

Handbook of Population and Housing Censuses

Part I

Planning, Organization and Administration
of Population and Housing Censuses



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Handbook of Population and Housing Censuses

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PREFACE

The United Nations has, over the years, issued a series of handbooks and technical reports intended to assist countries in carrying out population and housing censuses. These handbooks and reports have been revised from time to time to reflect new developments and emerging issues in census-taking, as well as national experiences in conducting a census every decade. 1/ The new edition of the Handbook of Population and Housing Censuses, now under preparation, is to be published in several parts over the next several years.

Two parts of the Handbook have been completed. Part one, the present publication, is concerned with the overall planning, organization, enumeration and post-enumeration work of the census, including administrative, management and logistical aspects of a population and housing census. Part two, entitled Demographic and Social Characteristics and published in 1992 (ST/ESA/STAT/SER.F/54), deals with selected demographic and social topics that were covered in national population censuses conducted during the 1970 and 1980 census decades. Both parts also discuss how the various phases of census work, as recommended by the United Nations, may be effectively put into practice. Users of the Handbook are urged to consult Principles and Recommendations for Population and Housing Censuses (ST/ESA/STAT/SER.M/67), published in 1980, 2/ and Supplementary Principles and Recommendations for Population and Housing Censuses (ST/ESA/STAT/SER.M/67/Add.1), published in 1990, 3/ for the details of the United Nations recommendations. However, relevant principles and recommendations given in those publications have, where indeed necessary, been restated in the various editions of the Handbook.

In addition to the census handbook series, technical reports on various aspects of population and housing census work have been issued. Those reports focus on new emerging areas of census planning and processing and of data storage, retrieval and dissemination, and in particular on the development of modern technology and its application to census work. Recent published reports include the Emerging Trends and Issues in Population and Housing Censuses (ST/ESA/STAT/SER.F/52), 4/ Manual on Population Census Data Processing Using Microcomputers (ST/ESA/STAT/SER.F/53) 5/ and The Use of Microcomputers for Census Data Processing. 6/ Handbooks on a number of subjects closely related to population and housing censuses and the utilization of census data have also been published by the United Nations. These include, for example, Handbook of Statistical Organization, 7/ the Handbook of Household Surveys, Revised Edition, 8/ Handbook of Vital Statistics Systems and Methods, Volume I, 9/ Handbook for National Statistical Data Bases on Women and Development, 10/ Demographic Evaluation and Analysis of Population Census Data: Aspects of Technical Co-operation, 11/ Report of the International Conference on Population, 1984 12/ and World Population Monitoring, 1989. 13/

The present publication was prepared by the staff of the Statistical Office of the United Nations Secretariat with the assistance of Mr. Pidatala Padmanabha, former Registrar General and Census Commissioner, Government of India, who prepared major portions of the first draft.

Notes

1/ In connection with the censuses taken in or around 1950, the following reports were issued: Population Census Handbook (provisional edition), October 1949; Population Census Methods (Sales No. E.49.XIII.4), November 1949; Fertility Data in Population Censuses (Sales No. E.50.XIII.2), November 1949; Data on Urban and Rural Population in Recent Censuses (Sales No. E.50.XIII.4), July 1950; Application of International Standards to Census Data on the Economically Active Population (Sales No. E.51.XIII.2), January 1952; and Handbook of Population Census Methods (Sales No. E.54.XVII.4), June 1954. For the 1960 round of censuses, the three-volume Handbook of Population Census Methods (Sales No. E.58.XVII.6) was issued: Volume I: General Aspects of a Population Census, 1958; Volume II: Economic Characteristics of the Population, 1958; and Volume III: Demographic and Social Characteristics of the Population, 1959. For the 1970 round of censuses, the following parts of Handbook of Population and Housing Census Methods were issued: Part III: Topics and Tabulations for Housing Censuses (Sales No. E.70.XVII.6), 1969; Part IV: Survey of Population and Housing Census Experience, 1955-1964 (Sales Nos. E.70.XVII.7 and E.70.XVII.7/Add.), 1972 and 1974; and Part VI: Sampling in Connection with Population and Housing Censuses (Sales No. E.70.XVII.9), 1971.

2/ United Nations publication, Sales No. E.80.XVII.8.

3/ United Nations publication, Sales No. E.90.XVII.9.

4/ United Nations publication, Sales No. E.91.XVII.4.

5/ United Nations publication, Sales No. E.90.XVII.19.

6/ Department of Technical Cooperation for Development and Statistical Office, both of the United Nations Secretariat, working paper (UNFPA/INT-88-P09/1, 1989).

7/ United Nations publication, Sales No. E.79.XVII.17.

8/ United Nations publication, Sales No. E.83.XVII.13.

9/ United Nations publication, Sales No. E.91.XVII.5.

10/ United Nations publication, Sales No. E.89.XVII.9.

11/ United Nations publication, Sales No. E.80.XIII.3.

12/ United Nations publication, Sales No. E.84.XIII.8.

13/ United Nations publication, Sales No. E.89.XIII.12.

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INTRODUCTION

1. The purpose of a population and housing census is primarily to satisfy essential national needs for statistical data. Those needs are the main factors that determine the content of the census. Both the content of the census and the operational procedures undertaken to obtain the desired data can, however, be improved by studying the experiences of other countries that have successfully carried out censuses and adopting or adapting their practices to the extent appropriate. In addition, international uses of census data are important and a desirable feature of a modern census would be to increase the possibility of international comparability of census data through the adoption, to the extent possible, of the international recommendations regarding topics and their definitions.

2. The international recommendations relating to a census are contained in the publication Principles and Recommendations for Population and Housing Censuses (ST/ESA/STAT/SER.M/67). 1/ The objectives of the United Nations principles and recommendations are: (a) to help in improving census operations and the utility of census results in national terms and (b) to increase, to the extent possible, international comparability. The recommendations stress the need for developing national expertise in census-taking so that accurate and usable data are collected and applied as input in the formulation of national programmes relating to the development and socio-economic sectors in such areas as population policy, housing, health, education and manpower development. The recommendations emphasize the importance of evaluation of census results and the need to modernize data-processing systems.

3. Part one of the Handbook of Population and Housing Censuses concerns the planning, organization and administration of population and housing censuses and presents possible courses of action to render operative the international recommendations, which in the text are referred to as Principles and Recommendations.

4. The subject matters is presented in fourteen chapters. Chapters I and II, which are introductory, offer formal definitions of the census and describe its role in the national statistical system. Chapter III indicates the broad framework within which a census has to be planned. Chapters IV and V describe the basic steps that are necessary for establishing the census organization and the structural backdrop against which the census organization will have to function. Chapters VI and VII deal with the core activities of the census, including enumeration. The subject of chapter VIII, training and publicity, could no doubt have been included in chapter VII since that subject is so closely related to the enumeration activities. However, it has been presented separately for two reasons. First, chapter VII would have become rather long and consequently fatiguing to read. Second, there are some aspects of training and publicity that are important for other stages of the census operations and those aspects needed to be included; however, their inclusion in the chapter dealing with enumeration would have been rather inappropriate. Chapter IX deals exclusively with data processing while chapter XII discusses publication and dissemination of data. These two chapters, though not in unbroken sequence, are interconnected.

