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The First Complete Enumeration of Papua New Guinea – The 1980 Population Census

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Abstract: The 1980 Population Census of Papua New Guinea was the first complete enumeration of the population of the country. It was also the first census to be designed and processed within the country. This paper gives the background to the census and outlines the development and implementation of the project, concentrating on the problems encountered and the procedures developed to overcome them in this (in many ways) unique environment. The census project was a thorough exercise and recommendations are also given for the future.

Key words: Census; population; group enumeration census; census editing and imputation; census dissemination.

1. Introduction

A population census in any country is a considerable challenge. Few projects match the commitment of funds, staff and other resources. This is particularly so in newly independent countries, such as Papua New Guinea, with very limited statistical resources and experience. However, in such countries, there is usually an awareness of the need for planning and thus the need for a good data base. In Papua New Guinea in the 1970s there was a considerable lack of basic population data and what was available had great limitations. The challenge facing the 1980 census project was to satisfy these demands by producing as much as possible of the required data with an acceptable degree of quality in the prevailing difficult conditions.

This paper documents the background of the 1980 Census of Papua New Guinea and summarizes the development and implementation of all major aspects of the project. Many aspects were being developed for the first time in the country, and procedures applicable to local conditions had to be tested and implemented. Recommendations and experiences from overseas are of considerable assistance in such a situation, but it still remains a considerable challenge to apply them in the conditions prevailing. The paper concentrates on the problems encountered in many aspects of the project and how most of them were solved. Throughout the project, particular attention was paid to ensuring that as many aspects of the project as possible

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would be of continuing value to the country (for example, mapping, data processing and staff training). The paper also gives some recommendations for future censuses in Papua New Guinea.

2. General Description of Papua New Guinea

Papua New Guinea became an independent nation on 15 September 1975. It occupies the eastern half of the island of New Guinea and some 660 associated islands, the largest of which are New Britain, New Ireland and Bougainville. The terrain of the mainland and the larger islands is rugged; high mountain ranges are a feature, extending beyond 4 000 meters in several places. Fast-flowing rivers descend to the coastal plains joining large swamp systems.

Papua New Guinea is notable for its relative lack of contact with people from other countries. Prior to independence, the southern part was an Australian colony and the northern part was administered by Australia under mandate from the United Nations. Up until the Second World War, little development took place in the country. After World War II, development assistance from Australia increased considerably but even in the 1950s administrative patrols were still establishing first contact with the people of some of the remote valleys.

Papua New Guinea is also noted for its cultural and linguistic diversity: over 700 languages are spoken by its three million people. However, Hiri Motu and particularly Melanesian Pidgin have now spread widely. English is the language of education, higher administration and commerce.

Population distribution and density varies between areas. In coastal areas of the mainland and on most of the islands, villages tend to be clusters of dwellings with large areas of unpopulated land between them. However, some coastal areas and most of the highlands of the mainland are characterized by scattered high-density settlements. The average village size is about 240 persons, although a few coastal villages and highland clans contain 2 000–3 000 persons. Over a third of the total population lives in the densely populated highland valleys of the mainland. Urban areas grew rapidly in the 1970s but the pace of growth slackened considerably by the 1980s. Port Moresby is the capital and the biggest urban center.

The main means of transport in the past was by air and sea. Roads are slowly stretching out into rural areas but today the capital is still not linked by road to the highlands or to the north side of the main island.

The largest commercial enterprises in the country are the gold and copper mine of Bougainville Island and the recently opened Ok Tedi mine in the west of the country. Coffee, copra, cocoa and oil palm are the major agricultural export crops.

3. History of Census Taking

Prior to 1966 there had been two distinct types of census conducted in Papua New Guinea. The least important one was that which covered the non-indigenous population at the same time as the Australian census. This group comprised only 25 000 persons out of an estimated 2 million in 1961.

