	x	x	x	x	–	x
Television	–	–	–	–	–	x	–	x
Refrigerator	–	–	–	–	–	x	–	x
Cooking fuel facilities	–	–	–	–	x	x	–	x
Type of lighting	–	–	x	x	x	x	–	x
Water supply facilities	–	–	x	x	x	x	–	x
Toilt facilities	–	–	–	x	x	x	–	x
Nuptiality and fertility								
Age at marriage	–	–	–	–	x	x	–	x
Children born alive	–	x	x	x	x	x	x	x
Children still living	–	x	–	–	x	x	x	x
Births last 12 months	–	–	–	–	–	–	–	x
Cultural characteristics								
Mother tongue	–	x	x	x	x	x	x	x
Religion	–	x	x	x	x	x	–	–
Language								
Tagalog	–	–	x	x	x	x	–	x
Spanish	–	x	x	x	x	x	–	–
English	–	x	x	x	x	x	–	x

Appendix. *(Continued)*

Topics	1903	1918	1939	1948	1960	1970	1975	1980
Educational Characteristics								
School attendance	x	x	x	x	x	x	x	x
Highest grade completed	–	x	x	x	x	x	x	x
Degree obtained in college	–	x	–	–	–	x	x	x
Literacy	x	x	x	x	x	x	–	x
Vocational/Technical skills	–	–	–	–	–	x	x	–
Migration								
Place of previous residence								
5 years ago	–	–	–	–	–	x	x	x
10 years ago	–	–	–	–	x	x	–	–
Physical Disability	x	x	x	x	–	–	–	–
Economic Characteristics								
Place of work/schooling	–	–	–	–	–	–	–	x
Labour Force:								
Type of activity	–	–	–	–	x	x	–	–
Occupation	–	–	–	–	x	x	–	–
Industry	–	–	–	–	x	x	–	–
Status	–	–	–	–	x	x	–	–
Gainful Occupation:								
Usual activity	–	–	x	x	–	–	–	–
Occupation	x	x	x	x	–	x	x	x
Industry	x	x	x	x	–	–	x	x
Status	–	–	x	x	–	–	x	–
Wage or salary	–	–	x	x	–	–	–	–
Additional occupation	–	–	x	x	–	–	–	–
Income from additional occupation	–	–	x	x	–	–	–	–
Housing Characteristics								
Type of building/house	–	–	–	–	x	x	–	x
Number of dwelling units	–	–	–	–	x	x	–	x
Construction materials:								
Roof	–	–	–	–	–	x	–	x
Wall	–	–	–	–	–	x	–	x
Period of construction	–	–	–	–	x	x	–	x
Number of room	–	–	–	–	–	x	–	x
Number of occupants	–	–	–	–	–	x	–	–
Type of occupancy	x	x	–	–	x	x	–	x
Floor area	–	–	–	–	–	–	–	x
Tenure of occupancy	–	x	x	x	x	x	–	x

27. REPUBLIC OF KOREA

Historical background

Although Korea has a long history of population counting, modern census-taking was only introduced in 1925 when the country was under the Japanese rule. Since then censuses have been carried out (almost) every five years. The most recent census in 1985 was the thirteenth census of population and the fifth census of housing in the series of census taking. Since 1960 all censuses have enumerated the population on a *de jure* basis.

The population and housing censuses are Designated Statistics Numbers 1 and 2 based on the provisions of the Statistics Law The provision of the Census Decree of Korea stipulates that a full-scale census is to be taken in years ending in zero and a simplified census in years ending in five. However, the distinction between the full-scale and the simplified census has virtually disappeared in recent years as the scope of the simplified census has expanded to meet the ever-increasing demand for census information.

Design of the 1985 census

In the 1985 census, information on all items was collected by complete enumeration. In past censuses only basic items were collected through complete enumeration and items concerning migration, fertility and labour force were obtained on a sample basis. The number of items covered in the 1985 census was 30, 16 for population characteristics and the rest for housing characteristics. They were:

Population

1. Name and the origin of the family name
2. Relationship to head of household
3. Sex
4. Age
5. Religion
6. Place of birth
7. Place of residence one year ago
8. Place of residence five years ago
9. School attendance and educational attainment
10. Type of economic activity
11. Industry
12. Occupation
13. Marital status
14. Number of children ever-born
15. Number of children surviving
16. Number of children dead

Housing

1. Type of living quarters
2. Tenure or ownership of a household
3. Cost of rent
4. Number of rooms used in the household
5. Cooking fuel used in the household
6. Kind of household appliance
7. Number of households in the housing unit
8. Number of total rooms in the housing unit
9. Total area of floor space in the housing unit
10. Type of heating system in the housing unit
11. Type of kitchen
12. Type of toilet
13. Type of bathing facilities
14. Multi-purpose housing units

The population was counted on the basis of the *de jure* concept, that is those persons who usually live in an area at the time of the census. However, persons who were living in Special Enumeration Districts (EDs) were enumerated exceptionally at their respective places, but were allocated to the usual residence of their family. Persons who had no usual residence were enumerated where they were found at the time of the census.

The following persons away from home at the time of the census were enumerated at the usual residence of their family: (i) civilians who were away from home for business or travel; (ii) those who were in a police station detention house (not a penitentiary); (iii) those who were travelling abroad at the time of the census; (iv) hospital patients and their attendants; (v) government officials abroad, (vi) crew members vessels, airplanes and locomotives. Excluded were: (i) workers and students who were living abroad; (ii) foreign diplomatic crops, foreign personnel working in UN organization, and their dependents, and (iii) foreign military personnel, military civilians and their dependents.

All housing units within the area defined by the census were canvassed. Housing units were classified into detached dwellings, apartments, town houses and dwelling units in permanent buildings not intended for human habitation.

The census design defined two types of enumeration districts EDs and special EDs. The general EDs were all areas where free access was permitted while the special EDs were composed of collective institution, such as

military camps and fleets, prisons, police stations and diplomates abroad, where access was prohibited.

Each general ED covered 50 to 80 households, or 60 households on the average. General EDs are divided into ordinary EDs and quasi EDs. Quasi EDs were formed in districts that were not appropriate for ordinary EDs, such as boarding houses and social welfare institutions. Ordinary EDs were defined in accordance with the boundaries of administrative areas or natural features such as roads, buildings or rivers. The total number of general EDs in the 1985 census was around 152,000; this included 147,007 ordinary EDs and 5,361 quasi EDs.

About 85,000 enumerators were employed on a temporary basis for the census. Among them, about 27 per cent were university students and 40 per cent were from heads of a neighbourhood in urban areas and heads of a village in rural areas. Some 40,000 census officials from the Dong, Eup and Myeon levels of the administrative hierarchy worked as supervisors.

In the 1985 census all survey items were covered by the complete enumeration method. On average two enumeration districts were assigned to an enumerator.

During the three days prior to the main enumeration period which extended from 1 to 10 November, each enumerator prepared a map of his/her ED showing the location of each household and prepared a list of all households in the ED. The enumerator was also instructed to paste slips of paper showing the household serial numbers on the entrance of the housing units.

After completing and examining the questionnaires, the enumerator was requested to compare them with the household list for consistency. The completed questionnaires, household lists and ED maps were then submitted to the Dong, Eup and Myeon offices where they were checked by the census officials, and then forwarded to the National Bureau of Statistics through each level of local governments.

Census organization

The National Bureau of Statistics (NBOS) is a semi-autonomous organization under the Economic Planning Board of the Korean government. The Population Statistics Division, with a regular staff of about 20, was responsible for the content and execution of the census, including the questionnaire design, table formats, analysis of the results, recruitment and training of enumerators.

The local government hierarchy played an important role in the 1985 census. The Republic of Korea is divided into nine provinces (Do) and four special cities (Shi) which have the same status as province. Each province contains cities (Shi) and counties (Gun). Gun are subdivided into collections of villages (Myeon) and towns (Eup). The four special cities are subdivided in to wards (Gu), which are again subdivided into sub-wards (Dong), as are Shi. In all, there are 46 cities besides four special cities, 50 Gu, 135 Gun, 187 Eup, 1,256 Myeon and 1,830 Dong offices as of 1 November 1985.

This local government hierarchy was particularly important in the designation of enumeration districts, recruiting and training of enumerators, and the supervision of the enumeration. The Minister of the Economic Planning Board directed the governors of the provinces to supervise the execution of the census, and the governors appointed census officials down the administrative hierarchy within their jurisdiction.

For the 1985 census, two special committees, namely, the Technical Advisory Committee for Census and the Census Data Users' Committee were organized. The Technical Advisory Committee comprised demographers, economists and statisticians, while the Census Data Users' Committee included representatives of government agencies, research institutes and business associations.

Data processing

In order to carry out the data preparation, particularly for manual edits and coding, about 300 persons with a minimum of high school education were recruited on a temporary basis for one year.

However, data entry onto magnetic disks was executed on a contract basis with private business data centers. Upon receipt of the data input by private companies, the NBOS carried out computer editing. Records that failed to satisfy the editing criteria were maintained in separate files for verification and amendments, and then were corrected manually. Thus, the cleaned data for a 2 per cent sample of the schedules were prepared. Meanwhile, manual edits, coding and data entry onto magnetic disks for complete questionnaires are scheduled to be finished by the end of 1986. After that a series of computer edits will be run during January to July 1987, and the full tabulations will be made in October 1987.

The preliminary counts of the population, households and housing units by minor administrative units, based on the summary sheets prepared by enumerators were released in March 1986.

To meet the urgent needs for census data, an advance sample tabulation of the main characteristics on population size and its structure, migration, fertility, households and housing units will be made on the basis of a sample of households selected systematically. The advance report will be published in October 1986.

Evaluation

In order to get an estimate of the completeness of coverage as well as a measure of response variability of a few key items, post enumeration surveys have been carried

out in each Korean censuses since 1960. However, matching records has been found to be a very time-consuming task in the Korean context since: (i) the addressing system is not systematic and orderly; (ii) some people keep addresses which are different from their usual residence; (iii) it is difficult to obtain accurate information on the addresses of migrants, and (iv) it is difficult for enumerators to identify the correct ED.

These considerations led to the adoption of a response-bias design for the 1985 PES using dependent reenumeration. The emphasis was on obtaining complete coverage and accurate responses and on eliminating errors in the census. In order to ensure as complete coverage as possible, the PES enumerators were selected from experienced and qualified enumerators of the National Bureau of Statistics and were trained by the NBOS staff. In addition to the PES, the completeness of the 1985 census was checked by employing the cohort comparison method. The basic data utilized in this method were number of population by age and sex from the 1980 and the 1985 censuses, age-specific fertility rates derived from a survey, age-specific death rates derived form the life table and number of emigrants by age and sex from the Ministry of Foreign Affairs. It was estimated that the net underenumeration rate in the 1985 census was 1.45 per cent.

Costs

The total budget required for the 1985 census was about 10,400 million Won (equivalent to $US 12 million) excluding salaries to be paid for regular staff in both central offices and local government agencies.

Plans for the next census

Plans for 1990 census are: (i) the introduction of optical mark reader (OMR) system to speed up data processing; (ii) adoption of sample enumeration to meet the needs of diverse users; (iii) the recruitment of more qualified enumerators; (iv) the preparation of effective training materials; and (v) the introduction of a mesh code to draw up various maps.

28. REPUBLIC OF THE MARSHALL ISLANDS

Historical background

The first population census known to be conducted in the Marshall Islands was held in 1920 with a total indigenous population of just less than 10,000. Subsequently, the Japanese Administration, with the advice of the Mandate Commission of the League of Nation, held the census quinquennially.

The post-war censuses have been carried out by the United States of America and were conducted in 1958, 1967, 1973 and 1980 with the populations respectively of 14,000, 19,000, 24,000 and 31,000. The 1973 and 1980 censuses were specially developed to give data other than the population counts.

Design of the 1980 census

The 1980 census was designed by the then district planners and the territorical planner under the supervision of the U.S. Bureau of the Census. The local inputs were forwarded to the district planners who in turn presented them to be incorporated in the census questionnaire. Pretesting of the sample questionnaire was made to ensure its suitability in Micronesia.

Attempt was made to enumerate all persons residing in the Marshall Islands at the time of the census period with the exception of the military personnel. In the earlier censuses the same procedure of having the head count was applied to determine the entire population of the country.

The enumeration district maps, which were drawn for the 1973 population census, were slightly modified and up-dated for the 1980 census. A number of the enumeration districts in the urban areas were split into two due to the high population density in those districts.

Training and fieldwork

Three or four weeks prior to the census night were given for the training, pilot project and transporting of the census enumerators and crew leaders to their designated places. The first training session was held for the crew leaders or supervisors and the second for the enumerators. The crew leaders then trained enumerators with the assistance of the instructor and the census co-ordinator. Upon completion of the training both crew leaders and enumerators were asked to take oaths. A pilot project was carried out to evaluate the performance of the enumerators and the crew leaders and to pre-test the questionnaire and the census map.

Data processing

The census questionnaires of the 1980 census were forwarded to the United States Bureau to be processed and tabulated. However, the preliminary editing and data preparation were done manually. The preliminary population, based on manual counts, was announced by the Chief Secretary shortly after the census.

Dissemination and publicity

The census reports and special tabulations were distributed by the United States Bureau upon request, although the Office of Planning and Statistics could produce certain tabulations if requested. The computer records of previous censuses of Micronesia are being kept at the United States Bureau.

Public announcements about the population census were made through the radio broadcasting services, newspapers, posters and word of mouth, weeks before the start. A radio programme was requested for the duration of the census to enlighten the public about information asked for by the enumerators. It was also needed to monitor the progress of the outer island enumerators and to direct and advise them when problems arose.

Personnel and costs

The manpower required for the implementation of the 1980 census, excluding data processing personnel, was 97 of which 80 enumerators; one clerk typist; eight crew leaders; four editors; one administrative clerk; one co-ordinator; one census-taking adviser and one demographic adviser.

The fund allotted to the Marshall Islands by the High Commissioner and the United States Bureau for the census-taking was about $US 100,000. In addition, the costs of data processing and printing of the census report were borne by the United States Bureau.

29. SAMOA

Historical background

The first population estimate for the Samoa Islands was published in 1839 showing a population of 46,600. That estimate appears to have been based on a head count. From 1900 until 1961 population censuses were taken frequently under the German Authorities and the New Zealand Administration. The 1966 census was the first census of population taken after independence in 1962. Since then censuses have been taken every five years. The most recent census was heldn in 1986.

Over time there have been quite a number of changes in census concepts and many additional questions included. In the early censuses few questions were asked, for example, age, sex, ethnic origin and religion. There were no questions on economic activity, education, migration or fertility. Censuses taken under the New Zealand Administration, from the mid-1940s, introduced questions on economic activity and education. The first census to ask questions about housing was that of 1971, since then that topic is included every ten years.

Design of the 1986 census

Samoa's last census of population and housing was conducted in 1986 on a *de facto* basis and it covered the whole country. Maps used in the 1981 census were updated. They were prepared by the Cartographic Division of the Department. The interview method was used for the collection of information. A Household Interview Schedule and a Personal Interview Schedule were used for the collection of information for the census, and the listing form had one question on the type of housing. A few enumeration blocks were selected for the pretesting of the census questionnaire before it was finalized and printed.

The field enumeration work in past censuses was done by teachers and school inspectors of the Education Department. They were paid for their assistance. However for the 1986 census the enumerators requested higher payments than had been budgeted for. In order to avoid delay in the selection and training of enumerators, village registrars were approached for the selection of suitable people from each village for the enumeration work. A list of enumeration blocks for each village was given to each village registrar for their selection of enumerators with guidance from the Department of Statistics. Those selected for the enumeration work had reached secondary level of education. Before training enumerators, the staff of the Department of Statistics were given training on all census documents, as most were involved in census work.

The training of enumerators on listing and mapping was carried out on the third week of August, and the training on the census questionnaire on the second and third week of October. The whole country was divided into 24 training centres, 15 in the main island of Upolu, and nine in Savaii. Eight teams from the Department of Statistics did the training. The census questionnaire and instructions were in English and Samoan and this helped with the training.

The listing and mapping was done in the last week of August and the first two weeks of September. The information collected from the listing forms was the building number, household number, name of the head of the household, the number of persons in the household and the type of housing. The information on the number of persons in an enumeration block enabled the department to plan the distribution of census questionnaires for the actual enumeration. About 850 enumerators were used for the field enumeration.

As in past censuses the double-round enumeration method was used. That is, the preliminary census (first visit, one week before the final census) where every person is enumerated and all their information recorded, and the final census (second visit) where the enumerators pay a second visit from midnight of 3 November to midday of 4 November, to check whether there were any additional persons in households or whether any had left or whether there were any births or deaths since the first visit.

During the listing, mapping, preliminary and final censuses visits, the staff of the Department of Statistics made regular visits around the country in efforts to supervise and control the work of the enumerators. The enumeration of all hotels, the National Hospital and the wharf was done by the staff of the Department of Statistics. Before the collection of the census documents enumerators were given a few days to check their work and fill-in summary records.

Data processing

In early January 1987 a temporary staff of 20 was recruited for six months for the checking and editing of the census questionnaires and the coding. The Department had three IBM microcomputers, two PC XTs and one PC AT. For the Department of Statistics the first time will process the 1986 census data using its own microcomputers. That will give the Department valuable experience for the next census. A data processing section within the department has been established. With the departure of the

United Nations volunteer on data processing at the end of 1986 and the delay in recruiting a replacement, there was some delay in the processing of the census. Despite the delay a start was made on entering the data using dBase III. The main census report will be prepared as soon as the data processing is completed. It is planned that a seminar about how best to disseminate census information will be conducted after the report is completed.

Publicity and costs

Local newspapers and the radio were the two means of publicizing the 1986 census. Also the Minister of Economic Affairs and Statistics gave a speech over the radio emphasizing the importance and usefulness of a census for the social and economic planning of the country.

The estimated cost of the 1986 census as approved by Parliament was Samoan Dollars 86,405. That figure included salaries of enumerators, printing, stationery, publicity, transport, coding staff, report and data processing. External assistance was given in the form of advisory and consultancy services, volunteers, vehicles and data processing equipment. Apart from the local staff of the department, technical assistance was also received from ESCAP, EPOC and United Nations volunteers.