5. Chapters X and XI, which deal with evaluation of census results and use of sampling in the census, have been placed after the chapter on data processing because their subjects are considered an integral part of the main operations. The presentation in these two chapters needs some explanation, however. The discussions, it will be noted, are descriptive and management-oriented rather than technical. The reason is that the topics discussed are the subject-matter of two other parts of the Handbook that are more technical in nature, while the focus of this part is mainly managerial rather than technical.
6. Post-census management issues are dealt with in chapter XIII while chapter XIV refers to some emerging issues in census-taking that, it is hoped, will generate both introspection and determination among census takers. Many of those issues have arisen because in recent years the census has ceased to be the low-profile activity (with the census taker operating in relative anonymity) that it constituted till a few decades ago.
7. The topics that a census could include and the tabulations that could be generated have not been dealt with in detail in chapters VI and IX because these are the subjects of two separate parts of the Handbook.
8. References are presented at the end of the present publication. These can be considered, at best, only indicative of the wealth of material that is available. Some of those references have been cited as possible further reading and not necessarily to indicate the source of a point made in the body of the Handbook.
9. The present work is an expansion of papers that were presented at the Interregional Workshop on Planning, Organization and Administration of Large-Scale Demographic and Social Data-Collection Activities for Small Areas, held at Bangkok in November 1989. The Workshop was organized by the former Department of Technical Cooperation for Development of the United Nations Secretariat with substantive support from the Statistical Office of the United Nations Secretariat and the Economic and Social Commission for Asia and the Pacific. The main recommendations of the Workshop have been incorporated in this part of the Handbook.
10. There is always a dilemma connected with the preparation of such a handbook, which seeks to be all things to all persons. It can be very concise and in the process seem incomplete or, it can be long and seem crammed. If this work leans toward the latter condition, it is only because it has sought to be as comprehensive as possible. Obviously, considering the wide range of census experience in the countries of the world, one will have to be selective both in consulting the Handbook and in adopting some of its recommendations. No set of recommendations on operational issues can be of universal applicability. The Handbook attempts, in effect, to synthesize global experience in census-taking.

I. THE CHARACTERISTICS OF A CENSUS

11. Census-taking had its beginnings in ancient times. 2/ Inventories of people, taxpayers and assets were made at some time or other in most countries, but the methods and purposes were different from modern ones. The early inventories were carried out mainly to identify the population groups that should be taxed or recruited for military duties or public works. Those groups did not always include the whole population or even a representative sample of it and were more often restricted to particular categories, depending on the purpose for which a given inventory was being made. From such early enumerations, the modern population census, with the characteristics of universal enumeration, wide scope of inquiry and provision of information for administrative and statistical purposes, can be said to have evolved by about the seventeenth century. Today, the census is probably the most prolific source of information on the population and housing conditions in a country, and by providing accurate and detailed statistical data on the demographic and social condition of the people at the national, subnational and local levels, it meets a variety of information needs. Therefore, the census must be considered an exercise of national importance and not just a routine governmental activity. In fact, the census undertaking requires the participation and cooperation of every citizen in the country and the results of the census belong to and should be used by everyone. A census is everyone's census.

A. Definitions

12. Principles and Recommendations define a population census as "the total process of collecting, compiling, evaluating, analysing and publishing or otherwise disseminating demographic, economic and social data pertaining, at a specified time, to all persons in a country or in a well-delimited part of a country". 3/

13. By definition, a census of population is required to include in its enumeration all persons in a country. However, some countries include in the census count the numbers of their nationals living abroad. This modification in the definition is based on certain special circumstances. In particular, countries with a small population, a considerable proportion of which lives abroad, resort to such inclusions. In this context, it must be noted that the exact determination of nationals living abroad is very difficult and their inclusion in the census of a country might result in distortions in the data.

14. The size of the population and its demographic, economic and social characteristics are an important and essential input, in one manner or another, in the planning and implementation of almost all administrative, industrial, commercial and environmental activity. Comprehensive and periodic data for that input are obtained through a census, which provides benchmark statistics at the level of a country's lowest administrative unit. The furnishing of such statistics constitutes, in fact, a unique feature of the census.

15. Principles and Recommendations define a housing census as "the total process of collecting, compiling, evaluating, analysing and publishing or

otherwise disseminating statistical data pertaining, at a specified time, to all living quarters and occupants thereof in a country or in a well-delimited part of a country". 4/

16. Many countries have conducted the census of housing and the census of population in one operation. The information on the number and characteristics of housing units is very useful for assessing both adequacy and quality of housing. If information on facilities is also obtained, the data will provide essential input for evaluating health and living conditions.

B. Essential characteristics

17. The essential features of a population and housing census are universality, individual enumeration, simultaneity and a defined periodicity. 5/

1. Universality

18. The census should cover the whole territory of a country or a well-defined part of it. In other words, it should cover a precisely defined area. The utility of the census data is enhanced if they refer to a well-defined area, usually the whole country. There may be exceptional circumstances that warrant the census's being limited to a part of the country but the national data set will then, to that extent, be the poorer. Universal coverage requires that every individual present or residing within the country be brought within the scope of that coverage, depending on the type of population count desired. Similarly, the housing census must include within its scope every living quarter within the area, irrespective of type. In other words, the inclusion of every unit of enumeration, whether of persons or houses, is an essential requirement of the census of an area.

2. Individual enumeration

19. A census necessarily implies that every person and every living quarter are enumerated separately and their characteristics recorded separately. Such a feature is essential if a census is to provide useful demographic, economic and social data for small areas and permit the cross-classification of data on interrelated characteristics.

20. Though a census is by definition a complete enumeration, the use of sampling techniques for obtaining data on certain specific characteristics is being increasingly adopted. The adoption of sampling in the census enhances the range of data obtained at a given point of time. In the case of some characteristics it may not always be necessary to obtain information at the level of the basic administrative or territorial unit such as the village: data on those particular characteristics available at the larger territorial levels and at national level may be sufficient. In such circumstances, the adoption of sampling techniques could be considered.

21. In certain situations, a group enumeration may have to be considered. This method may have to be adopted in areas where the terrain, the nomadic character of the population or other factors do not permit individual

enumeration. In group enumeration only totals and summarized information will be obtained. This system of enumeration must not be confused with the special practice sometimes followed of assembling all the inhabitants of a small area at a central point for the convenience of enumeration. In that case, individual information can be collected. In some areas, with improvement in mobility and communications, the practice of group enumeration could be replaced by that of assembly as a step towards individual enumeration.

3. Simultaneity

22. Each person and every living quarter must be enumerated as nearly as possible with reference to a well-defined point of time and the data collected should refer to a well-defined reference period. The time-reference period need not be identical for all the data collected: for most of the data it will be the census day but for some characteristics such as occupation or work it may be a period prior to the census day. Simultaneity, as at a specific point or over a specific period of time, is essential for ensuring an accurate count and for obtaining comparable data on characteristics.