The other, more important type was the administrative censuses of the indigenous population. These censuses collected a considerable amount of information for administrative purposes and usually produced a summary of population figures for each patrol area or census division. They were of limited value for population information because only a few items were available in summary form; there was a lack of simultaneity and, often, incomplete coverage. Despite these limitations, however, these censuses did provide the essential base for the first true census in 1966.

The 1966 Census was the first attempt to provide estimates of the total indigenous and non-indigenous population at the same point in time. (See Brewer and Whittington (1969), Bureau of Statistics, Territory of Papua and New Guinea (1966), and van de Kaa (1971).) A complete enumeration was conducted in all urban areas and rural non-villages (RNVs). (RNV is the accepted local census term for missions, plantations, and similar non-traditional rural settlements.) A ten percent clustered sample was taken of the traditional villages. The data available from the administration village census was the base for this sample. This first census raised considerable enthusiasm and was generally considered a success.

In 1971, a repeat of the 1966 operation was attempted. (See Bureau of Statistics, Papua New Guinea (1974), Economic and Social Commission for Asia and the Pacific and South Pacific Commission (1982), and the Institute of Applied Social and Economic Research (1979).) However, the social and political climate had changed considerably since 1966. It was an uncertain time, not very suitable for conducting such a major operation. Political feelings were building towards self-government and independence. Rapid localization was taking place in the public services and many field positions were staffed by relatively inexperienced officers. Only a short preparation time was allowed and direct assistance from Australia was considerably less than in 1966.

Preliminary results of the processing of the 1971 Census showed a probable major undercount. An investigation was launched into the assumed under-enumeration. By using limited post-enumeration survey data and demographic rates calculated from 1966 and 1971 census data, a set of adjustment factors was produced. Only the adjusted results were published, and the adjustment process was never documented. Later investigations suggest that lack of control over sampling in the village sector may have been as important a factor as any generalized undercount. The smaller inner villages seem to have been used in some cases rather than the broader grouping of the same name.

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

4. Early Preparations and Decisions for the 1980 Census

Early preparations for the 1980 Census were marked by uncertainty. The two previous censuses had largely been designed from and processed in Australia. No relevant staff remained and few records from the two previous projects were in a usable state. The Papua New Guinea Statistical Office had only a small permanent population section and a recently established field surveys section on which to build the new project. The proposal for a census had considerable support in the government, but it was not until the United Nations Fund for Population Activities (UNFPA) appointed a Census Advisor in September 1977 and the Government appointed a Census Director in January 1978 that serious planning commenced.

It became obvious early in planning that the proposed census would have little support unless it was a complete enumeration. Sampling was generally distrusted and the adjusted 1971 sample census results particularly so. Planners for the recently established provincial governments especially needed small area data. Electoral boundaries were another major

requirement which necessitated small area data. However, users were pressing strongly for a wide range of questions. It was realized that the quality of field staff was likely to be low, particularly in remote rural areas, and that a complex questionnaire could not be used. Thus a compromise strategy was recommended to the Cabinet and accepted in mid-1978: that

- All urban areas, RNVs and a sample of rural villages be covered with a 'long' questionnaire,
- The remaining rural villages be covered with a 'short' questionnaire.

The 'long form' ultimately consisted of 26 questions and the 'short form' of 12 questions. All short form questions appear on the long form. The sample design was very similar to that used in the two previous censuses.

The strategy outlined above was a major undertaking for the country. Government officials were anxious that this first complete enumeration be thorough and successful and have as many ancillary benefits as possible. In particular, they wanted the processing of the census to be done within the country, since this would provide considerable training for staff in this relatively new field for Papua New Guinea. UNFPA said tentatively that they would be willing to fund this aspect of the project.

The development and implementation of the overall strategy required a sizeable temporary organization. Most of 1978 was spent in establishing this organization, recruiting staff, gaining the necessary bureaucratic approvals and funding allocations, etc. It was not until the first few weeks of 1979 that most of the staff had been recruited and installed either in the separate project headquarters or in provincial offices. This meant less than 18 months to the start of fieldwork and a very tight timetable for the development and implementation of all aspects of the census project design.