30. SINGAPORE

Historical background

The first census in Singapore was taken in 1871. Since then, regular decennial censuses had been taken up to 1931. The Second World War delayed the subsequent census till 1947 when it was conducted jointly with that of the Federation of Malaya. The second post-war census in Singapore was taken in 1957. The first census after independence was conducted in 1970 – a departure from the usual decennial intervals because of other priorities and the desire to follow the United Nation's recommendation to conduct censuses in years ending in either zero or one for international comparability.

The 1970 census witnessed the introduction of a sample enumeration as an intergral part of the census. The system of dual enumeration schedules was used whereby data on the basic or core items were collected from the total population and those on the more difficult or specialized items were obtained from a 10 per cent sample. The sample items covered topics on education, fertility, unemployment and housing amenities. Other new features introduced in 1970 were the adoption of international concepts and definitions (modified to suit local conditions where appropriate); the conduct of a properly-designed post enumeration survey for evaluating census results; and the use of electronic computers for editing, processing and tabulating the results.

The 1980 census was Singapore's second census since independence. It was decided to canvass 25 personal items and two housing items. The system of dual enumeration was again adopted . Thus, 16 basic personal and two housing items were assigned to the main enumeration schedule and nine additional specialized personal items were included in the 20 per cent sample enumeration. Items in the 1980 sample schedule but not in the 1970 counterpart were "income from work", "address of workplace (or school)", "usual mode of transport to work (or school)", "Languages or dialects spoken at home" and "religion" of which the first three were introduced for the first time in a census in Singapore.

Design of the 1980 census

In the study of various alternative designs for selecting the sample, the criteria taken into consideration were (i) that the sample should be representative of the population; (ii) that the size should be sufficiently large to enable reasonably precise estimates of attributes present in 0.1 per cent of the population, that is, a sub-category of about 2,500 persons; (iii) that the selection procedures should be simple, and selection centrally undertaken by census headquarter's staff; (iv) that the ultimate sample units selected should be readily identifiable and easily located; and (v) that the sample enumeration should not cause undue difficulty in field operations.

The sample design finally adopted which satisfied the criteria was a single-stage 20 per cent sample of reticulated units. As the target population was persons living in private households, reticulated units comprising institutions such as military camps, hospitals and hotels were excluded.

Before selection, the eligible reticulated units (the ultimate sample units) were listed in order of their census district/reticulated unit (six-digit) numbers. The ordered list was divided into seven segments, each of which consisted of reticulated units in ten census divisions (nine in the last segment). For each segment, the method of systematic selection was applied to select a 20 per cent sample of reticulated units. The reticulated units may be considered as "clusters" of houses, households and persons. Thus, when all houses, households and their members in the selected reticulated units were included in the sample, they also accounted for 20 per cent of all houses, households and persons in the universe respectively.

Work on reticulation and mapping commenced in 1978, as soon as it was decided that census divisions and census districts which corresponded to respective electoral divisions and census districts should be used as the basic geographical unit for tabulation and analysis. However, for the purpose of field operations and the allocation of work to enumerators, it was necessary to subdivide census districts into smaller areas which constituted the reticulated units.

Committee structures

Planning for the 1980 census began with the establishment of a Census Planning Committee in March 1978 with the then Senior Minister of State for Finance as chairman. The members included demographers, physical and economic planners, statisticians and computer professionals from government ministries and departments, as well as academicians and research workers from the then University of Singapore.

The committee provided over-all guidance and made policy decisions on the conduct of the census. The committee appointed three working sub-committees to look into certain technical aspects of the census. The three subcommittees were (a) Questionnaire and Tabulations, (b) Census Reticulation and Mapping, and (c) Classification of Occupation and Industry.

The Department of Statistics set up a Standing Committee on Census Matters with the Chief Statistician

as chairman, and other senior staff as members, to serve as the secretariat throughout the whole duration of the census from its planning to the publication of the results.

Training and fieldwork

Census Office was fortunate to have a relatively well qualified fieldforce. However, it was recognized that this in itself would not ensure the collection of good quality data because census taking is a rather specialized operation. To ensure that the fieldstaff were well trained in the various aspects of the census operations, Census Office drew up and implemented an intensive centralized training programme for each of the three levels of the fieldstaff, namely, assistant superintendents, supervisors and enumerators.

The training of fieldstaff was organized into three phases, one for each level of staff. Training was centralized, since the trainers could specialize on specific topics and the same trainers delivered the lectures and led the discussions on those same topics to different classes, thus reaping the benefits of specialization and division of labour.

A manual of instructions for enumerators was the main reference material for fieldstaff at all levels. The manual contained details of definitions and concepts, operational procedures, interview techniques, examples and illustrations of completed enumeration schedules. It also described the specific duties and responsibilities of enumerators. Special manuals of instructions were also prepared for assistant superintendents and field supervisors on their respective duties and responsibilities.

Elaborate preparations were made for the 1980 census and much resources spent in the training of fieldstaff. Some six weeks were devoted to training the more than 2,600 fieldforce for a total enumeration period of only five weeks. This apparent disproportionate allocation of resources and time to training complemented the efforts at recruiting qualified workers, and was well justified by the efficient manner in which the enumeration plans were implemented and ultimately, the quality of the results.

To test the plans and procedures, a trial census was carried out in June 1979. The results were used to make final revisions in the plans for the actual census in 1980. The date was chosen about one year ahead of the official census day to ensure conditions comparable to those expected in the actual census. This included weather conditions and the mid-year school holidays when many Singaporeans take vacations overseas.

Among its major findings, the trial census confirmed the suitability of scheduling one week for house and household numbering and listing, and three weeks for preliminary and three days for final enumeration. It also confirmed the rapid turnover of enumerators engaged on a temporary basis and the successful use of specially printed, self-adhesive paper instead of cards for numbering and labelling houses and households. The trial census removed the fear of poor response to sensitive questions like income from work, mode of transport to workplace or school, and language or dialect most frequently used at home.

After numbering and listing the houses and households to ensure complete enumeration of population, preliminary enumeration was conducted to collect particulars of every person. Two enumeration schedules, namely Enumeration Schedules A and B, were used for recording particulars of persons. The former, which contained 16 basic personal, educational and economic items, was applied to 80 per cent of the population and the latter, containing another nine special items on transport, languages spoken, religion and fertility, was used in the 20 per cent sample. Since the reticulated units were the ultimate sampling units, only one type of schedule was used for all private households within the same reticulated unit.

Enumeration of household members followed a systematic order, based on relationship to head and age, in order to avoid inadvertent omission. The enumerator also routinely checked whether there were any very young children and members temporarily away from Singapore, as those persons might be unknowingly overlooked by the informant. Any new household found to have moved into the house since the numbering phase was similarly enumerated. Enumerators were also instructed to check "unoccupied houses", numbered in the previous phase, to ensure comprehensive coverage. All movements of households into or out of houses were noted.

In the final enumeration, the information entered in the enumeration schedules were confirmed or amended if there were changes. Enumerators revisited every house and confirmed that those enumerated in the preliminary enumeration stage were still members of the households and that they had not died or left the household. All particulars of those who were confirmed as members were retained in the schedules. Additions were made, for example, for newborn babies. All houses indicated as unoccupied during the preliminary enumeration were revisited to ensure that occupants who moved in after the preliminary enumeration were enumerated. This final systematic enumeration over a short duration helped to avoid omissions or duplications.

Evaluation

One of the more important improvements over previous censuses was the dovetailing of the house numbering and preliminary enumeration phases. It dispensed with the need to hold separate recruitment and training of numberers and enumerators, shortened the house numbering phase from three to one week, and reduced the interval between the two phase from two weeks to two days. This helped reduce administrative work, turnover of enumerators and amendments to records due to households shifting. Moreover, the reduction of the entire enumeration period by four weeks lightened the burden of departments and statutory boards which contributed staff to the census.

The most common problem was "non-contact", that is, the existence of a household in a house was established but the enumerator could not contact any member of the household after several visits. Such households mainly consisted of young working couples and one-person households. To overcome the problem, a letter informing the households of the date and time of the enumerator's next visit and requesting someone to be present at the appointed time was issued. For unco-operative households which ignored the letter, the enumerator first checked with their neighbours on the times the householders were most likely to be at home and then visited them.

Owing to the booming contruction sector, there were many temporary or make-shift "dormitories" or worksite quarters in 1980. The difficulties in enumerating occupants of these quarters stemmed mainly from their fast turnover and the futility of trying to reach them in the day, apart from the physical hazard. In the case of smaller worksites, the quarters consisted of only a couple of small huts or even just some space in the partially erected building.

A post enumeration survey (PES) was planned and carried out as an integral part of the 1980 census evaluation programme. The main objective of the PES was to evaluate the completeness of coverage and the reliability of information collected in the census. Advantage was taken to incorporate a topic of interest into the PES for special study. In the allocation of areas, all PES fieldworkers were assigned to census districts and reticulated units that were different from those allocated to them in the census to ensure objectivity in the re-enumeration.

Census Day, 0000 hours, 24 June 1980 was taken as the reference day for the PES. Fieldwork of the PES was completed in two weeks. For coverage check of houses and households, all occupied houses within the reticulated unit were checked if each of them had a house/household label and a corresponding entry in the House/Household Listing Schedule. All unoccupied houses were also checked whether they were vacant on Census Day or were vacated after Census Day. In addition, every household enumerated in the PES in a particular house but was not listed in the relevant House/Household Listing Schedule was asked the date it moved into the house. Similarly, each person enumerated in the PES was asked whether he was living in the house before or only after Census Day.

In the processing of PES schedules, a matching process, involving the one-to-one pairing of households and persons enumerated in the PES with those in the same houses enumerated in the census, was carried out. The PES showed that the coverage of houses, households and persons in the census were very good, exceeding 99 per cent.

Data processing

All enumeration schedules, systematically filed by reticulated units, were returned to Census Office for scrutiny, editing, coding and check-coding. Editing was undertaken mainly by senior and more experienced staff. All staff were specially trained for editing and coding. All items were checked thoroughly for completeness and consistency. Omissions, inconsistencies, and mistakes were verified by reference to related entries in the schedule. For items such as occupation, industry or income, editors clarified with the respondents by phone.

For practical reasons, household items on tenancy and type of household were coded by editors during the editing stage. For personal items, a system of specialization was adopted whereby items were divided into five groups to be coded by specialized teams of coders. Specialization enabled the selection of coders with better aptitude to concentrate on coding the two most difficult items, namely, occupation and industry (activity of employer/firm). It also accelerated the over-all coding work as coders could more or less memorize the codes, except those for occupation and industry. Though at any one time, a coder was responsible for only one group of items, he was trained in all groups to allow for flexibility of redeployment in case of uneven progress among the groups.

All records of persons and households captured on the computer magnetic disks were subjected to stringent computer edit checks for validity and consistency. All error records detected by the computer were listed in a computer print-out. They were verified and amended for subsequent updating. Amended records were similarly reedited and verified till all the records were completely clean before tabulation.

The Computer Services Department (CSD) was responsible for the production of statistical tables and tabulations. Tables in this context referred to the sets of priority tables planned for advanced release while tabulations referred to the comprehensive sets of multi-dimensional detailed tabulations which served as a ready source of census data for use by policy makers and researchers. A total of 516 tables under nine subject matters were generated by computer. They were manually checked for intertable consistency before publication. The first set of tables for publication was completed by December 1980 and the last by August 1981.

Data entry for the 1980 census was carried out on the CMC XL 40 key-to-disk system. In this system, disks were used to hold the information entered through the video display stations which were connected to a built-in microprocessor. All data entered were verified. When the volume of verified data was sufficiently large, that is covering several complete census divisions, they were transferred from the disk storage to magnetic tape.

Analysis and dissemination

In order to achieve timeliness in making available the results without unduly sacrificing comprehensiveness,

Census Office decided to make periodic releases on special topics as and when such results were ready. The census releases contained the more important statistical tables of each of the topics. The tables were produced with minimum delay from camera-ready computer print-outs by photo-offset printing. Statistical tables in each census release were accompanied by some basic analysis, together with explanations of the relevant concepts prepared by census Office staff. Maps, charts and diagrams were included to highlight visually the more significant results and make the releases more interesting.

There were nine census releases in all. The first release, on general characteristics of the population, was published by December 1980, six months after the census was conducted. Eight other releases, on demographic characteristics, literacy and education, economic characteristics, geographic distribution, households and houses, income and transport, languages spoken at home, and religion and fertility followed at intervals of about five weeks. The ninth release was published in September 1981. For more detailed and in-depth analysis of the census data, specialists and researchers in various fields were invited to write monographs on topics of their speciality.

Publicity

An extensive programme to publicize the 1980 census was prepared by census office in order to allay any apprehension and to secure the willing co-operation of the population. The publicity programme was designed to inform the public, through all possible media, of the whens, wheres, hows, whys and whats of the census as well as the ways they could help in this national undertaking. Some publicity, albeit a modest one confining to the conventional mass media newspapers, television and radio, on the 1980 census was given in 1979 when the trial census was conducted. A much more comprehensive publicity programme was implemented in 1980, beginning with a press conference by the Chairman of the Census Planning Committee. Newspapers of the four official languages and the Singapore Broadcasting Corporation (SBC) gave extensive coverage to the press conference. Feature articles on the census and related subjects were also published. About 22,000 copies of eye-catching, brightly coloured census posters with the caption "Help Plan a Better Future" were printed in the four official languages and disseminated widely.

The comprehensive census publicity programme reached virtually all persons in Singapore. It succeeded in increasing their knowledge of, and arousing their interest in the census. The relatively well-informed and interested public were not only more co-operative but also in a better position to respond correctly to questions asked of them. This had greatly facilitated the conduct of the different phases of enumeration, both in improving the quality of response and in reducing the need for revisits.

Personnel and costs

The census of population, being an *ad hoc* project of relatively short duration, had to rely heavily on seconded staff from other organizations for a short period and on newly-recruited temporary workers. In the case of the 1980 census, the planning and technical personnel and some supervisory staff at the enumeration phase were drawn from the permanent staff of the Department of Statistics, the bulk of the field supervisory staff, namely assistant superintendents and supervisors in charge of census divisions and districts came from other government departments and statutory boards.

The majority of enumerators were recruited from outside the civil service. Besides the usual emplacement of advertisements in all the major newspapers and the extraction of names form the list of registered job seekers maintained by relevant ministries, Census Office recognized that one of the main sources of suitably qualified enumerators was female pre-university II students (boys would be called up for national service after the General Certificate of Education (GCE) ("A" level). Therefore, circular letters and application forms were sent to principals of junior colleges and relevant schools in the latter part of 1979 to enlist their help in persuading their students to take up census work.

The preferred minimum educational qualification was the GCE "A" level. However, for practical reasons, some candidates with qualifications lower than GCE "A" level, mainly those with relevant working experience, were also appointed. With more than four-fifths of the enumerators possessing qualifications of GCE "A" level or higher, the 1980 census had the best ever qualified workforce in the history population censuses of Singapore.

Being a very large and *ad hoc* project, it was difficult to request provisions for and to disburse such provisions of the census in accordance with normal budget procedures. Agreement was obtained from the Ministry of Finance in 1978 to create a block vote – "Census of Population". In order to have an indication of the probable total cost of the 1980 census a preliminary estimate for the whole project was made in July 1978, using rates, prices and other information prevailing then and making certain assumptions of the coverage and methods to be adopted. The figure was about $S 4 million. The census budget was reestimated annually in 1979 and 1980 and the approved provisions was approximately $S 4,800,000. The actual expenditure incurred in the census was lower than the approved provision by more than a million Singapore dollars.

31. SOLOMON ISLANDS

Historical background

Solomon Islands has held five censuses of population this century, in 1931, 1959, 1970, 1976 and most recently in 1986. The 1931 census was basically a head count, while the 1959 census was a sample census. The 1970 census was the first complete enumeration of the population in the country but it was still a relatively simple census. It provided information on a limited number of topics such as sex, age, marital status, ethnic origin, religion, fertility and mortality but no household, economic and education data.

A more comprehensive census was carried out in 1976 just before the country became independent in 1978. Since then, the monitoring of population change in the country has been very limited. There is no vital registration system and data on internal movements of people have not been collected nationally. As recent information on the size, growth, distribution and socio-economic characteristics of the population is needed for administration and development planning, Solomon Islands held its fifth census in 1986. The provisional results released in February 1987 showed a total of 286,000 people.

Design of the 1986 census

The 1986 census was the first census after independence. It was a *de facto* census. Persons were enumerated according to where they were found at census night rather than according to village, district or island of usual residence. In Solomon Islands, where the population tends to move a lot, and the concept of usual residence is not very clear to the people, this method gives a more accurate result than the *de jure* count. The *de facto* census also facilitates comparison with the two previous censuses. In this census, both a "two-visit system" and a "one-visit system" were applied. The two-visit enumeration was applied in almost all areas of the country, except in 5 per cent of areas where one visit enumeration was carried out in areas where the enumerators could not be expected to complete two visits in the time available.

The enumerators counted persons who spent the night at the household before the enumerator's visit to the household. These first visits therefore provided a complete census for the whole country, on a "floating census night" basis. The second visits to the households were carried out after a fixed census moment. In the second visit enumerators were required to delete persons who before the night of 23 November had died, moved out of the household and added babies born and people who moved into the household since the first visit.

The census results will be processed in such a manner that a comparison of the floating and fixed census night can be made with the purpose of making firm recommendations for census methods to be applied in future censuses.

The topics on the 1986 census forms were largely comparable to those of the 1976 census. Questions on language and duration of stay in the place of usual residence were dropped. Other questions for individuals were extended, for instance those related to migration and economic activities. Some questions remained the same, but procedures were strengthened. Thus, in order to try to act more correct reporting, enumerators were required to list the names of all children ever born of women with a large progeny (those having more than six children) in their record books.