4. Defined periodicity

23. A census is said to present a picture of the population at a given point of time. While a single picture is very useful as providing baseline data, the utility of census data is enhanced if such data are available at periodic intervals. A series of periodic censuses is very useful for assessing trends - the past can be evaluated, the present assessed and the future projected. Censuses should therefore be taken at regular intervals so that comparable data are available in a sequence. Consecutive censuses are essential for the study of changes and trends over time in the important facets of a population such as growth, distribution, work characteristics, age structure, literacy and educational attainment. A series of censuses makes it possible to assess the magnitudes and directions of demographic and socio-economic trends.

C. Other desirable characteristics

24. Censuses should be taken regularly. Determining the interval between two censuses will be influenced by the two considerations of data needs and costs. Relatively short intervals permit more accurate assessments of demographic trends and refined projections. Changes in distribution of population, which are more pronounced than ever before (and information on which is very useful for assessment of trends in urbanization and for development planning), will be better monitored with census data obtained at shorter intervals. On the other hand, changes in some of the characteristics that a census will usually cover do not take place so rapidly. Also, a census is generally an expensive exercise involving considerable mustering of resources and manpower. Census frequency will have to be determined after taking these factors into consideration, while keeping in mind that too long an interval between, as well as infrequency of, censuses reduces their utility considerably. It is recommended that a census of population and housing be taken at least once in 10 years.

25. Some countries conduct a census every five years. However, for most countries, organizing a quinquennial census would be difficult, in view of the considerable financial and manpower resources necessary for this purpose. Experience indicates that, in most countries, considerable time is required for tabulation, analysis and publication of the results of a census that has been completed and for the activities preparatory to the succeeding one. A more comfortable interval between two censuses will provide enough time for the testing of new techniques or methodology that may assist in improvement of both the quality and coverage of the census. In such countries, it would seem more appropriate to build up capabilities for surveys for obtaining data on selected characteristics at more frequent intervals between decennial censuses than to conduct full-scale censuses quinquennially. There may, however, be a need for quinquennial censuses in a country that has no reliable civil registration system or survey capacity yet, with the census inquiry being restricted to obtaining the basic data on the population and housing.

II. THE ROLE OF THE CENSUS IN THE NATIONAL STATISTICAL SYSTEM

A. General role in the statistical system

26. The population and housing census, an integral part of a country's national statistical system, is the principal source of statistics on population and housing characteristics and satisfies a major requirement of that system. It is apparent that the importance of the census is coming increasingly to be recognized. However, this recognition is not of so recent an origin. As far back as 1853, the First International Statistical Congress, held in Brussels, adopted a resolution regarding the census "which is perhaps the first formal international recommendation on the subject ..." 6/ "The importance of the census as a source of basic data required not only on the general population, but also on special population groups, such as women, children, youth and the elderly, refugees and the homeless" has been constantly reiterated. 7/ The expansion in the content of the census in recent years beyond conventional demographic, social and economic inquiries into areas of new policy concerns has increased the importance and utility of the census to Government and other users of census data.

27. Within the national statistical system, the census provides indispensable information such as benchmark data on a wide range of characteristics, a frame for statistical surveys and data for compilations of a wide variety of social and economic indicators. It is the logical starting point for the establishment of a statistical database system that would meet continuous national needs. The establishment and maintenance of such a system will require close coordination between the census of population and housing and other large-scale statistical surveys and investigations, in areas including consistency and uniformity in the definitions of common concepts and characteristics. Such consistency and uniformity will, in particular, enhance the utility of census information when that information is used in conjunction with the results of other major data sets within the statistical system.

B. Relationship between the censuses of population and housing

28. Before the interrelationship between the census of population and housing and the other components of the statistical system is considered, it would be appropriate to recognize the close relationship between the population census and the housing census. As stated in Principles and Recommendations, they should not be considered completely independent of each other. 8/

29. Certain essential elements are common to both and even if, for operational reasons, the two censuses are conducted separately, they have to be well coordinated and conducted as close to each other in time as possible for maximum utility of the results and optimum use of resources. In most countries, the population and housing censuses are conducted concurrently, often with the use of a single schedule. Such an approach facilitates the matching of the information on population and housing and expands the scope of analysis and reporting, especially because the housing data can be related to the demographic, social and economic characteristics of the members of households.

30. If the housing census is conducted prior to the population census, some data on the demographic, social and economic characteristics of those living in such households must be obtained. This is the basic data necessary for analysing the housing stock more meaningfully and in the true context of human needs. The information on the characteristics of living quarters collected in the housing census has necessarily to be associated with the characteristics and composition of the occupants of those quarters.

31. Even where a formal housing census is not carried out, it is still possible to obtain some basic information on housing conditions during the preparation of the lists of structures, buildings and living quarters. The listing operation is an essential part of enumeration procedure during which information on the housing stock and its characteristics could be collected. In such cases, some essential information on the household will have to be obtained as part of the listing operation so as to enhance the utility of the data on housing.

32. The enumeration of homeless persons can be carried out as part of the population census, particularly when the housing census is carried out simultaneously, or during either the housing census or the population census if these are carried out separately.

C. Relationship with sample surveys

33. The census is primarily concerned with the collection of information on certain basic characteristics of the population and of housing. While the scope of the inquiry may vary among countries, a large part of the enumeration is almost universally concerned with those general characteristics and it is often difficult to expand the scope of the census beyond a certain point. It is also relevant to note that census-taking is an expensive exercise and funding for extended inquiries is normally not easily available. However, it is useful to obtain basic information on changes in size and other characteristics of the population and also to have more detailed information on some of those characteristics. In addition, data are often needed on demographic, social, economic and housing characteristics that are difficult to canvass in a census. In fact, the census is a poor mechanism for obtaining detailed data on complex characteristics, the investigation of which calls for special skills or training of the field staff. The adoption of sampling will, in such cases, be appropriate. The data that the census cannot provide, including the study of changes between two censuses in some characteristics, could be obtained through sample surveys. At the same time, the census provides benchmark data for measuring those changes in characteristics based on the results of such surveys.

34. The census provides the frame for sample surveys and there is therefore an operational link between the census and such surveys. The utilization of the census frame for living quarters and households in sample surveys would, however, be subject to stipulations in the law relating to maintenance of confidentiality and contingent or continuous updating of the frame itself. Both these issues are considered below. Employment of the census frame in sample surveys would constitute, it may be noted, an optimal use for the fairly large sums expended on the census.