5. Major Design Features of the 1980 Census

5.1. Mapping

5.1.1. Rural

Few features relevant to the census were defined on the maps available prior to the census. Provincial boundaries were defined. However, Census Divisions (CDs), the lowest administrative unit, were usually defined only broadly in terms of the villages within them. Similarly, Districts, the intermediate administrative units, were defined only in terms of the CDs they contained. Few areas had comprehensive maps of village locations. Rural non-villages (RNVs) were generally well defined because they were on alienated land. It was decided to embark on a major exercise of producing a comprehensive map for each province, showing all census units (CUs) – villages and RNVs – and all administrative boundaries. RNV boundaries would be shown where possible. Village boundaries could not be determined in most areas as land disputes are a major area of conflict in Papua New Guinea. Villages were shown by the location of either the main village or the central gathering point in areas of scattered settlement. A recently produced 1:100 000 topographic series provided the base maps. All possible sources of information were used. Establishing even a list of CUs was often a problem. Villages can be unstable and move, merge and separate, particularly in areas with nomadic people. A hierarchical numbering and coding system was developed and a register of all CUs was established on computer records that corresponded to the maps.

5.1.2. Urban

Unfortunately, most of the 1971 census urban maps either were in poor condition or had been mislaid. However, a very comprehensive

set of cadastral maps was available for most core urban areas, and recent aerial photography was available for most towns. Each urban area was thus completely remapped for census purposes. Statistical urban boundaries were redefined with particular consideration for peri-urban migrant settlements and villages. Dwelling listings were completed for most surveyed areas and these were divided into clearly defined census units of approximately fifty dwellings. Boundaries were clearly defined for all urban settlements and villages and a dwelling count was done. The subdivision of settlements and villages into units of fifty dwellings was often impossible since no suitable boundaries existed. Interviewer folders were prepared for each census unit with maps, aerial photos and dwelling listings (if available). Summary maps were prepared for control purposes. A numbering and coding system for urban areas was also developed, similar to that for the rural areas, and the urban CUs were added to the computer register.

5.2. *Enumeration methods*

5.2.1. Rural

Some of the earliest rural pretests focused on the enumeration methods to be used in rural villages. An evaluation was made of house-to-house censusing compared to group-enumeration. For a house-to-house census, all outlying hamlets and garden or fishing houses had to be located and preferably sketch-mapped for each village as a preliminary step. Group enumeration methods were the established procedure for the administrative censuses, which were being revived throughout the country as part of a community-level information system. In one pretest, it was found that the house-to-house census produced a considerable undercount. Few of the outlying houses were located. In another pretest, the house-to-house census produced a better count but took considerably more time. Garden houses or outlying hamlets can be one or two days' walk from the main village, often over very rugged terrain. It was decided that the group enumeration method with refinements was likely to produce the best result, particularly considering the decentralized operational control necessary in Papua New Guinea conditions. As part of the 1979 and 1980 preparations, provincial staff put considerable effort into re-establishing the village census books in their revised format, and these books were then used as the base for the 1980 Census for rural villages. A major publicity campaign in 1980 was directed at encouraging people to gather at their census point on their appointed census day. Additional questions were asked about visitors and other people not likely to be on the village census books. A house-to-house check was made in some peri-urban areas where migrants had settled with traditional villagers.

Procedures were developed for the differing types of RNVs in a series of pretests. Most RNVs were on alienated land and detailed maps were often available for them (e.g., government stations, missions, settlement schemes). In these cases the maps were used as a check list by the supervisor who crossed off each dwelling or section as it was enumerated. Plantations were enumerated by the same procedure for permanent residents and by using the labor register for labor lines. Unofficial migrant settlements were enumerated using the house numbering procedure applied for urban settlements.