The initial preparation of the maps for the 1986 census started in October 1985. The country was divided into 820 enumeration areas (EAs), each included an enumerator's workload of approximately 350 persons. The population information required for drawing EA boundaries was based on the existing anti-malaria programme maps and the Village Resource Survey 1984-1985. However, as villages in Solomon Islands tend to change place, name or size very often, 12 area managers were sent out to the field to update the draft maps and the population information. The updated information was then sent back to the Census Office in Honiara for preparation of the final EA maps.

The Government of Solomon Islands received considerable financial assistance from the European Community (EC) and UNDP which provided two volunteers and equipment. The EC mainly funded training, transport and other enumeration costs, while the other phase was related to the costs of data processing, technical assistance in census management, data processing analysis and user training. It is interesting to note that EC did not provide technical assistance directly, but put out the second phase of the census project for tender among a small number of European Demographic Institutes.

Committee structures

Steering committee functions were mainly carried out by the Government Statistician, the Undersecretary from the Ministry of Finance and the Deputy Secretary to Cabinet of the Prime Minister's Office and the Census Commissioner. A Users' Committee was formed in the early stages of the census and consisted of the representatives of various Government Ministries and non-Government Organizations. This committee has met three times before the actual census in November. The Committee did not

only consider topics to be included in the census and matters related to publication and dissemination, but also technical questions such as enumeration methods, timing of the census and so on.

Training and fieldwork

In order to train the large number of supervisors and enumerators about 40 professional trainers were recruited from among government and non-government organizations. The four courses for trainers were held in the period from late September to early October. The supervisors' courses started around the 20 October in the main centres of the country and lasted for eight days. The courses went reasonable smoothly in most of the centres except in one areas where dissatisfaction occurred largely due to water shortages.

For selection purposes, the supervisors (and the enumerators in later courses) had to sit tests during the courses. The test results and the general performance of the participants were used for the final selection of the required number of staff. The supervisors also participated in the enumerators' courses where they assisted in the training of their own teams.

The enumerators' courses were held in ten centres from 3 to 7 November. Most of the courses were completed in time but not without problems. For example, quite a number of trainers who had been trained in the earlier courses were not available for teaching. This was solved by using some of the brighter supervisors as trainers and also using some of the other overseas volunteers who were available at that time.

Training was done on the basis of a Training Guide which was supported by exercise books for enumerators and supervisors. It prescribed a high degree of class participation as trainees were constantly asked questions. There were also numerous exercise sets both at class and individual level. The teaching was accompanied by practical work consisting of mock, mutual and field interviews.

No serious opposition to the enumeration was encountered. Some small groups in isolated areas initially refused to be enumerated but were persuaded to revise their views. During the actual enumeration, the topics enumerators had most trouble with were economic activity and children ever born. There were not only problems in understanding the concepts involved, but also a tendency to omit the answers for persons born in 1973 and before. At the end of the enumeration, quality controllers were employed to make sure that the census forms were of sufficient standard. The quality controllers had specific instructions on how to test samples of the households in the EAs. Substandard work was returned to the relevant supervisors and enumerators for correction. Checked work was forwarded to the district office for another check and subsequently sent to the Census Office in Honiara.

Data processing

The census plan called for data processing in two overlapping stages, manual processing of the returns in Honiara and computer processing in the Netherlands.

The manual data processing in Honiara consisted of checking and coding of the returns from the field. This work was completed in just over four months. The checked and coded census forms were microfilmed and sent to the Netherlands for further computer processing. Data capture, editing and tabulation is expected to be completed in August 1987. It is planned to disseminate the census results by issuing several publications and holding meetings and training courses. There will be eight provincial reports, one for each province and Honiara. These will contain simple tables of most of the variables that were included on the census questionnaire.

The main census report will consist of basic information mainly in the form of long series of fairly complex basic tables which are intended for use by higher level planners, donors and researchers (Volume 1). A demographic and socio-economic analysis of the basic tables will appear in a second volume. Any users who wish to obtain census information not included in the published reports can contact the Government Statistician.

Publicity

The main publicity campaign started from August and ran up to the census night in November. Too much early publicity may have turned the public away from the census by the time of the enumeration. The publicity programme was designed to highlight the major census activities through local radio programmes and newspapers. Its main aim was to provide a clear statement of the purpose and conduct of the census and to remove doubts and uncertainties. Another important aim was to appeal for the support and co-operation of all segments of the population throughout the country.

Personnel

The overall manpower for the census can be divided into those recruited overseas and those provided by the Solomon Island Government. The overseas personnel included the Census Commissioner, two United Nations volunteers, (a Cartographer and a Census Statistician) funded by United Nations Population Fund (UNFPA), two Australian volunteers and one volunteer from New Zealand who took up the posts of Census District Superintendents. The local staff included the Deputy Census Commissioner, the census accountant, two secretary typists, one data processing supervisor, 12 Area Managers, four draughtsmen and two checkers/coders. Other short-term employees were required at different stages of the census work. These were 11 enumerators who were temporarily employed to carry

out the pilot census, 40 trainers; 820 enumerators, 150 supervisors, 15 quality controllers and 40 checkers and coders.

Dissemination

If time and resources permit, a small atlas of cartograms showing the distribution of various population variables will be produced. Other important elements of the dissemination will be a seminar for high level government staff to discuss the implications of the census information for further policy making. Further, a training course for trainers who are to conduct workshops in the provinces to instruct lower level government officials, teachers and women's organizations about the results of the census and what they mean.

32. SRI LANKA

Historical background

Sri Lanka has a long history of regular census taking dating back to 1871. The Registrar General supervised the first census of 1871. The responsibility of administering the census programme in the provinces was entrusted to the government agents and to their assistants in the revenue districts. They were also responsible for the demarcation of enumeration areas and the appointment of enumerators. The census of 1871 was a *de facto* enumeration and only persons who were actually present in their home on the night of enumeration were counted. All subsequent Sri Lanka censuses have also enumerated the population on a *de facto* basis and have covered the entire country. The method of enumeration has been direct individual interviews by enumerators using census schedules, except in the earliest three censuses where the census schedules were delivered to the households to be answered. The topics covered and the procedures adopted have followed international standards, conventions and recommendations. The items for which information was canvassed at each census between 1871 and 1981 are summarized in appendix.

Censuses after 1901 have carried out enumeration in two phases. A preliminary census was scheduled to take place a week or two before the final census, at which the enumerators canvassed the census schedule. Persons who are likely to be present at the residence on the final census night were enumerated in that housing unit. The final census has always been fixed between 6.00 p.m. to midnight on the appointed day and the enumerators visit each dwelling place and confirm or amend the population enumerated at the preliminary census in that dwelling place. Special arrangement were also made to enumerate persons in institutions and person found outdoors or travelling on the census night by deploying outdoor enumerators. An innovation introduced in the 1971 census and further extended in the 1981 census was to provide for a considerable amount of pre-coding and self-coding on the census schedule itself, requiring the enumerator merely to circle the appropriate code as the answer to each question. This was introduced to reduce the amount of coding after the completion of the enumeration.

Design of the 1981 census

In the 1981 census, as at previous censuses, it was decided to limit the collection of some items of information to a sample of the population, because of costs as well as to maintain processing work within manageable limits. Thus two schedules were canvassed: a general schedule containing population topics only and a second (long) schedule containing additional population topics as well as housing topics from the sampled population. In order to provide reliable data at high levels of disaggregation it was considered that urban areas should be totally enumerated. Sampling was restricted to the rural and estate sectors which together comprised 75 per cent of the population. The rural and estate areas of each administrative district, were treated as separate strata and systematic 10 per cent sample of census blocks was chosen from each stratum. A complete enumeration of all housing units was undertaken within the sample blocks selected. Thus in the urban areas, and in the sampled census blocks, a population and housing schedule (long schedule) was canvassed. While outside the sampled areas a short schedule comprising only of populaton information was canvassed.

The country is divided into nine provinces and each province is sub-divided into a number of administrative districts. At the time of the census there were 24 administrative districts of which the administrative head was the Government Agent. Each district was further divided into Assistant Government Agent's Divisions. The Gramasevaka divisions constituting several villages is the smallest administrative unit and there were approximately 4,100 such divisions. In the revision and updating of lists of towns and villages particulars relating to the redemarcation of areas were compiled. Thereafter a prelisting of all housing units and buildings was undertaken. All housing units were assigned numbers and the number assigned was recorded on a prelisting form. The delimitation of census blocks were carried out at this stage, and the prelisting officers were advised to delimit the blocks by grouping together 50 to 80 adjacent housing units in the rural areas, and 80 to 120 units in the urban areas, paying due regard to distances between buildings, nature of the country and local conditions. The prelisting officers were also required to draw a sketch map of the area.

Sri Lanka census field operations have so far not been based on a census cartographic or geocoding system. This limitations had been understood and a census cartographic unit was established in 1979. However, this unit did not have the capacity, nor the resources to provide the input required for the 1981 census. Thus it was necessary to use sketch maps and the particulars on housing units collected at the prelisting stage.

Committee structures

In order to undertake the planning and programming of the census, a Steering Committee, with the Director of Census and Statistics as Chairman and six senior departmental officers who were directly involved in the 1971

census, was established in 1977. This committee was directly or indirectly concerned with all major decisions, including those on over-all strategy, scope and content, planning and designing, census-taking procedures, documentation, staffing, budgetting and scheduling. Thus the planning process had been designed with a view to utilizing the experiences of 1971 and previous censuses and had provided for a review of the methodologies adopted and documentation used.

Although a separate Users Committee was not established, all major data users within and outside the Government were addressed and their views obtained by circulating a document "Scope and Content of the 1981 Census of Population". Representatives of agencies which expressed and communicated their views were invited for discussion and several useful suggestions made by the users were adopted.

Training and fieldwork

The training of census personnel was a priority task and plans were drawn up to provide comprehensive training. The training plans were prepared and scheduled taking note of staff requirements, distribution, and time of engagement of the different categories of personnel. The Department had the advantage of a permanent field organization with staff deployed at the district level and some 200 Assistant Government Agents Divisions into which the country was divided at the time.

The Assistant Directors and Statisticians of the Department were trained at Headquarters by the Census Division. Comprehensive training was provided covering census schedules, concepts and definitions, field procedures, supervision and administration of the census.

The Government Agents and Heads of local authorities who were appointed as Commissioners of Census in their areas of jurisdiction were also provided extensive training. The training was undertaken in October 1980. Assistant Superintendents of Census who were trained in the first phase, functioned as trainers to train field staff of the Department and the Assistant Commissioners of Census in the districts.

At the 3rd phase, the Assistant Superintendents of Census, and the Statistical Officers conducted training classes for the Census Circle Supervisors. The training of enumerators was undertaken by Statistical Officers and Statistical Investigators working in the field who had been provided training at the 2nd phase of the training programme. Training programmes for census enumerators lasted for one day.

Government Agents were appointed as Census Commissioners to organize, supervise, and assist in conducting the census in the districts to which they were appointed. Similarly, the Heads of local authorities, were utilized to play this role in the urban areas. The Divisional Assistant Government Agents were appointed as Assistant Commissioners, and officers of local authorities in urban areas were also appointed Assistant Commissioners. The appointment of Government Agents and their Assistants as Census Heads in the districts and divisions has also made it possible to obtain the co-operation of the public and to make them treat the census as a national endeavour without any bias.

Evaluation

A post enumeration survey (PES) was conducted one to three months after the date of enumeration to evaluate the completeness and quality of the census data as well as the quality and efficiency of census enumerators. For the PES, urban, rural and estate sectors were treated as separate strata and using a systematic procedure within each stratum 2 per cent of urban blocks and 0.5 per cent of the rural and estate blocks were sampled. In order to reduce errors and improve efficiency only the permanent staff of the department, who were trained for this survey were entrusted with the field work.

Data processing

On the completion of the final enumeration, enumerators were required to prepare a population summary of the census block. The provisional count of the population by districts was released within three days of the date of the census based on the enumerators abstracts. All the completed census schedules from the 24 districts were received within three weeks of the date of enumeration. Receipt of all the census schedules were ensured by checking the schedules against a master register of census blocks. Editing and coding of the census schedules for the 10 per cent sample tabulations were entrusted to 50 editor-coders who were specially recruited and trained for this purpose.

Each schedule was first scanned to ensure that all identification information has been correctly filled and if errors or omissions were found they were corrected. It was also necessary to ensure that the age had been entered, and if not it was imputed. As already mentioned except for the topics of educational attainment, occupation and industry all the other items were precoded or self-coded. In the sample schedule two other items, viz. district of birth, and district of previous residence needed to be coded. The enumerators were provided with a card which contained the district codes, and they were required to enter the district code for these two topics.

A set of detailed edit specifications were prepared for computer editing. This was found to be too time consuming, and some of the checks were eliminated. The edit checks ensured the validity of the range of values for each topic, the correctness of skipping, and internal consistency of response categories. Whenever the edit checks failed for a schedule all information for that schedule was printed, and the error print-out referred to the Census Division for manual correction. A similar procedure was also adopted

with regard to imputations, when imputation of missing entries were not possible on the computer.

The data processing capability of the Department was upgraded for the 1981 census by installing an IBM 4331 main frame computer with peripherals and a system 34 in 1980 utilizing technical assistance from UNDP/ UNFPA. The data entry for the census 1981 was effected using the system 34 with 14 data entry terminals and 22 card punching machines and nine card verifiers. The data were then transferred to tape files using the IBM 4331. Editing and imputation programmes were written by the processing staff.

Analysis and dissemination

A general report of the census, providing a descriptive and analytical account of both the census and the demographic developments during the intercensal period was prepared. The General Report of the 1981 census presented a brief overview of the organization of the census, followed by chapters on population size and growth; distribution, migration, urbanization age, sex composition, ethnicity, marital status, labour force and occupation, industry and housing.

In order to meet the different requirements of data users, it was decided to provide three types of data releases: a Preliminary Results Series; 10 per cent sample tabulations; and final tabulations. The results of the 10 per cent sample tabulations in respect of population, housing and the economically active population were released shortly after the census. They were followed by the final report series, containing the final tables which were published in three volumes: Volume 1 containing 24 separate district reports; Volume 2 containing country tables – separate reports on population, migration and housing; and volume 3 the General Report, which provides a descriptive and analytical account of the organization of the census and analysis of census data.

Publicity

The need for conducting an effective island-wide publicity campaign before the census enumeration date was recognized, and work on this activity commenced well in time. The main objective of the publicity programme was to inform the public and enlist their co-operation. Individual programmes were designed to inform the public of the census procedures and activities, the benefits that could be derived for the census, the importance of providing complete and accurate information and the need for the co-operation and participation of all persons.

The publicity programme was more comprehensive than in earlier censuses. Messages from the President of Sri Lanka and the Director of Census and Statistics were broadcast through the radio and inserted in the press, highlighting the importance, confidentiality and the legal requirements to provide census information. A special commemorative stamp was also issued to draw public attention to the census, and to keep the census in public view. A short film, "Census and You", was also produced which depicted census taking and data processing activities and the uses of census taking. People were asked to stay at home between 6.00 p.m. and midnight on 17 March for the final count. The day was declared a holiday for workers to enable them to reach their homes to be enumerated.

Personnel and costs

The conduct of the 1981 census is provided for by the Census Ordinance of 1900 and by its subsequent amendments, the last of which was the Census (Amendment) Act, No. 16 of 1981. The law provides the Minister in Charge, currently His Excellency the President, to direct that a census be taken of population, housing, livestock, trade, agriculture, labour, industry or commerce and for the appointment of a Superintendent of Census to superintend the taking of the census.

The ordinance and its amendments also provides for the appointment of Deputy and Assistant Superintendents of Census as well as Commissioners and Assistant Commissioners of Census to assist the Superintendent of Census and to be in charge of census-taking at the sub-national levels. All census personnel including the Census Superintendent and enumerators who are duly appointed are deemed to be public servants under the Penal Code. This legislation has also made it obligatory on the occupier of any land, house or other premises to provide access to a census official for him, affix numbers for a census listing operation, as well as to answer any questions relating to the census schedule to the best of his knowledge and belief.

The Director of Census and Statistics supervised the census. One or two Deputy Directors of Census and Statistics were appointed as Deputy Superintendents to assist him. The staff of the Department, of the rank Statistician and above functioned as Assistant Superintendents. Government Agents of the administrative districts were appointed as Commissioners of Census and were responsible for the general guidance and supervisions of the census operation in the area to which they were appointed. Assistant Government Agents attached to the divisions were appointed as Assistant Commissioners. In the urban areas the Heads of Local Authorities were appointed as Commissioners while the Assistant Commissioners were drawn from the staff of these instituions. The Census Commissioners and Assistant Commissioners appointed the enumerators.

The cost of the 1980 census has been estimated at Rs. 30.1 million. However, this estimate does not include the costs incurred for supportive services rendered by the service divisions. The Government of Sri Lanka received a substantial input from the United Nations Population Fund (UNFPA) and United Nations Development Programme (UNDP) to conduct the 1981 census. This assistance was in the form of computer equipment, advisers, and fellowships. The UNFPA project assistance amounted

to $US 313,220 and a substantial component of this was used for upgrading the computer facility of the Department.

Issues

As at earlier censuses demarcation of enumeration areas was undertaken by the listing officers at the listing stage. This listing and demarcating of census blocks in urban areas had, in some instances, been completed with considerable effort. It was also difficult to ensure that all occupied premises were prelisted in distant rural areas where open spaces exist. It is accepted that the procedure adopted does not make it possible to verify whether the prelisting operation was complete and comprehensive and covered the entire ground area.

Censuses of Sri Lanka have been conducted on a *de facto* basis. However, the *de facto* method requires very large cadres of enumerators as a single enumerator could only enumerate 75 to 100 housing units within the six census hour period allotted to this activity on the final census night. Recruiting persons with adequate qualifications having requisite aptitudes, training, deployment and ensuring the maintenance of proper communication between them and the supervisory staff and in collecting the returns was difficult.

The computer equipment which was upgraded was available only just before the census-taking and there was insufficient time available to prepare, test and install the software for efficient processing and analyses.