35. There are usually several items common to a census and to those sample surveys that seek to investigate characteristics related to population or housing, including age, sex, family relationship, marital status, literacy and educational attainment, size of household, fertility levels and housing characteristics. Items such as work and occupational characteristics are also likely to be common, depending on the focus of the sample surveys. Both the census and sample surveys adopt definitions regarding rural and urban status of localities. Given the close link between the two operations, it is highly desirable that the definitions of the items common to both be compatible if not identical. From the point of view of the data user and for the enhancement of the utility of the total stock of data from both sources, there will be a great advantage in adopting similar concepts and definitions for common items. Such standardization of concepts and definitions will facilitate analyses requiring the use of data from the census and sample surveys and will also help in evaluating coverage in the two operations. 9/

D. Relationship with other statistical investigations

36. Principles and Recommendations explains the relationships between the censuses of population and housing and other statistical investigations such as the censuses of agriculture, establishments and buildings, and the system of civil registration and vital statistics. 10/ These investigations are summarized below.

1. Census of agriculture

37. With the increasing integration of the systems of data collection, the relationship between the population and agricultural censuses is closer than before. This does not imply, however, that there should be an attempt to combine and integrate them into a single operation. Such an attempt has been made in a few countries, but generally there would be both conceptual and operational problems in combining the two censuses. The units in the two are different and the burden of investigation and inquiry on both the enumerator and the respondent would be very great.

38. The unit of enumeration in the agricultural census is the holding, which is the economic unit of agricultural production, while the units of enumeration in the population census are the household and the individuals within the household. Nevertheless, information obtained from the population census on persons engaged in agriculture as an occupation or in the agricultural industry supplements that obtained from the agricultural census. It must be noted, however, that when the investigation is limited to determining only the principal economic activity of each person with reference to a short time-reference period, the population census may not identify persons involved in agricultural activity only incidentally during the reference period nor those so involved during a time other than the reference period. It will therefore be useful to include in the population census a question on economic activity with a longer time-reference period so as to identify all persons engaged in some agricultural activity.

39. The population and housing census can also be of use in organizing the agricultural census. The information from a recent population and/or housing

census can be utilized for demarcation of enumeration areas, preparation of the frame for the agricultural census and design of the sample wherever a complete enumeration is not envisaged. To be able to so utilize that information, the appropriate linkages must be incorporated in the population and housing census. While planning that census, it must be considered whether some information that would facilitate preparation for a subsequent agricultural census can be collected. For example, the population and housing census can identify households with agricultural holdings. In addition, households that are involved in agricultural activities not necessarily associated with landholding, such as rearing of poultry, animal husbandry and apiculture, can be identified.

40. It is important that the relevant definitions used in the population and housing census and those used in the agricultural census be compatible so that the results of the two censuses can be used jointly. In particular, if an agricultural census sought to collect information on some demographic or social characteristics of persons involved in agricultural activity, it would be desirable for that agricultural census to adopt the same definitions and classifications of such characteristics as were adopted in the population census, thereby permitting a high degree of comparability between the results of the two censuses.

2. Census of establishments

41. Information on industrial and commercial establishments is generally not part of a population census but it may be possible to use some of the information that is collected on the economic characteristics of individuals in preparing lists of establishments. Lists of, and (in an elementary form) information on, such establishments can be obtained in the housing census. The listing of establishments obtained through the census can be used for carrying out a subsequent census of the establishments themselves. However, most countries maintain registers of those establishments in which more than a specified minimum number of persons (generally 5 or 10) are employed. It will therefore usually be necessary to obtain information through the census only on smaller establishments, particularly those operated by single persons or the self-employed. It is obvious that because this information tends to become out of date very rapidly, it must be available immediately after the census is completed.

42. The information that is required from the census of population and housing for the census of establishments is the type of industry and status in employment (as, for example, employer or own account worker) of economically active persons, the name and address of the establishments concerned if available and, in the case of employers, the number of employees. If such complete information is available, the information relating to small employers and own account workers can be extracted during processing. Usually addresses and the direct relationship between a person as employer and his employees will not form part of the information from the main census schedule. Such information could, however, be collected through the use of a separate schedule relating exclusively to industrial and commercial establishments that might be canvassed as part of the census enumeration. However, it must be noted that such inquiries add to the operational costs and management requirements.

3. Census of buildings

43. The housing census covers all structures and buildings, residential and non-residential. Such a complete listing will be necessary in order that, for the purposes of the population census, occupied buildings may be identified and all living quarters located. The comprehensive list so obtained will provide the frame for carrying out a detailed census of buildings. The frame of buildings can be used for generating separate frames for special surveys of specific categories of buildings such as schools, hospitals and hotels.

44. The canvassing of a building or housing schedule is sometimes carried out as part of the housing census. Information on housing conditions such as materials of construction of the wall, floor and roof; year of construction; number of rooms; and availability of essential facilities, for example, water-supply, power and fuel, can be obtained through the use of appropriate questionnaires. Such information, in combination with the relevant population parameters, will be useful for evaluating housing conditions, estimating housing stock and formulating a housing policy.

4. Civil registration and vital statistics

45. Population census data serve as denominators for the computation of vital rates. Census results, adjusted by current vital rates and migration statistics, are an essential input in the estimation of future size, distribution and other characteristics of the population at national and subnational levels. Furthermore, census data on fertility serve as a benchmark check on the validity of current birth statistics. It is therefore desirable to develop and maintain close consistency between the census and civil registration system with regard to concepts, definitions, coverage, classifications and tabulations of common characteristics. If there is a regular system for obtaining migration statistics, such consistency must be maintained with respect to that system too.

46. In some countries, individual census returns for infants under one year of age have been linked with birth registration reports of the year preceding the census date as a means of checking on the completeness of the census and the civil registration system. Linkage of death reports with census returns has also been attempted for the purpose of comparing the information on the characteristics of the deceased as reported in the two systems. The difficulties of large-scale one-to-one matching of records of events in two different systems should not be underestimated, but the increasing adoption of computerized systems of maintenance of data will mitigate those difficulties considerably.

47. The census provides information on the distribution of population. This information is useful for deciding both the number of registration centres that will be appropriate in a given area and their location. In particular, in large urban areas the local authority will be able to provide such centres based on the distribution of population by wards or divisions within the urban area.

E. The census and the system of population registers

48. A population register has been defined as "an individualized data system, that is, a mechanism of continuous recording, and/or of coordinated linkage, of selected information pertaining to each member of the resident population of a country in such a way as to provide the possibility of determining up-to-date information concerning the size and characteristics of that population at selected time intervals ...", 11/ the organization as well as the operation of the mechanism having a legal basis. In some countries, the population census has been used as the basis for establishing the system of continuous population registers. Maintenance of the population registers is very much dependent on the existence of an efficient and complete civil registration system for the recording of live births and deaths that will enable the continuous updating of the registers. If a system of population registers already exists, the census lists (subject to stipulations in the census law relating to the maintenance of confidentiality of individual information recorded in the census) could be used to cross-check the accuracy of both systems.

49. The census of population and housing and the population registers are complementary systems. The population and housing census can provide the demographic, housing, social and economic data not provided by the population registers. Similarly, the registers can yield information on characteristics not included in the census. However, even though the two systems are closely interlinked and include many identical items, in most countries one is scarcely a substitute for the other.