5.2.2. Urban

An early pretest was used to test the applicability of the two-visit system to Papua New Guinea urban areas. This system is commonly applied in smaller Pacific countries. Information is collected for usual residents of each

household in a lead-up period. This is then updated as soon as possible after a fixed census night, with reference to that night. In the pretest, in which relatively young technical college students were used as interviewers, it was found that a sizeable proportion of households had still not been contacted after the lead-up ten-day period. The first and second visits had to be combined for these households. Making a second contact with the other households also took a long time and, for those contacted, deletions considerably outnumbered additions. It was thought that interviewers were not probing sufficiently for visitors and were likely to be taking the easiest action for themselves, i.e. the lowest number of persons. The main enumeration was likely to use students in many urban centers, and control and supervision was likely to be even less effective than in the pretest. It was therefore decided not to proceed with the two-visit system but to use one-visit with a floating census night over a two-week enumeration period. The two-visit system allows measures of de jure and de facto population but needs additional testing before being applied in Papua New Guinea conditions. Future interviewers should also be more mature with the continuing increase in the available educated population; thus the two-visit system will stand a greater chance of success in the future.

In urban settlements and villages, where there were no individual addresses or dwelling lists, it was decided to test temporary house numbering. All dwellings within each settlement or village were pre-numbered with adhesive squares by supervisors at a preliminary visit. The supervisors then allocated certain dwelling numbers to different interviewers. This procedure worked well and was used in the main operation.

Other pretests concentrated on quality control and operational control systems in conjunction with questionnaire tests.

5.3. *Coverage rules*

Developing a set of coverage rules applicable to Papua New Guinea conditions was a difficult problem. Rural enumeration was to be spread over at least three months and urban enumeration over two weeks. No fixed census night was possible in either sector. The de jure concept of a "usual resident" was reasonably applicable in rural villages using the village census books as a base. However, in urban areas, previous surveys had shown no clear interpretation of the term "usual resident" except for long term urban dwellers with their own residences. It was essential that the rules be as simple as possible. In the end, the following mixture of de facto/de jure rules was applied:

- In *urban* areas and *rural non-villages*, persons were counted who spent the night previous to the day of enumeration at that dwelling.
- In *rural villages,* all persons were counted who usually lived in that village but who did not spend the night previous to the day of enumeration in an urban area or rural non-village; any visitors from urban areas or rural non-villages were also counted.

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 were fairly uniform over the enumeration period, the application of these rules should have given an accurate count of the total population. The main enumeration period of two weeks was carefully chosen to avoid any major events, and the whole extended enumeration was planned to take place during the coffee season and thus avoid major movements at the beginning and end of the season.

In the main enumeration, problems were encountered with two groups in particular.

Plantation laborers for coffee estates in the highlands were absent from their home villages at the time of the rural enumerations; but the coffee season finished early in some areas, and many laborers left the coffee estates before they could be counted at that location. It is not known how many returned directly to their villages and how many went into the towns or nearby settlements where they should have been counted during the urban enumeration. The second group were students at secondary school or tertiary boarding institutions. They were enumerated at the institution before they left for holidays which coincided with the census, and were told to make sure that they were not counted again. However, the results show that they were not always able to do so. Parents seem often to have included such students with their family for the census with or without the students' knowledge.

5.4. *Questionnaire design and related issues*

The design of the two questionnaires, the short and long forms, proceeded through a series of pretests in 1979 and a major pilot test in late 1979 and early 1980. The pilot test area chosen was one district of one province containing approximately 100 000 people. The area included a highland region, a coastal strip, islands, and a town of about 20 000 people. It thus allowed a realistic operational test in a variety of conditions. Some of the major issues related to the questionnaires are discussed below.