Plans for the next census

The next census is scheduled for 1991. In planning for the next census, special attention will be devoted to enhancing the quality of census data; providing data for small administrative areas required for planning and administration and reducing the lag between census taking and data dissemination. Planning will commence by mid-1987, and a Steering Committee will be constituted. After that a decision will be taken whether to set up a technical committee. It might be feasible to establish some working groups or working parties on specific matters and these groups could report to the Steering Committee. As an initial task it will be necessary to undertake a detailed evaluation of the 1981 census-taking procedures including post enumeration activities.

The data processing capability will have to be considerably strengthened, both by way of equipment and by way of manpower in order to meet targets and deadlines that will be established. It has not been possible to stem the mobility of trained computer personnel, a consequence of relatively low wages in the public sector and availability of opportunities for good programmers within and outside the country. Further, in-service training of programming staff on the use of software packages and tabulations has also been identified as an activity that should be undertaken in the initial phase of the census programme. Strengthening of the Printing Division by acquisition of new equipment is another priority area of action.

Appendix. Topics included in successive censuses

Topic	1871	1881	1891	1901	1911	1921	1931	1946	1953	1963	1971	1981
Name	X	X	X	X	X	X	X	Xs	X	X	X	X
Relationship to head of family or household	X	X	X	–	–	–	–	X	X	X	X	X
Sex	X	X	X	X	X	X	X	X	X	X	X	X
Date of birth	–	–	–	–	–	–	–	–	–	X	X	X
Age	X	X	X	X	X	X	X	X	X	X	X	X
Marital status	X	–	–	X	X	X	X	X	X	X	X	X
Ethnic group or nationality	X	X	X	X	X	X	X	X	X	X	X	X
Religion	X	X	X	X	X	X	X	X	X	X	X	X
Citizenship	–	–	–	–	–	–	–	–	X	X	X	X
Ability to speak Sinhala or Tamil	–	–	–	–	–	–	–	X	X	X	–	–
Ability to speak English	–	–	–	X	X	X	X	X	X	X	–	–
Literacy in Tamil, Sinhala, English	–	–	–	–	–	–	–	–	–	–	–	X
Educational attainment	–	–	–	–	–	–	–	–	Xs	X	X	X
School attendance	–	–	–	–	–	–	–	–	–	–	X	X
Type of activity	–	–	–	–	–	–	–	–	–	X	X	X
Principal occupation	X	X	X	X	X	X	X	X	Xs	X	X	X
Subsidiary occupation	–	–	–	X	X	X	–	–	–	–	–	–
Industry	–	–	–	–	–	–	–	X	X	X	X	X
Employment status	–	–	–	–	–	–	–	X	X	X	X	X
Salary or wages (income)	–	–	–	–	–	–	–	X	Xs	–	–	–
Dependency (means of subsistence earner on whom dependent)	–	–	–	X	X	X	X	X	X	–	–	–
Period for which employed	–	–	–	–	–	–	–	–	Xs	–	–	X
Whether sought work	–	–	–	–	–	–	–	–	–	–	X	–
Period of search for work	–	–	–	–	–	–	–	–	–	–	X	–
Reasons for not seeking work	–	–	–	–	–	–	–	–	–	–	X	–
Place of birth	X	–	X	X	X	X	X	X	X	X	Xs	Xs
Place of usual residence	–	–	–	–	–	–	–	–	–	–	Xs	Xs
Duration of stay of usual residence	–	–	–	–	–	–	–	–	–	–	Xs	Xs
Place of previous residence	–	–	–	–	–	–	–	–	–	–	Xs	Xs
Length of residence in Sri Lanka	–	–	–	–	–	–	–	X	X	–	–	–
Date of marriage	–	–	–	–	–	–	–	X	Xs	–	–	–
If previously married date of first marriage	–	–	–	–	–	–	–	X	Xs	–	–	–
Age at first marriage	–	–	–	–	–	–	–	–	–	–	Xs	–
If married more than once duration of subsequent marriage	–	–	–	–	–	–	–	–	–	–	Xs	–
Age at birth of first child	–	–	–	–	–	–	–	X	Xs	–	–	–
Number of children ever born	–	–	–	–	–	–	–	X	Xs	–	Xs	–
Number of living children	–	–	–	–	–	–	–	–	–	–	Xs	–
Date of last live birth within past five years	–	–	–	–	–	–	–	–	–	–	Xs	–
Infirmity	X	X	X	X	X	X	–	X	X	X	–	X
Orphanhood	–	–	–	–	–	–	–	X	X	–	–	–
Distance from usual residence to place of work or school	–	–	–	–	–	–	–	–	–	–	–	X
Principal mode travel to place of work or school	–	–	–	–	–	–	–	–	–	–	–	X

X denotes that the information was canvassed from all persons.

Xs denotes that the information was canvassed from a sample only.

– denotes that the information was not canvassed.

33. THE TERRITORY OF AMERICAN SAMOA

Historical background

The Territory of American Samoa consists of six inhabited and one uninhabited island: the main island of Tutuila where the capital Pago Pago is located, the island of Aunu'u on the far eastern side of Tutuila, the islands of Ofu, Olegesa, and Ta'u constituting the Manu'a group, and Swains Island, a small atoll to the far north. The population of the Territory of American Samoa has increased at an annual average growth rate of about 2.2 per cent since 1900. During the early years of the United States Naval Administration, several censuses of population were taken by the naval governors between 1900 and 1912, but the Territory of American Samoa has been included in the United States decennial censuses since 1920. Special censuses were held in 1956 and 1974, and population surveys were conducted in 1977 and 1985. All censuses collected population information. Agriculture data were collected in the United States decennial censuses in 1920 and housing data were collected in the 1970 and 1980 decennial censuses.

The 1980 census

The census items on the questionnaire for the Territory of American Samoa differ from those on the main United States census forms, so there are a number of restrictions which cause problems in data collection, processing, and analysis. However, since American Samoa must apply for the same federal grants and programmes as the United States, a certain amount of comparability with the United States form is needed. The United States Bureau of the Census had two meetings in Honolulu with a representative from the Territory of American Samoa prior to the 1980 census. The first meeting was in May 1979 in which the Bureau of the Census presented a completed questionnaire for discussion. The second meeting was in December 1979 to discuss tabulations.

The 1980 census of the Territory of American Samoa was conducted through direct interview. The enumerators visited and listed every housing unit in a single visit, asking questions and recording the answers. Responses were determined by the questionnaire and the instructions given to the enumerators. A single questionnaire was used, which contained all the questions asked of every person and household.

Census date was 1 April 1980. The data were collected on or after that date. The 1980 census was a *de facto* count, as were previous decennial censuses. Each person enumerated in the 1980 census was counted as an inhabitant of his or her "usual place of residence," which is generally construed to mean the place where the person lived and slept most of the time. This place was not necessarily the same as the person's legal residence or voting residence.

The 1980 census questionnaires were processed electronically by the Film Optical Sensing Device for Input into Computer (FOSDIC). For most items on the questionnaire, the information obtained by the enumerator was recorded by marking the answers in the predesignated positions that would be "read" by FOSDIC from a microfilm copy of the questionnaire and transferred onto computer tape with no intervening manual processing.

The tape containing the information from the questionnaires was processed on the Census Bureau's computers through a number of editing and tabulating steps. Among the products of this operation were computer tapes from which the tables in the publications were prepared on phototypesetting equipment at the United States Government Printing Office. For 1980, there were three population volumes, two housing volumes, and one agriculture volume.

Editing

In an attempt to reduce various types of non-sampling errors in the 1980 census, a number of techniques were introduced. These quality control and review measures were used throughout the data collection and processing phases of the census so as to minimize under-coverage of the population and housing units and to keep errors at a minimum. In the field, questionnaires were reviewed for omissions and certain inconsistencies by a census clerk or an enumerator, and, if necessary, a follow up was made to obtain missing information. In addition, a similar review of questionnaires was done in the central processing office. As a rule, however, editing was performed by hand only when it could not be done effectively by machine.

There were two means by which incomplete or inconsistent data on the questionnaire were corrected during the computer editing process: substitution and allocation. Substitution is the assignment of a full set of characteristics for a person and was used very little in the Territory of American Samoa because enumeration was by enumerators who knew their villages, when people would be home, and, in general, how many people should be at the housing units.

Allocations or assignments of acceptable entries were needed most often when there was no entry for a person on that item or when the information reported for a person was inconsistent with other information. Hot Deck editing was used for allocation.

The problem with Hot Deck editing in the Territory of American Samoa is that very few values are unknown at the edit stage. For example, only 188 persons were substituted in 1980 (less than 1 per cent), but 2,416 of the remaining 32,109 persons (8.5 per cent) had relationship, sex, age, or marital status or some combination of these allocated. If we had left unknowns in the data we would have had incomplete tables, and users would have had to make their own allocations, without using other information from individuals or other household members.

Issues

Housing unit definition: the United States definition of a housing unit is "a house, an apartment, a group of rooms, or a single room occupied as a separate living quarters or, if vacant, intended for occupancy as a separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other persons in the building and which have direct access from the outside of the building or through a common hall." This is the definition we used in 1970, as well as in the special censuses and surveys of 1974, 1977, and 1985. In 1980, in American Samoa, an additional criterion was added and the explanation found in the Bureau of the Census's publication for housing reads.

"Because of the living arrangements among extended families in certain sections of the Territory of American Samoa, additional instructions were provided to help enumerators determine whether a living quarters met the housing unit definition. Extended families make use of two different types of living arrangements. One type has a common kitchen surrounded by several structures (called fales) where the members of the extended family sleep. The meals are prepared in the fale with cooking facilities used by the members of the extended family. The family members either eat their meals at their own fale or together. In this arrangement, each individual fale is treated as a room within one housing unit. The other type of living arrangement has separate cooking facilities in each fale, but the family members share a common outdoor oven (umu). The family members pick up the cooked food from the outdoor oven and finish preparing and eating their meals at their individual fale. Since the occupants of each fale use their own cooking facilities to prepare their meals and they eat separately from other family members, each fale is considered a separate family unit." The effect of this change in the definition was to reduce the number of housing units but there were more persons on average in the units. Although the total number of individuals was probably not affected, the housing characteristics were affected in a number of ways. The actual number of housing units decreased between 1970 and 1980. Also, some of the housing data became obscured because the enumerator could only give characteristics for one of the units. Although we have been able to use this new definition, we are now pondering whether to keep the definition from 1980 to have comparability with data in 1990, or to try to get the Bureau of the Census to change back to the other definition to have comparability with earlier censuses.

Unemployment: the census provides information on the employment and labour force status of the population. For persons 16 years of age and over, the population is distributed among those in the labour force and those not in the labour force. Those in the labour force are distributed between the employed and the unemployed. The 1980 census recorded 9,990 persons over 15 as "not in the labour force," which was 54.5 per cent of that population. Also, only 2.4 per cent of those persons who were in the labour force were recorded as unemployed. Both of these figures do not agree with the actual labour force situation in the Territory of American Samoa.

Data from a 1985 survey showed unemployment rates of about 13 per cent. The survey data show internal consistency and differ considerably from the data produced in the 1980 census, even considering different economic conditions at the time of the two enumerations. It is possible to disaggregate the "not in the labour force" population from the 1980 census into constituent parts. Although there were 9,990 persons over 15 were listed as not in the labour force, 3,051 were students. Some might have been employed but in practice it is unlikely that many were in the labour force.

Other groups, which may overlap, can also be put in this category. For example, there were 403 persons doing subsistence in 1980, 24 prisoners, and 1,167 retired persons, aged 60 years and over. Of the 9,990 persons defined by the 1980 census as not in the labour force, about 3,000 remain to be explained. That is, although we can account for persons not in the labour force on the basis of being students, caring for their children, being retired or in prison there are still about 30 per cent of the "not in the labour force" population that does not seem justified as being categorized as not being in the labour force (although they may be unemployed). Some of these people may be the hard core unemployed, that is, they choose not to be in the labour force, even though they are not students, retired, mothers with children, or in prison. These are the people who could probably benefit from job training programmes. Almost all of the unemployed people were hidden in the "not in the Labour Force" category.

It is possible that enumerators did not understand the procedures for the labour force question and assigned persons who were either unemployed or actually doing subsistence to the not in the labour force category erroneously. It is also possible that some may have felt a relationship between responses to this question and possible non-inclusion in federally funded work programmes, or that if they responded that they only did subsistence, that this might "look bad" to other people who do not equate subsistence with "real work". Whatever the cause, it seems very likely that the 1980 counts for unemployed were much too low.

Plans for the next census

For our next census of population, scheduled for 1990, we need assistance in obtaining and learning new technology and in helping make sure that the data we obtain will be acceptable to Federal agencies for funding programmes and other uses. We can obtain the necessary training either through experts coming to our office, or by our going overseas. Conversely, we will work closely with the United States Bureau of the Census and other agencies to help them understand the relationships of the data to our cultural constraints.

Four representative from the United States Bureau of the Census visited American Samoa in January 1987, to meet with an Interagency Working Group, previously set-up at the request of the Bureau of the Census. We were presented with the possibility of a new system, called IMPS (Integrated Microcomputer Processing System) which uses ENTRYPOINT, CONCOR, and CENTS4 to enter, edit, and tabulate census data and also includes facilities for data analysis. We have been informed that this system will speed up the processing of the census and allow us to have results much sooner after the 1990 census than after the 1980 census. With this system we will be able to develop a questionnaire which is specific to our needs, and can be independent of that used in the United States of America, Puerto Rico, or the other Pacific island territories. For the first time we might be involved in data entry and other aspects of the census process, which we were not able to do during the 1980 census. We welcome these developments.

34. THAILAND

Historical background

The first national census was organized in 1909 and after reenumeration in some districts revised national returns were assembled and published for 1911. The next census, was in 1919 and covered the whole kingdom (with the exception of the metropolitan area of Bangkok, which was enumerated in 1920), and the combined returns were adjusted to give a figure for the earlier year. Subsequent censuses were held in 1929, 1937 and 1947. In the latter, mechanical tabulation procedures involving punchcards were used for the first time.

Since 1952 the National Statistical Office (NSO) has been in charge of conducting censuses under the authorization of 1952 Statistical Act (revised in 1965). The NSO carried out its first census in 1960. In that census, statistical data were tabulated at the various sub-national levels. The 1970 census was the first census in which electronic data processing equipment was used. It was also the first census that produced an evaluation report and adjusted the census population, as well as providing detailed analytical reports on several major subjects. The most recent census of population and housing was held in 1980.

Design of the 1980 census

As in the previous census, the 1980 census covered all persons residing in the country as of census date, 1 April. All Thai nationals were covered as were civilian citizens of foreign countries having their usual residence in Thailand, foreigners who had resided in Thailand for at least three months, persons having their usual residence in Thailand but who were at sea or temporarily abroad as of the census dates; and government officials, both military and civilian, including Thai diplomatic personnel and their families located abroad.

Persons who were not enumerated included nomadic groups, that is the hill tribes and fishing groups having no fixed place of residence; foreign military and diplomatic personnel and their families located in Thailand; and citizens of foreign countries temporarily visiting or travelling in Thailand for less than three months.

The basic unit of enumeration was the household. All households, and persons residing in each household as usual residence, were enumerated. All persons falling within the scope of the census were enumerated on a *de jure* basis, except students who were enumerated on a *de facto* basis. Both housing and population censuses were conducted simultaneously. In municipal areas long forms containing 12 basic population questions and 33 population and housing questions were used. In Bangkok metropolis and non-municipal area, all households were enumerated on a short form containing 12 basic questions except for a 20 per cent sample of households who were selected to ask the other 33 questions.

Maps were made for Bangkok metropolis municipal areas and large villages. There were two types of maps, enumeration district (ED) maps and master maps. Each ED map showed its boundaries, streets, lanes, canal and other land marks, location of houses and block boundaries within an ED. The EDs contained approximately 200 to 350 houses. Master maps showed the location of all enumeration districts in each municipal area or each district in the Bangkok metropolis.

Committee structures

The responsibility for conducting the census rests with the NSO. In addition to providing the government and the public with primary and secondary data, the NSO is in charge of improving the level of knowledge and enhancing the co-operation of the people in order to increase the usefulness of data collection. The NSO is a government agency with departmental status under the Office of the Prime Minister.

Implementation of the 1980 census was technically the responsibility of the NSO but since it is a most important project an Advisory Committee was established in 1978 by the Council of Ministers. The Advisory Committee comprised prominent experts in various fields as well as representatives from other government departments. Two sub-committees were also set-up,, a sub-committee on publicity programme and sub-committee on field work planning.

Training and fieldwork

Crew leaders and enumerators were selected from local school teachers and appointed by the Secretary General of the NSO. The criteria for selection of crew leaders and enumerators were: crew leaders had to be senior school teachers not over 40 years of age and thoroughly familiar with the locality they were assigned to work. Enumerators had to be between the age of 18 and 35 and familiar with the locality in which they were assigned to work. In some areas, however, the crew leaders and enumerators were also recruited from student graduates.

The provincial and district field directors were appointed from provincial governors or senior provincial and district officials. They were responsible for administering field operations in their provinces and districts respectively.

Each district also had one or two technical supervisors who were responsible for technical aspects of field supervision during the training phase, they also had to instruct crew leaders and enumerators on enumeration procedures.

Training of personnel was organized in three stages. Subject matter officers were first selected from programme technicians of the NSO, who had participated in the planning of the census. In the first stage, subject matters officers trained 65 master trainers (selected from technicians of the NSO), 12 regional statistical officers, 72 provincial statistical officers. In the second stage, master trainers trained 1,190 district technical supervisors. In the third stage, district technical supervisors went out in teams to each province to train crew leaders and enumerators. An average district technical supervisor to enumerators ratio of one to about 25 was maintained. The in-class training lasted one week for crew leaders and one week for enumerators. All crew leaders observed the training of enumerators both in class and field practice.

Enumeration was divided into three types according to administrative areas. In the Bangkok metropolis two phases of interviewing were taken. All persons and private households in each enumeration district were listed and enumerated using the short form containing 12 basic questions. Collective households were enumerated using a long form on detailed population characteristics but were not interviewed on housing questions. In phase II, after the first phase was completed for an enumeration district, a 20 per cent sample of private households was selected by the crew leader for further interviewing about both population and housing items. The listing forms were used as a frame for the selection of the sample households.