F. The census and other major data-collection activities: relative advantages and disadvantages

50. In recent decades most national statistical agencies have built up the capacity to collect and provide statistical data of acceptable quality at the macro level. Socio-economic data at the macro level are useful to Government for formulation of national plans for development and broad programmes within the overall plans. However, with larger investments in development, there has been an increasing demand for socio-economic statistics at the small-area level. Systems for the collection of information on some socio-economic characteristics of the population at the small-area level exist in most countries in varying degree. Such systems would include the census, the civil registration and vital statistics system, large-scale sample surveys, population registers and the administrative reporting systems. It is generally recognized that one of the unique features of the census is its ability to provide information on a variety of characteristics at the small-area level, but the other systems also have this ability to some extent. In order to be able to appreciate the utility of the census in this regard, it would be useful to consider the advantages and limitations of these systems as sources of universal statistics at the small-area level. 12/

51. The three major methods of collecting data for small areas on characteristics of the population, apart from the population registers, are the civil registration system, sample surveys and the census. In assessing the relative utility of these systems with regard to the availability of data for small areas on the size and socio-economic characteristics of the

population, some general considerations must be kept in mind. The focus of each of these systems is different and therefore the range and extent of data that each provides vary, depending on the data needs of the client departments or other users, as well as the purpose for which the data are used. Though all the systems require careful monitoring and supervision, some lend themselves to easier and more effective control. While all the systems, if they have to produce useful data, require some optimum levels of technical competence and administrative support, the degree to which such competence and support are necessary varies, with corresponding implications regarding structures and costs. Each of the systems produces useful data but because the range of characteristics on which information is available varies among them, no one system can satisfy all data needs. Some, however, are able to meet larger demands than others.

52. To achieve a successful civil registration system, an extensive administrative structure has to be built up and maintained on a continuous basis, with registrars at the field level who are easily accessible to persons having to report vital events. Normally, the registrars are part-time officials or officials of other departments to whom registration duties, apart from their normal functions, have been assigned. This type of administrative structure, while keeping staff costs lower than those of a full-fledged registration hierarchy, is not generally conducive to efficient management or effective control. The effectiveness of the civil registration system is also dependent on the perception of the public regarding its utility. In quite a few countries, the benefits of the system are not readily apparent to the public and the reporting of events is therefore likely to be inadequate. The adequacy of the number of registration centres, their convenient location, the extent of documentation that is prescribed and the costs of registration, if any, are additional factors that strongly influence the completeness of reporting of vital events. This is a system whose effective establishment requires considerable time and legal constraints are scarcely likely to improve compliance. In contrast, a population census, while as extensive in terms of geographic spread as the civil registration system, is a single effort carried out once or twice per decade. Consequently, technical and administrative resources can be mobilized and concentrated on the census and strong control mechanisms established for its duration. These advantages are also shared by sample surveys. The sample survey, and the census to a lesser degree, are activities that can be controlled and supervised more effectively than the system of registration of vital events. Also, public interest and involvement in a census or a sample survey can be evoked and sustained owing to the short duration of those activities. In the civil registration system, such interest and involvement will be dependent mainly on the public's perception of the utility of the system and its continuous and efficient management.

53. The primary purpose of the civil registration system is to meet juridical needs. It is mainly a source of data on births and deaths and, in many cases, of marriages and divorces as well. The variety of information that that system can provide is, however, limited. In particular, it cannot provide data on migration and on the size of the base population; it is relatively inflexible to changes in procedures or content and, because it is a continuous activity on an extensive scale, requires constant administrative efficiency. Therefore, though the civil registration system could provide data at the small-area level, the data would relate to restricted characteristics.

Similarly, sample surveys cannot normally provide data at the small area level for all such areas. The area for which data from a sample survey is available will depend on the size of the sample, but such a survey is generally not intended to provide data for small areas. In contrast, a census will be able to provide data for the smallest-area levels and the information will be comparable among areas because it refers to a common point of time. By definition, a census is an operation with the essential features of universal territorial coverage and simultaneity, one of its primary purposes being to provide data at small-area levels. Subject to the need to maintain comparability of data on essential characteristics from one census to another, the content of a census is flexible, and flexibility of content is an advantage.

54. None of the three systems are error-free. In the census and the civil registration system, sampling errors are absent because the entire population is included. Results of sample surveys, however, are subject to sampling errors. The sampling errors are calculated and generally provided together with the results but they are especially important when detailed cross-classifications are undertaken. The three systems are subject to errors due to undercoverage, underreporting and non-response. Among the three systems, sample surveys lend themselves better to control and supervision for the purpose of reducing such errors. The scale of operations of the census and the very short period over which enumeration is conducted set limits to the degree of control that can be exercised. The vital registration system has similar constraints due to its decentralized structure and, in many cases, lack of a unified hierarchy.

55. Some of the important advantages and limitations of the three systems are summarized as follows:

(a) A well-organized civil registration system can provide data for small areas. It has institutional continuity and will provide both long- and short-term time-series data. Detailed cross-classifications are possible. However, a civil registration system is difficult to organize and administer at peak efficiency in a short span of time and does not yield data on population size. The range of characteristics on which information can be collected is generally restricted. The scope for making changes in procedures or content is very restricted since such changes will disturb the continuity of the system. In many countries the system has yet to be established on a firm footing;

(b) A sample survey yields data on population size and on related characteristics simultaneously. There is flexibility regarding the topics that can be investigated and the depth at which the inquiries can be made. Administrative and technical control can be of a high order. If conducted periodically, a sample survey will provide time-series data. However, it cannot provide data at the small-area level. Extensive and detailed cross-classifications cannot be made since these will be subject to large sampling errors;

(c) A census provides data at the smallest-area level. Extensive and detailed cross-classifications are possible. A census simultaneously provides data on the size of the population and its related characteristics. Time-series data over long periods of time are available at national, regional and small-area levels. On the other hand, a census is expensive to conduct

and therefore cannot be held at short intervals. Due to operational constraints, the range of topics and depth of investigation are often restricted. A census is comparatively difficult to control and supervise.

56. Population registers have both administrative and statistical uses. ^{13/} They provide information for estimations of population and preparation of migration statistics, and are useful for planning and evaluating a census. They also provide a frame for sample surveys. The population registers, where they are well maintained, can provide data at small-area levels on the characteristics for which information is collected in the registers, including the size of the population. One of the advantages of population registers is that aggregate data at various area levels on the characteristics covered can be obtained at any time. The utility of population registers is considerably enhanced through linkages with other systems that record information on individuals. Sometimes, the same office may be responsible for recording events or information on different characteristics, which will facilitate continuous updating of the registers.

57. The establishment and maintenance of a permanent system of population registers that will provide information on a wide range of characteristics calls for a high degree of administrative organization and adequate funding. These conditions are not always met, and the result could be a considerable reduction in the accuracy of the registers or in their utility. In comparison, a census will be comparatively more convenient to conduct since, as stated earlier, it is a single massive operation conducted at long intervals. However, it would be useful for countries to explore the possibility of establishing the system of population registers, not necessarily as a substitute for the census, but for the other purposes that system serves.