- *Visitors:* It was very difficult to get interviewers to probe for visitors. Visitors are very important in urban areas but also relevant in rural areas. In the final design a separate question was inserted for visitors on the long form and separate columns were allowed for visitors on both forms to highlight and emphasize this aspect.
- *Age:* Few older people in Papua New Guinea know their age. A "notable events" book had been used before and was produced again. However, it was found that few events except the Second World War were well known, and interviewers often made mistakes in calculating age using notable events. For rural villages it was decided after several tests to use directly the date of birth given on the village census books. As each family was checked on the village census book, they were given a 'Family Record Card' on which had been transcribed their names, sex and dates of birth. The 1980 census interviewer converted the date of birth into the current age using a conversion chart. The interviewer checked this age by observation, family structure, etc. and, if necessary, recalculated it using notable events. This procedure produced a considerable improvement in age recording for villages. For all sectors, health record cards had become quite common for younger children, and the date of birth from these was used whenever they were available. Notable event books or lists will continue to be necessary, particularly for urban areas and RNVs in Papua New Guinea. It is recommended, though, that they be restricted to a few major events and that conversion tables be supplied so that as few arithmetic steps as possible are required on the part of interviewers.
- *Fertility and mortality:* The rate of registration of births and deaths in Papua New Guinea is very low. Indirect measures from the census are the major source of birth and death rates. Three broad questions on the long form were developed for this purpose. The lifetime fertility questions were extended from 1966 and 1971 to include the total number of children ever born and, for living children, whether they lived in that household or elsewhere. These subquestions

functioned as prompts and made possible internal consistency checks for each household. The current fertility and infant mortality questions, i.e. date of birth of last-born child and whether alive or dead, were very similar to the 1971 questions. A maternal orphanhood question was asked as in 1971, but in addition to asking whether or not the mother was still alive, it asked for her person number on the household form (if she lived with the household). This latter part of the question permitted fertility analysis using the 'own children' technique. The results of the demographic questions have been analyzed extensively. Generally, the questions have provided better data than in the past.

- *Education level:* During pretests it was noted that there was a tendency for the grade *in*, i.e. current grade, to be recorded for children at school. We asked for the 'highest grade finished.' It was thought that a two-part question asking for grade *in* for those at school and grade *finished* for those not at school was too complex. It was decided to proceed with only one question but to emphasize the problem in the training. This did not work; results show that up to eighty percent of school children in some areas have their grade *in* recorded. A two-part question will have to be used for future censuses; such a question is being used successfully in current surveys.
- *Economic activity:* There have always been problems and limitations on the data from any question to individuals on their main activity last week. Part of the problem lies in respondents' establishing their main activities. The difficulty is increased in Papua New Guinea by that men usually answer the question for women and commonly understate the female contribution to economic activities. For the 1980 Census additional questions were developed for the household level on both forms. One asked whether anyone in the household did any of a range of economic activities, e.g., grow coffee, cocoa, etc. The other asked whether the household had received any income in the last twelve months from any of a range of money-earning activities, e.g., selling food crops, fish, etc. Both household questions referred to more concrete identifiable concepts than the individual questions, and it is thought that the data are much more valid than the individual data. The household data are being widely used, in particular for household survey design.
- *Translation:* The variety of languages spoken in Papua New Guinea makes translating the questions on census forms impractical. Investigations were carried out to determine how in practice interviewers actually asked the questions in local languages. Interviews were recorded at some pretests and later translated by linguists. Often it was found that the answers were arrived at through a rather rambling, indirect conversation rather than via any direct question. Respondents often reacted unfavorably to direct questions and interviewers had little experience in interviewing technique. It was decided that major emphasis should be put on ensuring that interviewers clearly understood the purpose of each question and could also translate it correctly when required. A series of lay-over strips corresponding to the English questions were produced in most major languages. These were given to interviewers in the relevant areas at training sessions. Practice interviews were done in the local language and Pidgin or Motu as well as English. It was found that the strips were often mislaid in the field, but using them in training did seem to help interviewers both understand the questions fully themselves and ask questions better and thus served a useful purpose.