In other municipal areas all persons and households were listed and enumerated on a long form containing the detailed questions about population and housing. In non-municipal areas the enumeration was also in two phases. In the first, all persons and private households in each village or enumeration district were listed and enumerated by using a short form. After the listing was completed the crew leader selected a 20 per cent sample of private households to ask detailed information on both population and housing characteristics through the long form. At this stage, collective households were interviewed using the long form on detailed information on population items, but were not asked housing questions.

Evaluation

After the completion of the census field work a post enumeration survey (PES) was conducted to evaluate the completeness and the quality of the data as well as to evaluate the quality and efficiency of the census enumerators. The PES interviewers were regular field staff officers of the NSO. A sample survey was conducted in 5 per cent of the census enumeration districts.

Data processing

The 1980 population and housing census used automative processing equipment as much as possible. Machine editing was designed to check completeness and correct inconsistencies. There were 214 clerks, 83 clerks for verification, and 28 supervisors working on various stages of manual editing and coding, from checking questionnaires (enumeration forms) of each ED/village against the ED listing for its completeness, general editing and coding, editing and coding occupation and industry, to verifying editing and coding.

The identification codes of each household had to be acceptable and in accord with the control table look-up, which was prepared ahead of time from the ED listing. The unmatched records were deleted and listed out in an ED diary. A certain number of households were replaced by duplicated method where the information was poor or non-existent.

All codes of each field were checked and corrected. The hot deck method was used for correcting sex and age. The programme also consisted of consistency checks for editing both the individual, by verifying the information of one field against another within the same record, and at the household level, by checking the field of one record against another record of the same household. Long form edit was similar to short form edit except there was no replace or duplicate for the missing households in the structural edit.

An ED diary report for structural, range and consistency edits in each ED/village with a high error rate was assessed so as to determine whether which ED/village should be reedited and repunched.

Analysis and dissemination

Various analytical subject reports based on a 1 per cent sample of tabulations were produced. So far published reports are:

Economic characteristics, Subject Report No. 1

Migration, Subject Report No. 2

Fertility and Family Planning, Subject Report No. 3

Provincial Fertility Estimates for Thailand, 1965-1979: An Application of the Own Children Method, Subject Report No. 4.

Nuptiality, Subject No. 5

Household Structure and Factor Affecting Size of Household, Subject Report No. 6

Female Employment and Fertility, Subject Report No. 7

The 1980 census tabulations were prepared for each of the 72 provinces. The tabulations were also done for the four regions of Thailand and finally for the Whole Kingdom.

NSO distributed these volumes free of charge to government users and population research institutes in Thailand, to organizations in various countries and to international organizations concerned. Each volume consisted of 30 statistical tables for population data, and 16 statistical tables for housing data. Moreover, the tabulations were also made at the local level below the provincial level, all tables have been kept in the form of computer printout at NSO, and released only upon requests. Tapes of a 1 per cent sample of the 1980 census data have been copied for users with the approval of the NSO.

Publicity

For the publicity programme of the 1980 census, the NSO utilized various mass media, such as newspapers, radio and television, postal stamp and movie films. For the rural area, NSO launched a publicity campaign through local authorities and local social activities centres, for example, wats, schools, market places, local health centres and so on. For this purpose various kinds of publicity materials were used such as posters, brochures, calendars, wood boards and banners.

Costs

The budget for the 1980 census was 115 million bahts covering the years 1977 to 1982.

Plans for the next census

The next census will be held in 1990. We plan to expand the sample enumeration of detailed characteristics of the population and housing. However, in the next census, the NSO plans to reduce the size of the sample enumeration due to budget limitations and aims for the faster release of the census results. To help overcome problems of non-response, due to absence from home during the day, self-enumeration will be employed for some types of areas, such as the Bangkok metropolis and municipal areas. Much greater use will be made of microcomputers.

35. TOKELAU

Design of the 1986 census

Tokelau is a non-self-governing territory under New Zealand's administration and consists of three small atolls in the South Pacific with a total land area of approximately 12 square kilometres and a population of some 1,700 persons. The most recent census of Tokelau was held on 10 October 1986. It was taken under the authority of the Tokelau Census Regulations 1961. The Ministry of Foreign Affairs in New Zealand is responsible for administering the islands, with responsibility for the census being delegated to the Official Secretary for Tokelau Affairs, resident in Apia, Samoa.

Whilst the Department of Statistics in New Zealand has assisted with the processing of questionnaires at past censuses, the responsibility at the 1986 census was extended to cover both the development and design of the questionnaires, and the preparation of instruction manuals for field enumeration staff. The Tokelau census is a *de facto* census; all persons present in the Islands at census night were counted.

In December 1985 an invitation was sent to some 17 relevant organizations and individuals inviting them to indicate the topics they considered should be included in the 1986 census questionnaire. Whereas separate dwelling and personal questionnaires were used for the 1981 census, a composite Household Questionnaire was developed for the 1986 census. The form was designed to give results which would be comparable with previous results and at the same time conform to United Nations recommendations.

A pilot household questionnaire was developed in early 1986, and subsequently tested in Tokelau over a five-day period in April an officer of the Department of Statistics travelled to the Islands for that purpose. The opportunity to test the questionnaire proved to be invaluable given the resulting amendments arising from the test and discussions with the Tokelauan population.

The final version of the questionnaire contained 13 questions about the dwelling, plus 26 personal questions for each occupant. The major changes to the 1986 dwelling questions included the deletion of the question on lighting, and the inclusion of new questions on toilet facilities, livestock and persons absent. The previous question on cooking fuel was extended to provide information on all available means of cooking. Finally, the questions on number of occupants, address of dwelling and name of occupier of head of household were required to be completed by census officers rather than respondents.

The personal section included additional questions on education, employment (including work last week, membership of Tokelau Public Service (TPS), casual TPS work) and main unpaid activity. The question on migration outside of Tokelau was expanded to include dates of travel to and from Tokelau, while a new topic on usual residence was also included. Three questions on transport amenities, income and expenditure, were transferred to the dwelling section of the questionnaire.

Organization and fieldwork

During 1986 the Tokelau Director of Administration was appointed Census Controller. The School Principals on each island were appointed Census Supervisors for the purpose of organizing and controlling enumeration on their island. The remaining field staff, those who carried out the door-to-door interviews with the population, were also recruited from the Islands' senior public servants.

Because of the isolation of the Islands, and the fact that the 1986 questionnaire was more complex than in any previous census, extensive training sessions and field manuals were necessary. Three manuals were prepared Supervisor's manual and enumerator's handbooks parts 1 and 2. Instruction sessions for field staff were arranged to coincide with a Management Training Course being held in Apia for senior Tokelau public servants. Enumerators were subsequently trained by their supervisors. Several weeks before the census, the supervisors were required to divide each village into Census Districts, five each for Atafu and Nukunonu and seven for Fakaofo. Each district had to contain equal numbers of dwellings and the boundaries had to follow visible features such as village paths, the hospital, the TPS office or a line of trees.

Enumerators were required to make three visits to each dwelling in their district. The first visit, before census week, was to explain the census, to arrange for a suitable time for the census interviews and to fill in the record book. The second visit, during census week, was to interview the members of the household, while the final visit, after census week was to check that no person left or arrived at the dwelling between the interviews and midnight of census night. Follow-up visits and questionnaire checks were required to be completed by enumerators and all materials returned to the supervisors by 13 October 1986. Supervisors were required to make a number of quality checks on the work and progress of each enumerator. These included: a check on the progress of enumerators in their pre-census visits to each dwelling; ensure each enumerator carried out the procedures laid down in their handbook; ensure that a further visit was made to teach dwelling and check on the quality of work returned by the enumerator after receipt of the forms.

Publicity

To help promote awareness amongst the Tokelauan people, a number of posters were developed for use during the period of major census activity. They carried messages such as every five years Tokelau holds a census of its population and dwellings and help us to plan the things that really matter. Make sure you count for Tokelau.

Data processing

The completed questionnaires arrived in New Zealand on 3 November 1986. Prior to that clerical processing instructions had been developed along similar lines to those which were used for the New Zealand census. Initially questionnaires were balanced against the enumerators' record books. The village, district and dwelling numbers were checked for accuracy. The number of persons for whom data was received was checked against the corresponding record book entry. Finally, the name of the head of the household was confirmed as being that of person one in the household questionnaire.

The coding phase comprised the following fields: absentees, household type, relationship to head, family code, usual residence, place of birth, residence outside Tokelau, highest school qualification, highest qualification since leaving school and occupation. The final clerical procedure was the grooming operation. This phase ensured that the correct response to each questionnaire was clear to the data entry operators.

The data entry equipment used was a Nixdorf 8850/55 system with a 10 megabyte cpu, 128 k memory and 800 bpi tape drive. Due to the small number of records involved it was not considered economic to specify inter-field or inter-record edits on the Nixdorf equipment. However, range edits were placed on all fields to ensure that the data captured was at least valid for each field.

The resulting database was loaded onto the department's IBM 4361 mainframe computer, which operates in a CMS environment and the data file was created. The data was then downloaded to a Tandon PC.

Programmes to perform the editing, which had not been undertaken at the data capture phase, were prepared and tested in advance, using PC-SAS. The programmes were modified to read the format of the data file and subsequently run against the data. Errors were corrected until an error-free file was obtained.

The tabulations were photo-reduced and a report containing 73 statistical tables, plus diagrams, technical notes and definitions was subsequently produced. This final report was distributed to interested parties in late March 1987.

36. TONGA

Historical background

Tonga has a relatively long record of census taking. The first census was held in 1891, followed by censuses in 1900, 1911, 1921, 1931, 1933, 1935, 1936, 1938, 1956, 1966, 1976 and 1986. The 1956, 1966 and 1976 censuses were conducted under the provisions of the 1956 Census Act, but that Act was repealed in 1978. The latest census held in November 1986 was taken under the provisions of the 1978 Statistics Act, whereby Cabinet approval is required for the passing of Census Regulations. The 1986 Census Regulations were approved on 30 June 1986, only five months before the actual census day.

Design of the 1986 census

The 1986 Census Regulation officially appoints the Census Officer. It gives the power to the Census Officer to: (i) initiate a Census Advisory Committee that may contribute to the success of the census; (ii) divide the Kingdom into Census Districts (CDs) and Census Blocks (CBs); (iii) appoint supervisors and enumerators; (iv) prescribe the particulars to be stated on the census schedule; (v) organize a campaign to publicize and explain the aims, nature and benefits of the census; (vi) require all persons nominated as heads of households to ensure that persons within their households are enumerated; (vii) initiate a post-enumeration survey to follow the main enumeration; (viii) authorize and organize the processing of the information gained from the population census; (ix) commission the analysis and publication of the census results; and (x) organize a campaign to publicize the results.

With the help of a United Nations volunteer, funded by United Nations Population Fund (UNFPA), the mapping exercise was completed before the field operations began. Part of this exercise was facilitated by the use of census block maps updated using the 1984 Mini census. School teachers were used as supervisors and enumerators as in previous censuses. Several publicity programmes were used to enhance public awareness, using local newspaper, radio and posters.

The 1986 census adopted a *de facto* approach, a change from the *de jure* approach of the 1976 census. The change was necessitated because of problems in 1976 and the need to return to a system common in the Pacific region. For the first time an individual schedule was canvassed plus a form for each household. An individual form lends itself to being used for computer coding more easily than a form with up to ten individuals on it, and avoids the need to transfer the data to coding sheet, as is usually done with a Household form. Data entry can be made from the original schedule without transferring the data manually.

The design of the 1986 census was done with the need to: (i) make it comparable with previous census; (ii) fulfil the needs for demographic information; (iii) take account of the ability of the community to respond to the questions asked; and (iv) keep the questions limited to those absolutely necessary.

The number of questions asked in the 1986 census was less than asked in 1976. There were no questions on literacy, age at first marriage and subsidiary occupation. Three forms were used in the census field work namely, the prelisting booklet for the listing of all households within the CB; the household schedule for every household and the individual schedule for every individual enumerated.

Data processing

The South Pacific Commission assisted the Tongan Statistics Department in almost all stages of preparation work for the 1986 census of Tonga, including the procurement of two IBM PC-AT and seven Workstations for data processing. It was the first time that a national census of Tonga was processed locally using microcomputers.

The data entry of the PC2 forms and all the tables derived from PC2 information have been tabulated and are ready for analysis. Data entry of the PC3 forms only commenced late last month and to date 10 per cent of the forms have been entered. Coding of PC3 forms is being undertaken simultaneously with coding verification taken immediately thereafter. It is envisaged that by the end of 1987, the first tables derived from the PC3 forms will be available for analysis.

37. TUVALU

Historical background

The first census of the population in Tuvalu was carried out in 1979 and published in 1982. The information was used extensively by the government, in general policy matters and in the Second and Third Development Plan. It has been an objective of the Statistics Office in the Ministry of Finance to develop an ongoing capability in production of essential demographic statistics such as of population size and structure and employment. Tuvalu is a tiny set of nine coral islands with an estimated population in mid-1985 of just around 8,000 persons.

Design of the 1985 census

The last census of the population of Tuvalu was carried out in mid-1985. It was a mini-census which collected a limited range of data. Separate information for individuals was not collected, so only broad summaries can be produced. The census provides a valuable source of population data, particularly at the national level. The census was designed by the staff of the Statistics Office and was produced in both English and Tuvaluan. Largely because of design faults with the questionnaire and a lack of understanding by census collectors, problems were encountered with the accuracy of the collection and with detailed analysis of the results.

For example, it has been discovered that because the age breakdown used in the mini-census does not correlate with figures required by the Health Division they have not been able to adapt the data for measuring the success of their family planning programme. The questions on employment also created difficulties in interpretation and has had to be largely ignored when attempting to measure subsistence versus the cash economy. A further difficulty was in people's reluctance to reveal the amount earned through remittances. Figures available from the National Bank of Tuvalu did not agree with total figures collected for individual islands.

The collection, compilation, and dissemination of population data is entirely carried out by the Statistics Office using the prepared questionnaire as a base document. Information collected from the individual households are then published for the continuous use of the economy's development programme. The editing and publishing of the report is carried out entirely by the Statistics Office.

The installation of a microcomputer has improved the work of the Statistics Office but use of it is limited at the stage by a lack of experience and training. In recent years most statistical compilations and editing have been done manually.

38. VANUATU

Historical background

The first full population census in Vanuatu took place in 1967. The population count was 78,000. A census of Port Vila was conducted in 1965. The census was conducted on a *de facto* basis and covered not only the town and peri-urban areas but also those villages which contributed to the town's workforce. In addition to the usual basic demographic variables the topics covered were island of origin, ethnic group, time spent in Port Vila, years of schooling, principal language, religion, occupation and employer. A further urban census of population and housing was conducted in 1972 this time covering both Port Vila and Luganville. In determine the boundaries of each town for use in the 1972 census care was taken to ensure comparability with the 1967 census. Topics covered were similar to those in the 1965 Port Vila census but more detailed information was collected on economic activity, the nature of employment, hours worked and income.

Another census of population was carried out in 1979, just prior to Independence. That was the latest census covering the whole country. Most of the tabulations in the 1979 census report are on a *de facto* basis but some are on *de jure* population. In 1986 there were a further census but that covered urban areas only.

Design of the 1986 urban census

By 1985 it became clear that more up-to-date information on the growth of the population in the two urban areas was essential for planning purposes. After consultations with the National Planning and Statistics Office and the other major government departments approval was sought and given for an urban census to be conducted in January 1986, exactly seven years after the last national census.

To simplify comparisons between the 1979 and 1986 figures it was decided to restrict the enumeration in the urban census to the *de facto* population. A decision that had to be taken was the exact definition of boundaries of urban areas. Luganville was fairly straightforward and it was decided to continue to use the municipal area as the definition of the urban area, as in early censuses. Port Vila, however, was more of a problem. In the 1979 census, the urban area had been split into Port Vila Centre, which corresponded very closely to the municipal area, and Port Vila rural. In terms of the supply of labour, many of the persons living in Port Vila rural actually work in the centre of the town but in terms of most other characteristics the two areas are very different and Port Vila rural is much more closely akin to the other rural areas of the country. It was decided to limit the coverage of the urban census to the town centres.

Over 100 people worked on the urban census in a team comprising the over-all co-ordinator, team leaders, district co-ordinators, supervisors and enumerators. Some 70 people were employed for the enumeration of Port Vila and a further 30 for Luganville. Funding for the project amounted to about $US 40,000 and included the purchase of a microcomputer to process the data.

The greatest need for information was in the areas of employment, internal migration and fertility and these were the topics that the census concentrated on. The questionnaire consisted of two parts. Part 1 was a household schedule on which was listed the names and characteristics of each member of the household present at the time of the census as well as any visitors living with the household at that time. Information collected on this form included the basic demographic characteristics of the population information on internal migration and level of education achieved. The form was designed in such a way that information on the latter two topics was not requested of persons usually resident outside Vanuatu (in many cases tourists).

Part 2 was used to record information on each person aged 10 years and over who was usually resident in Vanuatu at the time of the census. This information covered marital status, usual and current activities and, in the case of women aged 15 years and over, information on fertility.

Any interviewing involving the indigenous population is invariably conducted in Bislama and the only real question was which language or languages the forms themselves should be prepared in. It was decided to use Bislama, a kind of pidgin English, for the questionnaires. At the same time, detailed question sheets for use by the enumerators were also prepared in all three languages to accommodate the significant expatriate population living in the urban areas.

Many of the answers in Part 1, the household schedule, were entered as codes by the enumerators. In most cases the possible codes were clearly shown on each form (country and area codes being the main exception – these were listed in the enumerator's manual). By recording the information in this way much valuable time was saved at the coding stage.

Handbooks were prepared in Bislama for both the supervisors and the enumerators. These contained details on the organization of the census, how to approach households, definitions, coding lists and detailed instructions on how to complete the forms.