58. Administrative reporting systems are a major source of information on a wide range of items. Administrative data are a by-product of the reporting systems within Government of ongoing and regular activities. Administrative reporting systems are an abundant source of information on a variety of characteristics of the population (apart from information on other aspects relevant to administration) and that information is available at regular intervals. Coverage by those systems generally yields data at the small-area level. However, there is little consistency in the concepts and definitions adopted by different agencies for even the same broad characteristics, the periodicity of reporting and levels of aggregation are not always uniform, and there is little attempt to evaluate the validity of the data with the same rigour employed in a survey or in the census. "The problem in utilizing administrative data for statistical purposes is to take advantage of its abundance, without becoming overwhelmed by irrelevant and inconsistent detail". ^{14/} In those cases where information on individual characteristics is available, that information could be used for cross-checking the information recorded in the population registers. It would be valid to state that the availability of administrative statistics on characteristics of the population does not, for the reasons mentioned, in any way diminish the need for the census.

59. The advantages and limitations of the various systems for obtaining data for small areas on as wide a range of characteristics of the population as possible and relating to the same point of time will have to be viewed in the

context of a given country's situation regarding availability of and need for data on a variety of socio-economic facets of the population, existence of technical and administrative skills and assurance of adequate funding. For most countries, the census continues to be the most dependable and feasible source for such data, its ability to provide comparable data at the small-area level on a variety of characteristics being its outstanding advantage. In most countries, it is more possible to muster the necessary technical, administrative and financial resources for a single major national operation like the census than to develop and maintain efficient, continuously operated statistical systems that will provide information on a universal basis. Therefore, till such time as most countries have developed the capability to organize and maintain an efficient population register system or other systems for providing relevant information that, in combination, yields data for small areas on designated characteristics of the population, the census will continue to play an important role as the major source of such data.

G. Utility of census data

60. The primary objective of a census is to gather and provide detailed information on specific characteristics of the population and housing at a given point of time. In the modern setting, census data have innumerable uses and a varied clientele that includes Government, business and industry, social and economic research and - a recent development - the political lobbyist. However, Government continues to be the single largest user. Some of the uses to which census data are put are indicated in the paragraphs that follow.

H. Use of census data in development planning

61. The census provides data on important demographic, social and economic characteristics of the population and housing at all levels of planning. Such data, in combination with macro data from other sources, form the basis for formulating policies for economic and social development at the national and regional levels, while census data at the micro level are a very important input in formulating programmes for development, within the larger framework of national and regional plans, at the small-area or local levels. The particular features of census data that render them useful in the formulation of development plans are comprehensiveness, comparability and availability at the small-area levels and at other levels of area aggregation. The utility of census data on population and housing is enhanced when information is collected simultaneously on the availability to each household of basic needed items such as drinking water, fuel, schooling, health facilities, transport and sanitation, as well as other items that may, at a given point of time, be relevant to the country.

62. In formulating policies for national development, census data are utilized for various purposes. These include:

(a) Assessment of the current levels of and differentials among important population and housing characteristics and evaluation of the availability of basic household needs in key sectors. The assessment can be carried out at various area levels and helps in the identification of disadvantaged areas and the setting of priorities for action plans. One

important result of such an exercise is the indication it provides of the relative emphasis that should be placed among different programmes in a particular local area;

(b) Evaluation of the benefits of development programmes at the small-area level over a period of time. Such an evaluation will be an important input in the measurement of progress in the basic sectors of development. In conjunction with indicators from other statistical sources, an indication will be available of structural changes that may be desirable in the development plan. Census data, as a series, are very useful for assessing the impact of programmes relating to literacy, employment and manpower, rural development, family planning and the like;

(c) Assessment of manpower resources. The census is a major source of information on the size and other characteristics of the labour force. National policies for enhancing educational levels and skills in the population draw on census data for an assessment of current levels and for deciding on content and priorities of programmes. Even where there is no specific population policy as such, the size and distribution of population and its characteristics are elements that influence development options. The natural growth rate of population and net migration rates available from the census are important elements in assessing population trends. Knowledge of these trends is essential for the preparation of long-term-perspective plans;

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(d) Assessment of the current demographic and social situation. Such demographic and socio-economic characteristics of the population as its size, skewed age structure, distribution and density by regions and by urban and rural areas, and rate of growth are sometimes matters of importance. The particular characteristics that may be of current concern will vary from country to country, as will the extent to which public intervention may be considered necessary. The data provided by the census on these characteristics will be an important input in the preparation of a framework of social statistics for the identification of such areas of concern, the assessment of the current situation and determination of suitable policies;

(e) Planning of social welfare programmes. An important component of economic and social development is the establishment of social welfare schemes, including such measures as social security, income support and social insurance for dependent population groups. Data on the population characteristics relevant for planning of such social welfare programmes will be provided by the census. For example, information on distribution of population, inter alia, by specific work characteristics, age group, educational level and housing conditions, combined with data from other sources to the extent necessary, will be essential for identification of special groups needing support from social security measures and for formulation of appropriate policies for specific beneficiary groups. Often, therefore, the scope of the census is extended to collect detailed information on aspects relating to the socio-economic condition of the people;

(f) Improvement in the social and economic status of women. In recent years there has been universal recognition of the disparities that persist in the social and economic status of women. Such disparities are rightly viewed not as an issue that calls for social welfare measures, but as a fundamental question of the role of almost one half of the population. As a consequence,

Governments have been paying increasing attention to the availability of information regarding women for formulation of special programmes for women and integration and expansion of existing development activities to enhance the role of and benefits to women. The census provides much data even with conventional tabulations, while an enhanced tabulation plan would provide more varied input for such policy formulation. The definitions of key characteristics may also need review, so that more representative data on women can be obtained. The importance of the census as a source of data for such specific policy interventions is apparent;

(g) Identification of special population groups. Concern has been increasing regarding both the socio-economic status of special population groups such as children, youth, the elderly and the disabled and the need to develop appropriate indicators useful for formulation of special programmes for their benefit. Special tabulations of census data can be obtained for those groups for the purpose of evaluating their current situation and for projecting future trends. Such information, combined with data from other relevant sources, will provide the framework for developing appropriate policies for special population groups;

(h) Formulation of housing policy and programmes. The housing census provides benchmark data for assessing current levels of housing stock and its characteristics. The housing census must be so structured as to provide the data on the specific characteristics of housing stock needed for this purpose. In most countries, Governments will want quantitative data on the housing stock, data on its distribution by regions and the lowest administrative area levels, and information on the characteristics of housing, as the minimum requirement for an assessment of the current housing situation and for the formulation of a housing policy. Changes in the housing stock and its characteristics over periods of time can be evaluated to assess housing deficits and requirements. Combined with the data on population size and growth rates, projections of housing needs can be made. Based on the changing characteristics of housing materials, the demand for such materials can be assessed and the implications relating to the relevant industrial and investment policy worked out. Since not all the information necessary for assessing housing conditions and needs will be available from the housing census, special surveys may have to be conducted to supplement census data;

(i) Formulation of policies for investment of development funds. The distribution of population strongly influences decisions on the allocation of funds and the scale of investment in major sectors of the economy such as housing, water-supply, transportation, educational and health facilities, banking and communication services. There is scarcely any sector of the economy that is not influenced by the regional differences in population size. The data from the census on population size and its distribution provide the underpinning for most of the investment and location decisions relating to services. In particular, the census is the major source for information on the scale and trends of urbanization and the differential rates of growth of the urban areas. Such information helps in formulation of rational policies relating to urbanization and the maintenance of due balance in the allocation of resources between urban and rural areas.