- *Color:* A new multicolor press at the government printer allowed both the pilot test and final questionnaires to be printed in two colors, black plus another color. For the pilot test a light pink was used for coding boxes and to highlight other areas of the questionnaires. Coders and data entry operators complained, however, that pink strained their eyes. Ultimately a light blue was used on the short form and a light green on the long form for the relevant areas. The use of these colors produced a much more attractive form which was more appealing to all who had to work on it.

5.5. *A revised strategy*

As planning and testing proceeded, field officers stated firmly that the existing strategy was too complex. Field supervisors in rural areas could not operationally manage two questionnaires, two sets of training materials and two field plans. The original strategy was also tried in the major pilot test, and in addition to the operational problems, it was found that people were missed in the boundary between sample and non-sample areas because of the lack of clear definition.

With Government approval, surveying the *rural sample* with the 'long' questionnaire was deferred to 1981. However, *all rural areas* were to be covered in 1980. Some areas, principally peri-urban areas where good staff, mapping and management were available, were covered with the long form in 1980. All remaining rural villages were covered with the short form in 1980. The overall sample percentage for the 1981 sample was reduced from 10 % to 7 %. There is no doubt that this revised strategy made the 1980 operation much more manageable.

The 1981 operation suffered from post-1980 letdown, however, and quality was not as high as expected. The sample design also seems to have been too highly clustered, with some provinces only having six or eight clusters of approximately 1 000 persons. Economic characteristics in particular were poorly represented in some provinces, and matching the 1980 and 1981 economic data was confounded by a considerable decrease in commodity prices over this period.

5.6. *Training*

Considerable attention was paid to training in both 1980 and 1981, but training took place in many remote locations with trainers of variable skill. After experimenting with the pretests, it was decided that a verbatim training guide was necessary to ensure consistency. An accompanying workbook was experimented with and refined, and ultimately was a great success. All training documents had to be produced for both forms and, for the long form, for the three sectors – urban, RNV and rural village. The production of these documents put a considerable strain on the development resources of the project.

5.7. *Quality control*

Various quality control techniques were experimented with during testing. It was ultimately decided that separate positions of quality controllers were needed for both urban and rural operations. In urban areas or accessible rural areas, these officers checked the forms daily. For rural patrols, the forms were checked as soon as possible after the patrol returned. Census unit summary sheets were designed for both urban and rural areas. These summary sheets had sections with questions for both supervisors and quality controllers to ensure that checks were made with previous records and that other checks were done. These procedures contributed greatly to the quality of the data and to overall coverage.

5.8. *Operations*

Detailed operational plans were prepared for all aspects of the main operations. These worked surprisingly well, and most areas kept close to their planned schedules. The census was uniformly supported by all political groups and raised considerable enthusiasm around the country. Operations in some remote aeas used the defence force. Most supervisors were administrative field officers with volunteers, including missionaries helping in some areas. Australian, New Zealand and Papua New Guinean air forces helped with transport of forms and equipment. Tribal fighting did occur in some highland areas but a truce was arranged in most cases for the census. Urban operations were the most difficult, and staff most unreliable in the capital, Port Moresby, in which there are sprawling squatter settlements and many high-income households with security fences, etc. Both areas generally did not welcome interviewers, particularly after dark. However, additional permanent staff members were allocated to fieldwork in the capital on their return from other areas and an intensive follow-up campaign seemed eventually to produce good coverage.

5.9. *Post-enumeration survey*

A limited post-enumeration survey (PES) had been planned and budgeted. It was expected that research officers working on pretests would control this aspect and would use university students as interviewers. However, the research officers had to be diverted to operational positions due to staffing problems and few students were available from the university. Because of these resource problems and because a PES should be independent and of higher quality than the main enumeration, it was reluctantly decided to abandon the PES. The 1981 rural sample did identify some areas of both under- and over-enumeration in rural areas, but no quantitative measure was possible. Demographic analysis of the coverage has been inconclusive, particularly due to the problems with the 1971 census data. However, various calculations suggest under-enumeration in the range 2 % to 5 %. It is acknowledged that a PES should be an integral component on any census project and one is recommended in future. A rural PES will always be logistically difficult in Papua New Guinea; it could encounter reaction from villagers and thus should be pretested. An urban PES should be no more difficult than in other countries, provided sufficient resources can be definitely allocated.