Census organization

The census was organized, conducted and processed entirely by the staff of the Statistics Office with some short-term technical assistance provided by ESCAP. Much valuable experience had been gained by the Office from the Agricultural Census Programme 1983. Many of the staff already had first-hand experience of data collection. Further, on the processing side, Vanuatu's assistance with the development of a user-friendly survey analysis package U-SP, again as part of the work on the agricultural census, meant that an ideal system for processing the information from the urban census already existed.

Preliminary fieldwork

The preliminary fieldwork would consisted of a listing exercise, a pretest survey and a pilot survey. Detailed maps showing individual dwellings existed for the areas concerned and the enumeration area (EA) boundaries were well marked on maps used during the 1979 census. Houses in Vanuatu are not numbered and although a house numbering exercise often precedes a census there was not sufficient time available to undertake this. Control over the coverage of the enumeration was therefore based on an initial enumeration, stickers were attached to each dwelling enumerated.to indicate its inclusion in the census.

The listing of households was carried out in November 1985 and was designed to list every household in the urban areas. For each EA three items of information were recorded, the geographic location of each household, the name of the head of household and the number of usual residents.

Following the listing exercise a pretest of the questionnaire was undertaken by the same team of enumerators. This was also carried out in November 1985 in Port Vila. The main objective of the pretest was to try out the questions and to assess their suitability for a full-scale enumeration. A sample of convenience was used for the pretest. Ten enumerators were used and each was asked to enumerate a total of five households composed of two expatriate and three ni-Vanuatu households. Thus, a sample of 50 household was used. Data gathering was completed within a week.

The pretest proved to be very useful. Questions relating to usual place of residence at Independence and at the last census, were found straightforward to answer. However, information on place of usual residence at the time of the last census was generally considered to be more meaningful than at the time of Independence since many ni-Vanuatu would have come to the urban areas at the time of Independence to take part in the celebrations and this temporary residence could well have been confused with the more difficult concept of usual residence.

Training and fieldwork

The Acting Principal Statistician was in charge of the over-all census operation. Two senior members of the Office were put in charge of the enumeration. Below were six district co-ordinators who in turn had two supervisors each working directly to them. Each supervisor had eight enumerators working as four teams of two. The district co-ordinator level was added at a late stage for operational reasons since it proved impractical for the supervisors to work directly to the officers in charge of the enumeration.

It was important that the field force should include both English and French speaking ni-Vanuatu. The census was timed for the long school holidays in order that the senior students and teachers could be available to take part. Enumerators were also recruited directly through radio announcements. When selecting enumerators the main criteria taken into account were their level of education, age, ability to speak English and French.

Supervisors were also provisionally identified at this initial stage of recruitment. However the final selection of both the enumerators and the supervisors did not take place until after the training course when abilities to carry out their tasks had been fully assessed.

Training sessions lasted for two days and were conducted in Bislama. Training took place during the week prior to the enumeration. The training consisted of a series of lectures and practicals. It explained the objectives of the urban census, what a census is, how it was going to be conducted, the organization of the field staff, familiarization of the questionnaires and training manuals, how to interview and how to overcome difficulties.

One of the biggest problems in training a large number of people in more than one location was finding enough suitable personnel to assist with this task and also to ensure that the training was conducted on a consistent basis. Training manuals were prepared and individuals were made responsible for the training on particular topics. The training courses were staggered so that key staff could travel from Port Vila to Luganville and so help with the training in both locations.

One advantages of conducting an urban census is that the field work is confined to a very small geographical areas with relatively good access and communications. Apart from one or two of the fringe areas no transport was required for the enumerators. District co-ordinators and some supervisors had access to transport which greatly facilitated their work.

The hierarchy of the organization involved enumerators, supervisors, district co-ordinators, team leaders and the over-all co-ordinator of the Urban census. All controls were exercised and data checked within this framework.

The boundaries of each area were carefully explained with the use of maps and by their physical identification. It was then the responsibility of the enumerators to visit every private household in their allotted areas. The number of areas each supervisor controlled depended on the number of private households in each EA and their ease of access. Some supervisors were responsible for only four EAs while others had up to seven EAs. A district co-ordinator was in charge of two supervisors. There were two team leaders, one responsible for the Luganville field force and the other for Port Vila.

Field work began on 20 January 1986. The moving census night approach was used and persons to be enumerated were defined as those resident in the house on the night previous to the day of enumeration. The enumeration lasted for approximately one week although the bulk of the interviews were done in the first four days.

The supervisor operated from a base where he could be found at a set time each day. The base and time was made known to all the enumerators working under him so that if problems arose the supervisor could be contacted immediately for advice. These control sheets were used initially by the supervisors for checking with the listings to identify households that might have been missed.

Data processing

The data were processed using the U-SP survey package. The power and flexibility of this package made it ideal. The data were entered and processed on the Micro Apl Spectrum multi-user microcomputer which was already in Vanuatu for the agricultural census. On completion of the initial processing the database was transferred to an Apricot PC for the second stage of the analysis.

The coding and editing of the questionnaires prior to entry onto the computer was done in three stages by a team of coders selected from amongst the best enumerators. The forms reached the Office in envelopes marked with the enumeration area number and the name of the enumerator on the outside. The first stage therefore was to match the household forms with the control sheet and to check that a form 2 existed for each person aged 10 years and over usually resident in Vanuatu. Further manual checks were then made on specific items.

In order to minimize the data entry it was decided to identify those persons who were unmarried and in full-time education and enter this information as an extra code on form 1 and hence obviate the need to enter any information on form 2 for these persons. At the same time the information on form 2 was crossed out to ensure the forms were not entered.

The second stage of the coding involved ensuring that the enumeration area numbers were correctly coded for data entry. The person number in column 1 was then converted into a two digit number as necessary and the form number copied in front of each person number to make a unique personal reference code. This number formed the "key" for data entry purposes. The rest of this stage of the coding involved checking the precoded answers for validity and coding the sex and country names entered on the forms. Ages were checked with dates of birth and corrected as necessary.

The third and final stage consisted of separating the form 2s from the form 1s, checking carefully once again that the correct numbers of forms existed and that the coding had been properly completed. The forms were then batched ready for data entry with the number of persons and households entered at the front of each batch.

The information was entered to computer from the forms by three data entry clerks. The clearks worked on a shift basis with up to two persons entering data at any one time over a ten-hour day. The data were entered in batches and after any error records had been corrected and the batch checked for duplicates and missing records the data were printed out prior to adding to the data base. The printouts were later checked at the desk and corrected as appropriate.

Although not as reliable a data entry procedure as double entry, an option available within the software package, the time involved in using double entry is of the order of two or three times that needed for single entry. The printout procedure was a good compromise and in fact the error rate was very small both on keying and on records that failed either the validity checks or the logical checks.

After the data had been entered and corrected, a number of checks were performed on the database to identify inconsistencies and illegal values. Once the database had been cleaned a number of substitution were made to facilitate the tabulation procedures. As an example, Vanuatu citizenship, which had previously been coded as 1, was split into two codes based on the answer to whether or not the individual had applied for this citizenship or not. Code 1 then became Vanuatu citizens who were natural citizens and a new code 2 became Vanuatu citizens who had had to apply for this citizenship.

The table specifications for the first report had been carefully drawn up in advance. Once the data were clean it was therefore a relatively straighforward task to produce these tables. Filters were carefully set up in such a way that by combining them the necessary subsets of the population could be easily identified. Grouped variates were also set up in a structured fashion so that the appropriate groupings would be produced in the tables. Many of the tables produced were five-way classifications. Most of the editing of the tables was done manually after the tables had been typed. Similarly when tables were too large for the paper, manual intervention at the output stage often overcame this problem.

The data entry and machine editing took approximately two months and the production of the tables for the main census report in final form a further month. The production of the main report was of prime importance as far as the dissemination of the information was concerned. An advantages of processing the census data on micro PCs within the Statistics Office was that the Statistics Office had at its disposal a clean set of data for the urban population which could be used to satisfy a range of *ad hoc* data requests.

Publicity

Considerable thought was given to the publicity campaign. Given the close proximity of the census to the festive season the publicity was split into two stages. The first stage, which took place in October and November, concentrated on the educational establishments and consisted of a schools poster competition and the distribution of publicity materials to the schools. The second stage commenced straight after the New Year and was designed as an intensive campaign using all the media available.

A poster was designed, printed and prominently displayed in all shops and public places. To encourage people to think about their ages before the enumeration the poster used age as a theme in its approach. The poster depicted a typical census interview and the enumerator is shown asking the respondent, and how old are you? A jingle was recorded for the local radio station to put out two or three times a day and again the question of age was emphasized.

Costs

The budget actually spent on the urban census was 2.9 million vatu. Salaries and wages accounted for almost two thirds of the costs of this project.

Plans for the next census

The Government of Vanuatu has given approval for the conduct of a full national population census in 1989. A fundamental theme which underlies the 1989 census and which will influence both its conduct and its objectives, is that it will be the first national census of Vanuatu.

In line with the theme of the first national census it is intended to develop a groundswell of enthusiasms for the census and to involve the population as fully as possible as well as ensuring the co-operation of all government agencies. These will be a high level Census Steering Committee. A National Census Office, under a Census Administrator, will be established.

39. VIET NAM

Historical background

Two population censuses were held in the north of Viet Nam. One was in March 1960 and the second was in April 1974. After the liberation of the south of Viet Nam a census was conducted on 5 February 1976, serving for the General Election in the whole country. The most recent census of population, covering the whole country, was held in 1979. In that census we received a significant amount of support from the United Nations.

Design of the 1979 census

In the 1979 census we used the permanent residents concept as the object of the census. This concept is relevant to the situation in Viet Nam and the requirements of state management, economic management, especially the requirement of vital registration and population statistics. We collected information on the number of households, number of persons (Vietnamese people and foreigners living in Viet Nam, persons who are working and learning abroad included), sex, ethnic group, date of birth, educational level, present occupation, trained occupation, working status (employment or unemployment), name of his/her office, old place where he/she lived, reason of moving to new place. Information was also collected on births and deaths so as to obtain estimates of fertility and mortality levels.

The method of census-taking was by means of direct interview. Enumerators went to each household, asked questions each person and noted down the reply on the census form and compared that information with data in the household statistical book and vital registration book. By this method the enumerator could have direct talks and get more detailed replies than mere scrutiny of other records. The latter provided a basis for checking.

Each enumerator took charge of 80 to 100 households (about 400 to 500 persons) and three enumerators made a group. After one day of the census, census groups met to look to the work of that day and to check census forms to find errors. A reenumeration, conducted in 20 per cent of census area, was held three days after finishing the census. Standard sampling methods were employed. By reenumeration we were able to evaluate the reliability of data collected in the main enumeration.

After the Government's decision to hold the 1979 census, several census committees and offices were set up from the capital down to communes. Urgent preparations and plans for the census were made. Draft instruction, documents, the census organizing personnel (enumerators and supervisors), the appointment of census group heads, staff training, budget anticipation and purchase of necessary equipments, printing documents, census forms were considered.

Issues

A population census is not a separate task of the Government Statistical Office only, but an important task of the Government, which should be strongly supported by all ministries and levels so as to obtain good results.

The General Statistical Office (GSO) plays an important role in preparations for the census; writing documents, designing scientific suitable projections, census forms and cards, printing documents, purchasing equipments, building up a hard-core force and anticipating budget, cartography and making relevant forms for computer data processing. These preparatory activities require a long lead time before the census.

Organizing and using a good communication system from the centre down to local levels to control the day-to-day work as the census evolves, to have timely decisions and making good preparations for data processing are essential ingredients of a successful census.

ANNEX 1

List of documents tabled at the Working Groups on the 1990 World Population and Housing Census Programme held at Bangkok, November 1986 and Rarotonga, June 1987

Title	Reference
Bangkok	
Provisional agenda	STAT/WPHCP/L.1
Annotated provisional agenda	STAT/WPHCP/L.2
Population census evaluation in the 1980 round: National practices and issues	STAT/WPHCP/1
A survey of recent population and housing census experience in the ESCAP region	STAT/WPHCP/2
Adjusting census counts for under-enumeration: the experience with the 1981 Australian post-enumeration survey	STAT/WPHCP/3
Technical review of recommendations on the economic topics and tabulations for the 1980 population and housing census programme and suggestions for the 1990 census decade	STAT/WPHCP/4
Progress in the revision of the International Standard Industrial Classification of all Economic Activities (ISIC)	STAT/WPHCP/5
Technical co-operation needs for the 1980 population and housing censuses	STAT/WPHCP/6
Review of recommendations on topics and tabulations for the 1980 population and housing census programme: demographic topics	STAT/WPHCP/7
Intercensal demographic surveys with special reference to dual-record survey system	STAT/WPHCP/8
Review of recommendations on topics and tabulations for the 1980 population and housing census programme: housing and others topics	STAT/WPHCP/9
The 1990 round of population censuses and the revision of the International Standard Classification of Occupations	STAT/WPHCP/10
Population and housing census data processing	STAT/WPHCP/11
Intercensal household surveys – The Hong Kong experience	STAT/WPHCP/12
Intercensal demographic surveys – The Malaysian experience	STAT/WPHCP/13
Sampling methods used in the data processing and tabulation of China's 1982 population census	STAT/WPHCP/CRP.1
Rarotonga	
Provisional agenda	STAT/PWG/WPHCP/L.1
Annotated provisional agenda	STAT/PWG/WPHCP/L.2
Recent developments and recommendations concerning economic topics in the 1990 population and housing censuses	STAT/PWG/WPHCP/1
Migration issues and the 1990 Round of Censuses in the Pacific	STAT/PWG/WPHCP/2
Recent population and housing census experience in the ESCAP region	STAT/PWG/WPHCP/3
Experiences in collecting demographic topics in population censuses	STAT/PWG/WPHCP/4
Report writing and dissemination of census data	STAT/PWG/WPHCP/5
Issues in census and survey data processing	STAT/PWG/WPHCP/6
Getting more out of censuses taken in the Pacific islands	STAT/PWG/WPHCP/7
Economic activity, work and paid employment their treatment and outcome in recent Pacific island censuses	STAT/PWG/WPHCP/8
Census information processing small Pacific island countries using microcomputers	STAT/PWG/WPHCP/9
Monitoring the social and economic transition in the Pacific island countries through census	STAT/PWG/WPHCP/10

ANNEX 2

Results of the survey of recent population and housing census experiences in the ESCAP region (Statistics Division, ESCAP)

General

Countries and areas in the ESCAP region were asked to give details of population censuses held or planned during 1975-1994 and to indicate whether or not they included housing censuses.

Table 1. Population censuses held or planned, 1975-1994

Region	Reporting countries or areas	Held 1975-1984	Held 1985-1986	Planned 1986-1994	Estimate 1985-1994
Asia	19	23	6	19	25
Pacific	14	21	9	13	22
Total	33	44	15	32	47

All reporting countries and areas had held at least one census during the period 1975-1986. As table 1 shows both in Asia and the Pacific increased activity was expected during the decade 1985-1994 although for most countries the future likelihood of a census was not definite. A few countries intimated that finance was a key consideration. Of the 59 censuses held between 1975 and 1986, 45 included a housing census.

Of the 33 countries or areas responding to the survey, only four mentioned that their last census did not cover the entire population. One of them was in the Pacific, restricting its census to urban areas. Among the three Asian countries, one restricted its census to the capital city, the other excluded some tribal areas, while the third carried out a by-census based on a one-in-seven sample of the population. Two Pacific countries reported that they had conducted mini-censuses covering entire population but using shorter questionnaires. Use of sampling for administering long schedules or questions of special interest became quite popular in the 1980s in Asia where seven countries reported such practice, as opposed to only two in the Pacific. Except for one, all of the countries utilizing sampling approach for long schedule, or part of the questionnaire, conducted their censuses on decennial basis.

Census cartography

It is well recognized in the region that high coverage depends to a large extent on the quality and use of census maps. The vast majority of countries (all 14 in the Pacific and 14 of 19 in Asia) used maps for their last census. In all but three cases in Asia and two in the Pacific, those maps covered the entire country. In five Asian countries where census maps as such were not used, listing operations of various nature were carried out according to local administrative arrangements.

Table 2 presents some information on source of base maps and their use. One problem highlighted in this table is that in most cases the mapping capability existed elsewhere than in the statistical office. Of the 28 reported cases in which maps were used only ten were maintained exclusively in the statistical office. In view of this position the relatively high rate of access to maps used in previous censuses suggested relatively good co-operation between statistics and other departments. Clearly the need for reliable mapping and cartographic services was of great concern to statistical offices. A large number of countries reported specific problems. In the Pacific, the most frequently mentioned problem was the unavailability of up-to-date maps; this is also evident in table 2 which shows that in the majority of cases the maps used from previous censuses were not regularly updated. In the absence of adequately updated maps, the identification of boundaries between villages and towns, and even between census blocks, posed major difficulties. Attempts to update maps in the field

Table 2. Source of maps and frequency of use in the last census*

	Source of maps			Used from previous census		Regularly updated	
	Statistical offices	Others	Both	Yes	No	Yes	No
Asia	4	7	3	11	3	8	3
Pacific	6	8	–	11	3	5	6
Total	10	15	3	22	6	13	9

* Countries/areas.

or through supplementary material itself was found to be difficult, lengthy and expensive. One country reported that the updating of maps was accomplished with the help of aerial photographs, comments from local government authorities and the use of larger scale maps prepared by the national mapping authority.

Several countries in the Pacific made comments on problems encountered in the listing of houses and households. Most of the reported problems were encountered in urban areas. For example, "It is sometimes a problem ... to identify which buildings are being used as dwellings, particularly in areas that are predominantly industrial or commercial rather than residential." Other problems which hampered proper listing of houses and households included difficulties with understanding sketch maps, vacant houses, same household occupying more than one dwelling, and changes in the name of head of household.

Data preparation and entry

Even from this brief review of country experiences it is clear that many of the issues relating to computer applications to census are far from resolved. The balances between cost, speed and accuracy and the need to develop and institutionalize effective statistical computing environments has meant that despite the exciting possibilities offered by new technologies, perhaps the 1975-1984 decade ended in a somewhat disappointing way.