I. Other uses of census data

1. By Government

63. An important administrative use of census data is in the demarcation of constituencies for electoral purposes. Detailed information on the geographical distribution of population by voting age, which is indispensable for this purpose, is provided by the census.

64. Governments also use census data for classifying and designating areas as urban or rural, for defining metropolitan areas or urban agglomerations and also for redrawing territorial jurisdictions of regions, districts and other administrative areas. The allocation of federal funds is often based on the size of populations of the regions, among other factors.

65. Local authorities find census data very useful for planning of services in their jurisdictions, including creation of new housing colonies, transportation, educational facilities and water-supply. The division of urban areas into wards for convenient municipal administration is usually based on the census data relating to distribution of population within each urban area.

66. The uses to which census data are put within Government are innumerable. Many policies and programmes of Government depend on the availability of census data for their formulation and evaluation. The use to which the data can be put will necessarily be dependent upon the range of characteristics they cover, the manner of presentation and the capacity to utilize the information presented. With the adoption of computerization in increasing degree, most development and administrative departments within Government find in the census an enormous and very useful database.

2. For research

67. The census of population and housing is a rich source of data for demographic, social and economic research. It provides comprehensive information at national, regional and local area levels on the size, distribution and composition of the population. In addition, most censuses provide data on migration and fertility. Indispensable data are available for the study of the composition, distribution and growth of population; of the patterns of rural/urban distribution; and of trends in urbanization. The population differentials by occupation and educational levels, fertility and age characteristics and economic characteristics can be studied at various area levels. The research uses to which census data can be put are indeed innumerable and quite often the conclusions of such research are useful to Government too.

3. By business

68. In the business world of today, decision-making has a high analytical content, with considerable reliance on factual information. Estimates of consumer demand in an expanding market situation require reliable information on the size of population at subregional area levels and its distribution by

sex and age, since these characteristics heavily influence the demand, inter alia, for housing, clothing, household goods, recreational and entertainment facilities, medical services and supplies, and communication and transport requirements. The location of industrial and business houses is often decided on the basis of such census data. In a decision on the location of a new plant, the size and composition of the prospective labour force will be relevant factors. Media houses also use census data extensively for determination of the characteristics of target groups. The data from the housing census is also used by those involved in the construction sector such as financing institutions and manufacturers of building materials and household goods.

J. The census and other statistical inquiries: operational issues

69. The utility of maintaining as much uniformity and comparability as possible in concepts and definitions in the census and other statistical systems scarcely needs emphasis. Statistical investigations, especially the census, are expensive operations and it would be most unfortunate if data from different sources could not be used in combination. It is desirable that the procedures for collection of vital statistics through the civil registration system, through sample surveys and other large-scale statistical activities, and through the census be coordinated with regard to coverage, definitions, classifications and tabulations so that fullest possible complementary use of information from different sources is ensured. Where permanent population registers exist, similar consistency should be established between the census and the registers. The advantages of maintaining such technical coordination are many, including that of being able to evaluate the results of the different systems by inter se comparison.

70. In planning the census, consideration should be given to the possibility of collecting the information necessary for generating a frame for other types of censuses or sample surveys. Such frames will relate to listings of buildings, living quarters, industrial or commercial establishments and agricultural holdings. However, the preparation of such frames must be recognized as incidental to a census and not necessarily a main objective. In other words, the preparation of such detailed frames must not result in overburdening the census, in which case all that the census can provide will be a simple frame.

71. National considerations such as convenience and lack of finances or technical staff will doubtless decide whether censuses can be combined. For example, the combination of the agricultural census and the census of population and housing has been attempted in some countries as representing an optimum use of resources. However, while there is certainly an advantage in combining the censuses of population and housing, there can be difficulties in combining other types of censuses with the census of population and housing. Administrative difficulties of organizing and managing two such large operations simultaneously should not be underestimated. The system of training and control could be overstrained by attempting to convey too many difficult concepts to the enumeration staff on topics that did not seem interrelated to them. It may be preferable to space out the censuses. The census of agriculture, for example, can follow the census of population and housing. The concern at all times should be to conduct the census with peak

efficiency, without allowing the strain on the organization to have a detrimental effect on the results.

III. PLANNING THE CENSUS

72. The census is an extensive, complicated and expensive statistical exercise. In planning the census, past experience is no doubt a valuable guide. However, since the census is undertaken once in a decade or every five years, conditions are likely to change so substantially between two censuses that each new census requires an almost totally new plan. Also, the focus of a census can partially change, particularly with regard to the economic and social characteristics and topics not investigated earlier but requiring attention at the time of a subsequent census. Planning the census is therefore the first critical step. In carrying out a census, the importance of very careful and adequate planning cannot be overemphasized.

73. From the preparatory stages, through the enumeration and till the final publication phase, the census consists of a series of distinct but closely interlinked activities. Each of these activities has to be carried out according to a well-planned calendar or timetable. It is essential to ensure that each of those diverse activities takes place in a proper sequence and at the time it should be carried out. The close linkages that exist between the various activities will preclude the undertaking of some without the completion of a previous one. For example, training of the staff cannot be undertaken without the training material's being ready, which is itself dependent on the finalization of the questionnaires and manuals; but questionnaires and manuals cannot be printed unless arrangements are made well in advance to obtain the required quantity of paper, those arrangements implying that an assessment of such a requirement was made based on decisions regarding questionnaire content and size. If this sequence of linkages is extended, it will be apparent that all activities making for a successful census are so closely dependent on each other that no one activity can be performed in isolation. Even small oversights in planning the census can result in serious difficulties that could affect the quality of the results or the costs.

74. There is no fixed or uniform approach to planning a census. The content, methodology and financial outlay on a census and the magnitude and complexity of each of the activities within it vary from country to country. The factors that can determine these variables include, among others, (a) estimated population size and pattern of settlement; (b) ethnic composition; (c) linguistic unity; (d) degree of literacy; (e) availability of transport and communications; (f) existence of recent and reliable cartographic material; (g) presence of sufficiently effective and widespread administrative agencies that can be inducted into the system; and (h) availability of adequate technical personnel for planning, preparing for and carrying out the census. The costs of a census are also dependent on the need to import any necessary materials (if these are being paid for from the foreign exchange resources of the country), such as paper for printing and cartographic equipment. The presence and influence of these factors doubtless vary from country to country.