5.10. *Data processing*

As this was the first census to be processed in Papua New Guinea, a complete strategy had to be developed that was compatible with local conditions. Processing development proceeded at the same time as other developments in the pre-census period. The main features of the processing are discussed below.

- *Equipment:* A lengthy evaluation was done to choose a suitable method, site and type of equipment for data entry and computer processing. It was finally decided to have a centralized processing center with an independent minicomputer and twenty visual display units. Unfortunately, mainly because of bureaucratic delays, the equipment and site only became fully operational quite a while after the main pilot test and only limited feedback was possible from pilot processing for the main census design. Overall, the equipment performed very well in spite of frequent blackouts caused by a severe drought in the capital.
- *Staff:* Very few trained staff were available locally and most senior positions had to be filled from overseas. Originally it had been thought that even locating and training suitable data entry staff would be a problem.

However, after a relatively slow start, local operators performed very well and achieved rates comparable to those in other countries.

- *Manual processing:* For all tests and for the final census a complete cycle of editing, check-editing, coding and check-coding was performed by teams of clerks. For an early test, codes were transcribed to data entry sheets for entry at another location. It was found, however, that error rates from transcription were unacceptably high and this procedure was discontinued. Coding space was allowed for all questions, when relevant, and data were entered from the coded forms. Tabulations were produced only from the final census data and at this stage it was found that much of the editing and coding had been poor. A series of additional computer edits was designed, and errors were checked and amended by the best clerks and research officers. The original editing and coding was badly supervised and it is thought that more emphasis should be put on computer editing in future.
- *Computer editing and automatic imputation:* A mixture of automatic imputation and manual correction of computer-identified edit errors was originally planned. Automatic imputation was to be largely confined to relatively simple items, including age, particularly on the short forms. As the main processing proceeded it was noted that the imputation rates were higher than expected and an investigation was launched. The main problem was age. On checking the base forms it was found that coding and field errors in relationship were causing more distortion to ages than they were correcting. Adoption, which is widespread, was a major factor. The complete editing system was redesigned with much less emphasis on automatic imputation, and all data already entered were reprocessed. Two reasons why these problems were not located earlier were that the pilot test data had been edited and coded by a small, well-supervised group and that adoption was not very common in the pilot test area. As noted above in discussing manual processing, many of the computer edits for manual correction were also originally not thorough enough. As this was the first census processed in the country, there was no guide to the type of errors likely to occur. Tabulations should have been produced from the pilot test data but were not, as 'COCENTS,' a tabulation package provided by the US Bureau of the Census, was not operational until very late. Also, as noted, the pilot test data would not have been a good guide for the main census.

6. Census Results, Dissemination, and Analysis

6.1. Census results

The first census results available were the preliminary census unit totals, published on 30 December 1980. (National Statistical Office, Papua New Guinea. National Population Census Bulletin (1980).) The Government had been promised these before the New Year for use in determining electoral boundaries. Final tables of the 1980 data began to appear only in mid-1982, due to processing delays. The tables were made available to users as they were produced and a series of provincial summary booklets containing the major tables has gradually been published. Final tables including the 1981 data were all available by the end of 1982. The economic data from the 1981 sample has been restricted because of problems mentioned earlier. A series of technical reports documenting all major aspects of the project was published before the project officially closed at the end of 1982. (See National Population Census Technical Reports (1980) and Gilbert (1984).)