All reporting countries in Asia and the majority in the Pacific used computer processing for their last census. Nevertheless a number of processing tasks continued to be performed manually throughout the region.

Table 3. Number of countries and areas reporting manual tasks performed (or intended) for the last census

	Asia	Pacific	Total
Preliminary population count	11	12	23
Data editing – all records	8	10	18
– a sample	2	1	3
Tabulations based on – all records	4	5	9
– a sample	1	1	2
No manual processing	1	1	2
Not stated	1	3	4

The majority of countries produced a preliminary count of population based on manual records. Somewhat surprisingly, despite the recent development of versatile computer editing software packages, the majority of countries continued the practice of manual inspection or editing of all records.

To fully appreciate the extent of developments in computer processing in census work would require far more detailed analysis than was possible from this survey. Table 4 none the less shows that most census or statistical offices have their own computers and in the majority of cases these were used for the census. In the Pacific eight out of 14 responding countries or areas reported ownership of computers in census/statistics office, and, except for one country, those facilities were utilized for processing the latest census. Of the six Pacific countries/areas which did not own computer facilities in census/statistics office, four reported that their census processing was done overseas, one utilized the facilities of the government data processing agency, and in one case manual processing was used. In Asia, only four out of 19 countries/areas reported that their census/statistics offices did not own computer facilities for processing last censuses. However, in three of these cases a national information centre or data processing agency was responsible for census data processing. Table 4 also shows that compared to previous censuses the use of own computer facilities by census or statistics offices substantially increased for the recent censuses. For example, seven Pacific countries reported the use of census/statistics computer facilities for the most recent censuses as compared to only four for previous censuses.

Table 4. Computer ownership and use for censuses*

Use of computer for census	Statistics/census offices have own computer facilities					
	Asia		Pacific		Total	
	Yes	No	Yes	No	Yes	No
Latest census						
1. Used own facilities	15	–	7	–	22	–
2. Used other facilities						
(a) within country	3	4	1	1	4	5
(b) outside country	–	–	–	4	–	4
3. Entirely manual processing	–	–	–	1	–	1
Previous census(es)						
1. Used own facilities	10	1	4	–	14	1
Total number of responding areas/ countries	15	4	8	6	23	10

* Countries/areas.

Many of the comments received related to problems in data processing. In almost all cases data were captured directly from the census schedule. As table 5 shows, five

Table 5. Data preparation and entry media*

	From questionnaire	From codesheet	By keypunch	By OMR	Not stated
Asia	17	1	13	4	–
Pacific	11	3	9	1	4
Total	28	4	22	5	4

* Countries/areas.

countries reported the use of Optical Mark Readers (OMR) to capture census data. It is of interest that several countries using conventional keypunch input indicated that for the next national census they were contemplating the introduction of OMR. The comments of the countries reporting use of OMR are worth quoting since they reflect the mixed experience of using this medium in the ESCAP region. Two countries gave generally favourable comment. According to one:

> "For the first time OMR was used for data entry work on the main census. The sample survey data were entered through manual data entry to diskettes. The operation was relatively smooth. There was, however, some delay in procuring and installing OMR equipment."

A similarly favourable comment was made by a country with even greater experience with OMR who reported:

> "The questionnaires are ready by the optical mark reader. There is almost no problem right now, but small adjustments of the machines have to be done every day so that raw data in the questionnaires are not misinterpreted. The humidity, dust and other environmental factors affect the accuracy. For the next census (1990), the system will have to be revised because the current system was developed according to our special needs. We are beginning to consider what system may be the best . . . ."

Comments from other countries were less favourable. One comments that rejected census forms:

> "had to be manually copied before resubmission."

That country also pointed out that OMR was not readily available. More serious criticisms were levelled by another country with extensive experience with OMR.

The OMR equipment was very old and more than acceptable down time was experienced. The OMR's frequently fed multiple documents through resulting in records being missing from the files. This placed extra burden on the edit and amendment resources. Staff completing the OMR documents found the work extremely repetitive and the quality of their work deteriorated. This resulted in an increase in the number of fields and documents not being read. There have been a number of compensation claims from OMR markers for Repetitive Strain Injuries.

Several countries highlighted the demands on time and resources made by conventional key-punch data entry. For example one country reported that:

> " . . . (the contracted firm) had only a few data entry machines than and they were also doing work for other customers apart from our work."

Another remarked that:

> "a large manual effort was required"

and noted that:

> "the elapse time was also long."

Data editing

The issue of resources was also raised in relation to census editing. As can be seen from tables 6 and 7, considerable variation existed in the edit strategies and systems adopted by countries, a reflection on the developments occurring in this area.

Table 6. Edit systems used*

System	Asia	Pacific	Total
UNEDIT	–	1	1
CONCOR	3	–	3
Other generalized software package	1	5	6
Ad hoc edit system	13	7	20
Number of responses	16	10	26

* Countries/areas.

Despite developments of standardized editing software packages, it was notable that the majority of countries depended upon an *ad hoc* editing system (see Table 6). There was some indication that specialized packages were being adopted using microcomputers; five Pacific and one Asian countries reported the use of such packages. Apart from UNEDIT, the generalized software packages used for census editing in the Pacific included U-SP and SAS. Table 7 shows that division of opinion was also reflected in the desirable extent of manual intervention in census editing. While 20 per cent of the responding countries claimed that they relied on automatic correction or imputation to edit records; more than twice the same proportion utilized an error listing for manual insertion of corrections. On the other hand, a significant proportion (about 40 per cent) of countries reported that they utilized a combination of both error listing and imputation. On-line editing was reported by five of the 25 countries/areas responding the question on the method of error correction. Exclusive reliance on automatic correction or imputation was less in the Pacific than in Asia. The proportion utilizing a combination of automatic correction and error listing was much higher in the Pacific than in Asia.

Table 7. Method of error correction*

Method	Asia	Pacific	Total
Automatic	4	5	1
Error listing	7	4	11
Combination (error listing + automatic)	5	4	9
On line	2	3	5
Number of responding countries/areas	16	9	25

* Countries/areas.

The development and testing of edit programmes was both lengthy and costly; as one country put it:

> "editing programmes took a long time to complete",

and another,

> "a lot of human resources are necessary for the examination and correction of errors."

As a result of this heavy demand on both time and labour it was not unnatural that attention was focused on efficiency.

> "Edit programmes could have been more efficient",

reflected one country since repeated runs of the entire tapes were necessary for each round of correction. In practices efficiency would be improved through better relations between subject-matter and data processing staff as well as in system development. An example of what was needed was given by one country:

> "Questionnaire and classification need to be fixed at an early stage to allow sufficient time for system development. Any subsequent change would result in major revision of the data processing system.",

and was more generally reflected in the comment of another country that closer co-ordination between the data processing and subject-matter staff was necessary.

The edit strategy was also influenced by the availability of human resources. As one Pacific country reported

> "Although the software has facilities for double data entry as a mean of editing, manual editing was resorted to due to available time". On the other hand another Pacific country thought "Manual editing is time consuming".

The relation between data entry and editing was illustrated by a country experiencing problems with OMR.

> "The editing and amendment system overall was quite good. It proved fustrating to staff amending data to have to correct errors resulting from the antiquated OMR equipment. It was also found that problems arose in cases which were an exception to the rule i.e. OMR markers fell into a routine in certain fields where the majority of the population gave the same response. Most of these cases could not be detected by the editing system."

Tabulations

As with editing, the software used for tabulations was closely related to each computer brand and configuration as well as individual country needs. Table 8 indicates the extent of use of various softwares for tabulation purposes. While in Asia an overwhelming majority of the countries relied on their own tabulation software, only half of the Pacific countries exclusively depended on such *ad hoc* systems. About one-fourth of the 26 responding countries reported the use of *ad hoc* systems in combination with generalized software packages. Apart from COCENTS and XTALLY, SAS, U-SP and TPL were also utilized in the region for census tabulations; the use of CENTS4 and CENTSIII was also reported in two Asian countries.

Table 8. Tabulation systems used*

System	Asia	Pacific	Total
XTALLY	1	1	2
COCENTS	3	1	4
Other generalized software package	5	6	11
Ad hoc system	13	5	18
Number of responses	16	10	26

* Countries/areas.

Comments from Asian countries hinted at the difficulties in planning tabulation programmes and in adapting plans to meet user needs. A comment typical of this uncertain position claimed that:

> "the tabulation . . . cannot satisfy the needs of users. Therefore, we are making a 1 per cent detailed sample tabulation which was not in the plan.",

and from another respondent:

> "tabulation had to be modified . . . This was time consuming."

An opposite view:

> "Too many tabulations made"!

In the Pacific, the difficulties in the practical use of generalized software packages were reflected in the comments. One country mentioned problems with tabulations as

> "lack of training on proper use of the . . packages."

Another made the comment

> "Installation of COCENTS took some time. It was not very "user-friendly" until embedded in an in-house programme"

Several countries referred to the limitations to table size imposed by the tabulation system. One such country, for example, claimed to be:

> "unable to print in-house tabulations which have more than 132 character positions."

Another observed that:

> "CENTS4 has its limitations especially in the size of tables."

As a contrast to the Asian experience, where 12 or the 19 countries/areas produced sample tabulations, use of sampling for tabulation purposes was virtually not pursued in the Pacific.

Dissemination of data

From the previous section it is obvious that the production of tabulations continued to play an important role in dissemination strategies adopted by countries. This was evident from the extensive lists of reports and publications produced by countries, which for the most part, depended upon conventional computer tabulations.

But the survey demonstrated a more conscious need to tailor statistical output to meet the specific and growing needs of users. Statistical releases were seen as one approach to meeting these needs that was able to balance speed, comprehension and depth. As one country put it:

> "In the release of results, census authorities faced the dilemma of having to choose between promptness on the one hand and comprehensiveness and depth in analysis on the other. In order to achieve timeliness in making available the results without unduly sacrificing comprehensiveness, periodic census releases on special topics were made available as and when results were ready. The census releases contained the more important statistical tables of each of the topics, accompanied, by some basic analysis together with explanations of the relevant concepts."

Indeed many countries grappled with the idea of how many official reports were needed and how comprehensive should they be. The concern was reflected in an observation that:

> "timeliness and extent of data published concerned some users". More specific problems linked to the publications programme were also mentioned. Among these, one country spoke of problems relating to confidentiality of small areas and the production of time series, especially where classifications were revised; another country referred to the difficulty in estimating demand for reports, particularly at the provincial or sub-national level"

A number of very significant developments had occurred which have already influenced the attitudes of national statistical offices to data dissemination. First was the expansion of alternative media for providing data to users. Second was the integration of data processing and printing which permitted, for example, photo-offset printing directly from computer printout. Much of the discussion about tabulations should be interpreted in the wider context of these developments.

In response to the survey question, most countries replied that they had or intended to release census tapes to users.

Most of the tapes released contained only a sample of records. However, in the majority of cases the data related to individuals enumerated in the census. This practice raised questions of confidentiality and quite a few countries commented on conditions laid down for the use of tapes.

Table 9. Release of census tapes to users*

	Asia	Pacific	Total
Released tapes	8	5	13
Did not release tapes	9	3	12
Not stated/not applicable	2	6	8
Total	19	14	33

* Countries/areas.

A few countries indicated that they laid no conditions on users; in such instances it would be useful to know whether safeguards existed in the formatting of the data tapes.

Table 10. Format of released tapes*

Format	Asia	Pacific	Total
(i) All records	1	4	5
Sample only	7	1	8
(ii) Individual records	7	4	11
Summary records	1	1	2

* Countries/areas.

In the instances where summary data alone were released, control over use was less important. One country stated it intended to release summary tapes but unit record data would not be released. But other countries needed circumspection in framing policy. Some countries had elaborated rigid procedures. One reported that:

> "The request to use the census data must be forwarded to .... together with a proposal of the study to be made and the tabulations needed. Usually the data processing are done in the (national statistical office) installation. In cases wherein the census tapes are released to users, the condition is that it be used exclusively for the proposal made."

Other countries seemed less stringent in controlling the precise use of information disseminated through magnetic tapes. One reported that files were:

> "for use by users for statistical purpose only. An undertaking to this effect had to be signed.",

another commented only that the identification of individual records would be erased before releasing to users.

No country in Asia and only one in the Pacific reported on-line access to computer files by users. It is

probably worth revealing the conditions laid down in this circumstance.

> "Access allowed to non-programming staff only via the COCENTS packages.
>
> 1. They had to attend a COCENTS course.
>
> 2. They were not allowed access to data below Census Division Level."

The printing of statistical publications was becoming inextricably linked to processing. However, while most statistical offices in Asia used their own printing facility the majority of the countries in the Pacific continue to make use of outside printers (see table 11).

Table 11. Use of printing facilities*

Facility used	Asia	Pacific	Total
Own printer	8	3	11
Outside printer	7	6	14
Both	2	1	3
Not stated	2	4	6
Total	19	14	33

* Countries/areas.

The use of outside printers was often associated with poor service and more particularly, delay in publication, for example:

> "Had to use government printing facilities which were rather slow. Used photographic reproduction of computer-printouts. Quality of publications not always good because of poor quality printouts."

And again:

> "Because we have no our own printing facilities, the schedule for release the census publications was delayed by a half year and the quality of the publications are not as good as expected."

In contrast, countries with their own computer facilities were generally satisfied and stressed the speed of processing:

> "The main report was published through film setter. Tabulations were reproduced directly from computer sheets through photo-offset method. This helped in speedy printing. There was no error in composition."

Most telling, even, as pointed out by another respondent, where own printing equipment used was elementary, it was possible to print the publications without much delay.

Evaluation

One surprising response to the survey was the widespread claim in the ESCAP region to have undertaken a post enumeration survey (PES) – a fact which is publicized very little by the countries. Seventeen out of 19 countries in Asia and eight out of 13 in the Pacific reported that they had conducted a PES.

Analysis

More than half of the responding countries in the ESCAP region had drawn up a comprehensive and coordinated programme of analytical studies. It is worth noting, however, that almost all countries highlighted the lack of skilled staff capable of undertaking research and in-depth analysis. Competing priorities, delays in the processing of the data, reliability of responses on certain items and unavailability of appropriate computer software were also mentioned as factors impeding the work on further analysis in census and statistical offices.

Future direction

As experience is exchanged, one way of looking at the direction of development is to anticipate which of the practices now being used or discussed will become widespread or more popular. This survey has illustrated that some features, the arrival of which indeed may seem inevitable, may not yet be ready for universal adoption. OMR is a good case in point. Two countries indicated that this was one of the changes they expect for the next census. Yet the experiences of countries in adapting OMR to census use has been, at best, very mixed. Other ideas are also entangled in this web of desirability and practicality. A great deal has been made of the delays in processing and releasing data, despite the incredible technological power at the disposal of the national statistical offices.

Yet, future plans continue to appear more ambitious. As examples:

> "The recent census could have been organized better. Better over- all planning is the only major change proposed for coming census. We will include one or two vital questions dropped in the recent one";
>
> "Changes have occurred to improve the data collected about families, ancestry, languages other than English spoken at home and type of education institution attended.";
>
> "For our next census, we intend to increase the number of topics, e.g. topics on housing and migration.";
>
> "The number of enumeration items will be 22 while in the 1985 census the number . . . is 17.";
>
> "Census to be conducted in one stage only with less questions over a shorter enumeration.".

In fairness, these movements probably were taking place, albeit slowly, and most statisticians were very conscious of problems. But there were pitfalls, some highlighted in the survey. For example, training of local personnel has been identified as one of the factors which will greatly improve the census coverage, data quality and the timely dissemination of results in the developing countries of the Pacific.

Finally many stressed the importance of sound testing and control. Much of the work that was envisaged very usefully focused upon such issues as the need to improve coverage of groups known to have high under-counts and, in view of the rising costs of censusconomical methods of data collection.

List of countries/areas included in the survey*

Asia

1. Afghanistan (1986)
2. Bangladesh (1981)
3. Bhutan (1980)
4. Brunei Darussalam (1981)
5. China (1982)
6. Hong Kong (1986)
7. India (1981)
8. Indonesia (1980)
9. Islamic Republic of Iran (1976)
10. Japan (1985)
11. Malaysia (1980)
12. Pakistan (1981)
13. Philippines (1980)
14. Republic of Maldives (1985)
15. Republic of Korea (1985)
16. Singapore (1980)
17. Sri Lanka (1981)
18. Thailand (1980)
19. Viet Nam (1979)

Pacific

1. Australia (1981)
2. Commonwealth of the Northern Marianas (1980)
3. Cook Islands (1981)
4. Fiji (1986)
5. Guam (1980)
6. Republic of Kiribati (1985)
7. New Zealand (1986)
8. Niue (1986)
9. Papua New Guinea (1980)
10. Republic of the Marshall Islands (1980)
11. Republic of Palau (1986)
12. Samoa (1986)
13. Tonga (1984)
14. Vanuatu (1986)

* For each country or area, the year in parenthesis refers to the census for which responses and comments were reported on the ESCAP questionnaire.

ANNEX 3

Results of survey of recent population and housing census experiences in Asia and the Pacific with reference to data processing (United Nations Statistical Office)

Organization of census data processing

In the 1980 census round, almost all countries and areas in the ESCAP region utilized computers for data processing. Most of them possessed their own computers and the processing of the census returns was done by them. Six countries or areas, namely, the China, Guam, Hong Kong, India, Singapore and the Republic of the Marshall Islands used computers available outside of the organization responsible for census taking. Malaysia and the Republic of Korea reported that a part of the census data processing was carried out by private service bureau.

In most countries or areas, the census data processing was undertaken at the central office. However, in the two largest population countries, China and India, the organization of the population census data processing was quite different from the rest of the countries in the ESCAP region.

In China, data processing was done almost entirely on a decentralized basis. Coding of questionnaires, data entry operations and computer processing were all carried out at the computer centres of 28 provinces. After the completion of provincial data processing, the provincial totals, recorded on the magnetic tapes, were sent to the central computer centre where the national totals were compiled.

In India, coding and data entry operations were performed at 14 regional centres. The magnetic tapes containing original input records were sent to New Delhi where five different computer installations outside of the census organization carried out the processing of census data.

In most population censuses, the preliminary population counts were produced through manual counting. In several countries, notably, China and India, some basic tables were also compiled manually at the local level.

Types of computers utilized varied largely reflecting the size of population, organization of data processing, years of the population census etc. Except for the developed countries such as Australia and Japan where a large mainframe computer was used, most developing countries in the region utilized either small mainframe computers or minicomputers. Microcomputers were used in small-population countries such as Kiribati, Vanuatu, the Lao People's Democratic Republic processed sample data by a set of microcomputers in 1985.

Data entry

Data entry operation was reported to be the single largest problem in the census data processing of large-population countries. Most countries or areas in the ESCAP region utilized a key-to-diskette (or a key-to-disk/tape) method which is primarily a manual operation. The 1982 population census of China used over 700 data entry stations and the 1981 population census of India over 500 terminals. Acquisition of data entry equipment and maintenance of the equipment proved to be a difficult task. Besides, recruitment, training and supervision of key operators posed a great challenge in census data processing.

Several countries in the ESCAP region utilized optical mark readers, (OMR), for census data entry. The device scans optically the surface of a document and converts a pencil-marking at a determined location into electronic signals. The document may be a census questionnaire (Japan) or a transcription sheet to which markings were given by an enumerator or a clerk from a census questionnaire (Bangladesh, 1981; Malaysia, 1980; and Australia, 1981). This method eliminates a manual key operation. The disadvantages of this approach are that the device, developed for census purposes, tends to be expensive or that the low-cost devices, developed for general business applications, are either slow in reading speed or prone to be mechanically unreliable when applied to such large and continuous operation as a population census.

Many countries or areas in the ESCAP region used a sample tabulation approach in order to provide advanced results or detailed results as quickly as possible. Samples were taken and data entry was carried out on the samples of small administrative areas, enumeration districts or households. The percentage of population in the samples differed from country to country. Twenty per cent sample was used in the 1980 population census of the Philippines. The population censuses of China, Indonesia, Pakistan and Sri Lanka used 10 per cent samples; the Islamic Republic of Iran and Malaysia, 5 per cent; the Republic of Korea, 2 per cent; Japan and Thailand, 1 per cent. In addition, Japan used 20 per cent sample for detailed tabulation.

Editing operation

Editing operation in population census data processing involves (a) checking of the validity of given entries or

codes and consistency between those entries; and (b) correction of the invalid entries and inconsistent entries.

Most countries or areas in the ESCAP region which responded to the census questionnaires reported that computer checking of input data was carried out by either the editing programmes developed by their own staff or the generalized editing software such as CONCOR and UNEDIT that were developed by the United States Bureau of the Census and the Statistical Office of the United Nations respectively.

Automatic correction of the errors was made to a full extent in some countries whereas it was limited to a minimum in other countries. The method of automatic correction uses either a pre-determined formula for correction (a cold-deck method) or the data obtained from the previously processed record having similar characteristics (a hot-deck method). No information is available so far as to how many countries have applied the above-mentioned methods.

Many countries experienced difficulties in preparing an efficient and effective editing programme because: (a) decisions on questionnaire and related coding schemes were delayed and frequently modified during the planning stage; (b) communications between the subject-matter staff and the programming staff were not smooth; (c) lack of competent staff who could set out edit rules; and (d) resources and time were not enough to test fully the accuracy and effectiveness of the editing programme. These problems clearly underscored the importance of an early decision on the 1990 census questionnaire and coding schemes so that ample time can be available for programming and testing of the editing programme.

Tabulation of data

Tabulation constitutes a phase in census data processing where the benefit of computer application is most expected to accrue. Without computers, the extent of census tabulation would have to be limited to a small set of core tables and still have required many months to complete them. Extensive cross-tabulations of key socio-economic variables would have been impossible. The 1980 population and housing censuses in the ESCAP region, indeed, produced detailed tables of unprecedented richness. In some of the countries or areas, the 1980 round of censuses was their first time to make use of computers.

Sample tabulations were carried out in many countries or areas having large population, as already mentioned (para. 14). The use of sampling in data processing accelerated data entry as well as tabulation operations.

Most countries or areas in the ESCAP region reported that they developed their own computer programmes for census tabulations while some countries utilized a generalized software package for tabulation such as COCENTS and CENTS4 developed by the U.S. Bureau of the Census; TPL by the United States Bureau of Labour Statistics; and XTALLY, developed under the software development project of the United Nations Statistical Office. Except for a few, these countries which utilized the generalized tabulation package also developed its own tabulation programmes to compile tables which the generalized tabulation programmes could not provide.

Several countries reported that some of the tables designed by the substantive office were too big in size to be accommodated in a computer memory or too wide in horizontal size to be printed by the computer printer. These were but some of a wide range of common problems stemming from a lack of communication between substantive office and data processing group which, in many cases, resulted in serious difficulties in programming, waste of time in modifying, for publication purposes, tables that were already compiled.

Several countries in the region, for example, Australia, Japan and New Zealand, took advantage of the power of the computer to produce small-area statistics. In so doing, however, several measures for the maintenance of confidentiality and the protection of individual privacy had to be included in the tabulation stage.

Dissemination

A general lack of printing facility is a common problem experienced by developing countries in the region with regard to the dissemination of the census results. In many countries, the office responsible for the population and housing census did not have a printing facility capable of reproducing copies for dissemination. They had to rely on the external printing offices such as a government printing office of a private printing company. Delays in printing were reported by some of the countries due to inefficient printing facilities.

Many countries or areas in the ESCAP region reported that the printing of census reports was made by a photo-offset printing method using the computer-produced tables as a manuscript. China and Japan utilized a laser printer to print manuscript tables with Chinese characters.

Not enough information is available with regard to an on-line data base containing the population census results. Most of the computers used around 1980 were not suitable for accommodating such a data base nor was available yet a data base management system for such specialized purpose. In about half additional tabulations.

For those countries which reported the time of release of census results, the preliminary series including size of population by sex, number of households etc. became available in three to five months after the census. Advanced tabulation on a sample basis produced the results in one to two years from the census date. However, the complete tabulation still required three to five years.

Strategies for effective data processing in the 1990 census round

Early planning Experiences in the 1980 round showed that many problems of data processing were largely caused by the late start of planning and delays in decision-making with respect to various components of data processing. It takes a considerable time to examine financial and human resources requirements for various alternative approaches to data processing. A technically ideal or desirable approach was found not always possible due to limitation of financial and/or human resources. Sometimes testing of possible alternative approaches to data processing may be needed before making any decisions on the final work plan.

Early planning of census data processing should include consideration of the following components: (a) organization for census data processing; (b) timing and volume of expected census outputs; (c) over-all data processing methods including data entry, editing, tabulation and printing; (d) selection of computer and related equipment; (e) staff training; (f) co-ordination with substantive office and census enumeration activities.

It is important that the planning of data processing forms an integral part of the over-all census planning and that the senior staff responsible for data processing participate from an early stage in the process of over-all census planning and in the decisions concerning the work plan as much and continuously as possible. Particularly, the decision process on the design of census questionnaires, coding procedures, if any, in the field, tabulation schemes, and formats of tables, must include the data processing staff. This strategy will help not only to ensure that the decisions made are viable but also provide to the data processing managers, at an early stage, the information necessary for the detailed planning of different phases in data processing.

Further, the subject-matter office should provide their staff and expertise to the data processing personnel as the latter establishes the processing procedures and standards such as the checking of census questionnaires, computer editing rules and correction procedures.

Priority for timeliness Early availability of the census results should be given the highest priority in the planning of data processing. When it is estimated to be not feasible to complete the 100 per cent tabulation within an early time, say, two years, a tabulation based on a sample of households, should be planned to provide an advanced report. The size of samples and the method of sampling will depend on such variables as the size of population, the size of enumeration districts, the type of questionnaire etc. which should be determined in collaboration with the subject-matter office.

Coding Checking and coding of the information provided by respondents require manual work. Pre-coding of responses will help alleviate coder's burden as well as avoid erroneous coding. Coding of detailed economic characteristics, such as occupation and industry, require a well-designed manual and training of coders. For monitoring the progress of work and the level of quality of work, record of daily work and results of sample check need to be collected and made available to the management of the data processing department.

Data entry The prevailing method of data entry for the 1990 census in the ESCAP region would continue to be a key-to-diskette method. The optical mark reader (OMR) will be still either too expensive or difficult to apply due to the difficulties in printing OMR documents, although more countries than in the 1980 census will use the OMR approach.

Unlike the 1980 censuses which made use of a number of dedicated data entry equipment or terminals connected to mini-/small computers, the 1990 censuses may be planned to use microcomputers for data entry. Costs of microcomputers have come down rapidly in the past five years and it is now lower than that of a dedicated data entry device (such as a key-to-diskette device) while its performance is far advanced and versatile. The microcomputers can be used, after the census is over, for other purposes at the national statistical offices as well as at other administrative or accounting offices.

The data entry operation is the most time-consuming operation among the data processing activities. It indeed determines the timing of the entire data processing operation. That is why a sample tabulation is desirable to obtain an advanced report, since data entry of sample questionnaires can be completed in a short period of time.

Editing Effectiveness of editing of input data by the computer is largely determined by the editing rules set out in the beginning. The subject-matter specialists are primarily responsible for preparing the editing rules as well as for verifying the performance of the editing programme after testing on the computer. The editing programme should be tested a number of times on sample data and evaluated by a team of subject-matter staff and programmers.

A decision has to be made in respect of an individual editing rule about how to correct the rejected entry. Automatic correction methods, such as a "hot deck" method and a "cold deck" method mentioned previously, are effective ways of improving the general quality of input data, provided the editing programme compile a statistics of editing results for the smallest possible areas. The percentage of rejected records should be always monitored and, when it exceeded a pre-determined level, all the rejected records of that area should be reviewed by a team of reviewers.

Although editing is most effectively done by the computer after the data entry operation, a certain type of items should be checked at the data entry stage. For example, almost all items in the input data are coded within a certain

range and codes outside of this range are considered "illegal". The data entry programme should be programmed to detect such "illegal" or "invalid" code at entry stage. It is also possible to make the entry machine "warn" the key operator, when "rare" but not erroneous codes are enter. These procedures serve to prevent errors being entered at data entry stage.

Tabulation The preparation of census tabulation plan should be made to obtain maximum benefits from the use of computer. While a larger internal memory of the computer is available at present, the effective use of memory for tabulation would result in producing more tables or completing the tabulation in a much shorter period of time than otherwise. It is also important to design the tables to be printed in such a manner that the computer printouts can be directly used for photo-offset printing.

To achieve this, a close collaboration between the subject-matter specialists and the data processing staff is, as stressed earlier, needed from the early stage of census planning through the development of tabulation schemes, programming and testing of the tabulation programmes. Such close collaboration would facilitate the elimination of duplicated tables to be included in the initial pass. The space in the internal memory thus saved can be allocated to the tabulation of additional useful tables which, otherwise, would require the second pass of input records. During the course of data processing by the computer, a number of tables, which are not part of the planned set of tables, would become potentially available as by-products. For example, small-area statistics can be derived during the 100 per cent tabulation; special tables for a segment of population, such as tables on women, on youths, on the elderly population etc. are potentially available when tabulations of certain items cross-classified by sex or age are made. At the initial stage of planning, it is therefore important to study the availability of those by-product tables and decide whether or not and how to extract and make them available to the users.

Printing and dissemination As the timely availability of the results is considered the highest priority issue in the census planning, a careful preparation must be made so that printing of the output tables can be carried out as quickly as possible. Printing of an advanced report should be considered since the publication of the final reports is even now expected to take some time.

Dissemination of the census results in machine-readable form, such as magnetic tapes or diskettes, should also be considered as a part of the dissemination programme. Particularly, the wide spread of microcomputers makes it possible for the users of census results to receive them on diskettes not only to print the tables but also to further analyze them using software available for the microcomputer. Therefore, it is considered very useful to plan a data base of census results in machine-readable form.

Microcomputers for census data processing Microcomputers are finding their way increasingly into the statistical data processing in developing as well as developed countries. They are more and more taking over the role of dedicated data entry equipment in the data capture of returns from censuses and surveys. The advantages of microcomputers lie in greater intelligence, attractive prices and flexibility in use after the data entry operation is over.

Microcomputers are also making in-roads into the more calculation-intensive data processing tasks usually reserved for mini and mainframe computers, such as editing and tabulation. For example, a recent population census in a country in Africa with about eight million inhabitants plans to process the census returns entirely on microcomputers. Such application of microcomputers was earlier held back by limitations in input/output capabilities as well as processing power. Newer type of machines available now combine increased CPU speed, surpassing the CPU speed of small mainframe computers just five years ago, with the ability to control a hard-disk of nearly 50 megabytes.

A major advantage of using microcomputers is the reduced vulnerability of the equipment to technical failure. Microcomputers are tolerant to environmental conditions than larger systems and more importantly the availability of a number of essentially independent systems means that a few breakdowns will not lead to a complete halt of the data processing operation. However, a competent maintenance continues to be of major importance and users will have to take more responsibility for its as suppliers are often not in a position to provide service on an immediate and cost-effective basis.

One of the major reasons for the popularity of the microcomputers for personal as well as business use is the availability of a variety of easy-to-use low-cost software packages for word-processing, spread-sheet computation, data base and so on. In the area of statistics, microcomputer versions of popular statistical analysis saftware packages, such as SPSS, SAS, P-STAT, are now available, although in many cases the capabilities are still considerably limited compared with their mainframe versions. For the application to the census data processing, similar conversion to the microcomputer versions has been done of the generalized software packages such as the editing package CONCOR and the tabulation package CENTS4 by the United States Bureau of the Census and the tabulation package COXTALLY by the software development project of the Statistical Office of the United Nations.

ANNEX 4

List of country/area participants who attended the Working Groups on the 1990 World Population and Housing Census Programme, Bangkok, November 1986 and Rarotonga, June 1987

Bangkok, 16-24 November 1986

Afghanistan	Mr. Abdul Salam, Vice President, Central Statistics Office, Kabul
Australia	Mr. John K. Cornish, Assistant Statistician, Population Census and Demography Branch, Australian Bureau of Statistics, Canberra
Bangladesh	Mr. Abdul Baten, Director, Population Census Wing, Bangladesh Bureau of Statistics, Dhaka
	Mr. Alauddin Ahmed, Deputy Director, Urban Development Directorate, Dhaka
Bhutan	Mr. Karma Dorji, Director, Department of Immigration and Census, Ministry of Home Affairs, Thimphu
Brunei Darussalam	Mr. Jaafar bin Okmd. Hj Saman, Statistician, Economic Planning Unit, Ministry of Finance, Bandar Seri Begawan
China	Mr. Zhang Weimin, Statistician, Department of Population Statistics, State Statistical Bureau, Beijing
France	Mr. Alain Lery, Chef de la Division. "Recensements de la Population" Institute National de la Statistique etdes Etudes Economiques (INSEE), Paris
Hong Kong	Mr. Lee Man Kong Joseph, Assistant Commissioner for Census and Statistics Department, Hong Kong
India	Mr. V.S. Verma, Registrar General of India and Census Commissioner, Ministry of Home Affairs, New Delhi
Indonesia	Mr. Salmon Kodijat, Secretary to the State Minister for Public Housing, The Office of the State Minister for Public Housing, Jakarta
	Mrs. Soedarti Surbakti, Chief, Social Statistics Analysis Division, Central Bureau of Statistics, Jakarta
Islamic Republic of Iran	Mr. Majid Jamshidi, Deputy Minister of Plan and Budget Chief, Statistical Centre of Iran, Tehran
	Mr. Mohamad Hossein Nejatian, Director, Social and Demographic Statistics Department, Statistical Centre of Iran, Tehran
Japan	Tadatoshi Sakai, Councilor, Statistics Bureau, Management and Coordination Agency, Tokyo
Lao People's Democratic Republic	Mr. Bounthavy Sisouphanthong, Deputy Director, State Statistical Centre, State Planning Committee, Vientiane
Malaysia	Mr. Kwok Kwan Kit, Senior Statistician, Census and Demography Division, Department of Statistics, Kuala Lumpur
Nepal	Mr. Bishwa Raj Regmi, Director-General, Central Bureau of Statistics, National Planning Commission Secretariat, Kathmandu
New Zealand	Mr. Michael A. Moore, Director, Population Census Division, Department of Statistics, Wellington

Pakistan	Mr. Muhammad Aslam Chaudhry, Joint Census Commissioner, Population Census Organization, Islamabad
Philippines	Ms. Luisa T. Engracia, Chief, National Censuses and Household Surveys Department, National Census and Statistic Office, Manila
Republic of Korea	Mr. Bong Ho Choi, Chief, Population Studies Section, Population Statistics Division, National Bureau of Statistics, Economic Planning Board, Seoul
Singapore	Mrs. Leow Bee-Geok, Deputy Director (Data Administration), Department of Statistics, Singapore
Sri Lanka	Mr. Raja B.M. Korale, Director, Department of Census and Statistics, Colombo
Thailand	Mrs. Wiwit Siripak, Director, Population Survey Division, National Statistical Office, Bangkok
	Miss Chintana Pejaranonda, Chief, Population Studies Section, Population Survey Division, National Statistical Office, Bangkok
	Mr. Neramit Dhanasakdi, Chief, Population and Housing Statistics Section, Population Survey Division, National Statistical Office, Bangkok
	Mrs. Oraphin Mathew, Chief, Sample Design Section, Statistical Techniques Division, National Statistical Office, Bangkok
	Mr. Angsumal Sunalai, Chief, System Analysis and Design Section, Data Processing Division, National Statistical Office, Bangkok
	Mrs. Jirawan Boonperm, Technical Statistician, Statistical Co-ordination and Standards Section, Statistical Technique Division, National Statistical Office, Bangkok
United States of America	Mr. James C. Gibbs, Chief, Evaluative Studies Branch, International Statistical Programs Center (ISPC), U.S. Bureau of the Census, Department of Commerce, Washington D.C.
Vanuatu	Mr. Andrew S. Maultby, Principal Statistician, Statistics Office, National Planning and Statistics Office, Port Vila
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