6.2. *Dissemination*

Besides the publications and tabulations mentioned previously, it was thought that a particular effort should be made to ensure the results of the census were understood and used. Provincial basic tables were delivered to each province by a senior member of staff, and a one-day meeting was held at which the tables and the availability of other data was explained. Corresponding longer meetings were held at the national level. These were followed by more intensive data utilization workshops of a week's duration for each region during 1983 and 1984. National workshops were similar but usually more specialized for each department.

6.3. *Analysis*

Further analysis of the census data was encouraged (Yagl-Ambu, Papua New Guinea Journal of Social Sciences and Humanities (1980)) 'COCENTS' training was given for users who wished to produce their own tables. A monograph series of publications was instituted to publish the results of analysis. Six monographs are currently being published. The four major ones are two on fertility and mortality, respectively, and two on migration. (See National Census Research Monographs (1980).)

7. Conclusion

The 1980 Census was a thorough and expensive project for the country. Its results have been well received and are being widely used. A total of 3 010 727 persons were enumerated, of whom 2 978 057 were citizens and 32 670 were non-citizens. Papua New Guinea, like most developing countries, has a young population with 43 % of the citizen population aged less than 15 years. The citizen population growth rate from 1966 to 1980 averaged 2.3 %. Demographic analysis shows considerable reductions in both mortality and fertility in recent years. The 1980 Census has supplied a detailed population data base which was not available before. The results have been incorporated into many national and local development plans. The census maps have been used widely and are a major asset. The census results are also particularly being used as a base for sample surveys.

The minicomputer supplied by UNFPA has been reinstalled in the main National Statistical Office (NSO) and continues to be used for census analysis as well as for processing household survey data. The NSO was reorganized and slightly expanded in 1983 to permit a better permanent structure for ongoing population and social data collection, processing and analysis. Unfortunately, this reorganization was a little late and some trained national officers left for other organizations when their temporary census positions lapsed at the end of 1982. However, it was possible to retain many trained staff. The new organization includes a small mapping unit which continually updates the maps and census unit listings. This new organization and their continuing activities will give a much better base on which to plan the next census, proposed for 1990.

Many lessons have been learnt from this first complete census. Some recommendations have been noted during this article and many are given in the Director's Report and the other reports of the technical report series. However, the following points are worth reiterating here:

- The two-form strategy (long and short forms) was difficult and increased the workload in most aspects of the project. A two-phase operation should definitely be avoided. The 1981 rural sample suffered from post-1980 malaise. If at all possible, a strategy of complete coverage with one form in the minimum enumeration period should be employed. Detailed investigation of particular topics should be left to a separate national household survey

program, and the census questionnaire should be made as simple as possible.

- Attention should be particularly focused on enumeration methods. The group enumeration method is becoming difficult and house-to-house enumeration or a mixture of methods needs to be tested more widely and implemented where possible. The possibility of collecting de facto and de jure population estimates should be incorporated into these tests, since there is a definite demand for these, particularly for the rural village sector.
- The availability of permanent computing capacity in the National Statistical Office should make possible better planning and coordination of processing with other activities in the future. In particular, a pilot test should be held earlier than in 1980 and fully processed so that the results can be incorporated into final census design.
- Training material should continue to be developed, and the possibility of incorporating the workbook into the interviewer's manual should be investigated.
- Operational planning must continue to receive major attention in the field conditions of Papua New Guinea. A basic structure of guidelines for planning and monitoring of operations is now available from 1980 but needs further development. Quality control, in particular, needs strengthening.
- The effort devoted to data dissemination and utilization should be continued and expanded. Seminars and workshops help to ensure that maximum value is obtained from the data.

The 1980 Census was a major stage in the statistical development of Papua New Guinea. The experience was certainly of future value to Papua New Guinea and may also be relevant to other countries at an early stage of their statistical development.

Particular mention should be made of the assistance given to the 1980 Census by various advisers from international organizations and from the Australian Bureau of Statistics.

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