75. It is conventional to consider the census as consisting of three stages: pre-enumeration, enumeration and post-enumeration. The pre-enumeration stage is the preparatory phase and consists of the following elements:
(a) establishing the legal basis for the census; (b) budgeting;

(c) formulating the census calendar; (d) establishing the administrative organization; (e) mapping (cartographic) work for demarcation of enumeration areas and identification of small areas; (f) preparing questionnaires; (g) testing censuses; (h) planning enumeration; (i) planning tabulation; (j) planning for data processing; (k) recruiting and training staff; (l) preliminary listing of living quarters and households; and (m) communications activities, including census publicity. The enumeration stage consists of canvassing the census questionnaires, while the post-enumeration stage consists of evaluation surveys, data processing, analysis of the data, dissemination and publication of the results, and promotion of the utilization of those results.

76. The various activities indicated as making up the different stages of a census are not entirely separate chronologically or mutually exclusive. They are, on the other hand, very closely linked and very much interdependent. The success of the census will depend on how well those activities have been integrated into a well-formulated - and efficiently executed - plan of operations, but it must be recognized that an outstanding plan will not by itself guarantee success though of course a weak plan will almost certainly result in disaster. The preparation of an adequate census plan requires time, strong technical input and an assurance of adequate financing of operations. A census cannot be organized and conducted at short notice: a deus ex machina approach would be most inappropriate. Mainly owing to late commencement, pressures to shorten the timetable often build up. While some short cuts may be possible on occasion, undue haste combined with insufficient technical support can be both wasteful and self-defeating and result in unreliable or seriously deficient data, which would, in turn, tell upon the very credibility of the census organization. The preparatory stage for a census must therefore commence well in advance. Its duration will depend on whether there is a permanent census organization that can commence planning the census, the availability of technical staff, the scope of the census, whether the housing census will precede the population count or whether these will be a combined operation, and related issues. In general (if experience is any guide), the preparations for a satisfactory census must commence at least three years in advance if a permanent organization exists or earlier if such an organization does not exist.

77. The main elements of each stage of the conduct of a census are discussed in the chapters that follow.

IV. CENSUS LEGISLATION, BUDGET AND ORGANIZATION

78. A census is an investigation that covers every individual and housing unit in the country. The results of a census are important to those it includes within its ambit because many administrative issues and socio-economic programmes that could provide benefits to these individuals turn on those results. It is therefore important that the census operations be efficiently organized and conducted and that there be an assurance of public involvement. These requirements will be met only if the census is conducted under appropriate legal authority, with adequate funding so that all stages of the census are carried out efficiently and through organizational structures that are able to conduct it in the manner desired. These three aspects, namely, census legislation, budget and broad organization, need consideration.

A. Census legislation: nature and content

79. In order to be able to function effectively, the census operations must be supported by appropriate legislation. If such legislation does not exist, it must be enacted well before the operations commence. Without statutory sanction, the census authority will not be competent to ask for information, nor will the public be under any obligation to respond to questions. The allocation of funds for the various components of census-taking will be facilitated if the legislation exists. Therefore, one of the very first steps that must be taken in organizing a census is the enactment, if it does not already exist, of the necessary legislation.

80. Country practice with regard to legislative measures will determine the manner in which the legal basis for the census is established. The legal authority to take a census may be incorporated in existing laws relating to the collection of statistics or it can be a separate law by itself. Where no permanent statute exists, special laws governing each census will have to be promulgated or special statutory notifications issued permitting and authorizing the taking of a census. The disadvantage in the latter system is that the periodicity of the census is not statutorily specified: censuses need not be held at set intervals or can be postponed indefinitely. It is recommended that for a given country the existing system be reviewed and that, wherever no permanent legislation exists, the following be considered: incorporating the necessary provisions relating to the census in the existing law relating to statistics or enacting a separate census law as may be appropriate within the legal system and practice of that country. If the authority for the census is already provided in an existing law, the adequacy of the provisions should be examined well before a census is taken to determine whether the stipulations in the law are sufficient or need amendment or updating. Such a review will be specially necessary in cases where the census legislation has been on the statute books for a very long time with no amendments or revisions.

81. The legislation governing the census should, among other functions, provide for (a) organizational matters, (b) operational flexibility, (c) public obligations, (d) maintenance of confidentiality and (e) general principles of access to information.

1. Organizational matters

82. The broad aspects relating to the organization of the census must be indicated in the law. The law must authorize the taking of a census and specify its periodicity. It must also provide for creation and designation of the central census authority, indicate the ministry within Government that will oversee the census authority, endow it with the necessary powers to organize and conduct a census and specify its relationship with other departments for this purpose, and lay a responsibility on those assigned census functions to perform those functions without question. The law will also have to contain provisions governing the administrative powers of the census authority in areas including disciplinary matters and punishments for non-compliance with orders of that authority. In addition, provisions relating to budgetary support for the census could be included.

2. Operational flexibility

83. The census law must, for operational convenience, provide for organizational and technical flexibility. The problems that may arise in carrying out a census cannot always be envisaged very much in advance. Similarly, the subject-matter of the census inquiries, while possessing the essential characteristics that are common to most series of censuses, may have to include items that are of special interest to the country at the time of a particular census. The incorporation, then, of provisions relating to type of data, manner of their collection or organizational structure to be erected that are too rigid or highly specific would be undesirable. It will be operationally convenient if the census law permits the issue of appropriate notifications or orders on such technical or organizational matters. The power to issue such regulations, along with the matters on which such regulations can be issued, could be incorporated in the census law.

84. Planning of the census, development of concepts and questionnaires, budgeting, specification of staff structures and laying down of administrative procedures are generally the function and responsibility of the central office. However, in the operational phase of recruitment and field management considerable delegation of authority will be necessary. The census law must permit such delegations by regulations. While referring to many of these matters to the extent necessary, the law may leave the detailed stipulations to be specified in regulations issued under the main statute.

3. Public obligation

85. The law must place an obligation on all persons to provide information, with a specification of penalties for non-compliance. While the realities of census-taking would indicate that the penal provisions should rarely be invoked, the inclusion of those provisions will be necessary to deal with extreme cases of obstruction to the census operations. In this context, it is relevant to note that offenses under the census law should be matters for summary proceedings and not be subject to the usual judicial procedures, which are generally long-drawn-out. Even if convictions were obtained, the impact of punishments would not be felt in the relatively short time over which the

operations, especially the enumeration, were conducted. The law will have to provide for the establishment of such summary procedures.

4. Confidentiality

86. The extensive use of population statistics for various purposes (administration, policy guidance and research, among others) has enhanced the demand for data that are not merely more detailed but cover new facets of the population. Consequently, the scope of the census has considerably increased in some countries. This, in turn, has enhanced public awareness of census inquiries and generated concern regarding issues of confidentiality and privacy. Therefore, a very important provision that the census law must contain will relate to the confidentiality of the information collected.

87. Since the success of the census is ultimately dependent on public cooperation, to establish public confidence the confidentiality of the individual information should be clearly stipulated in the census legislation and guaranteed by adequate provisions. An assurance in the mind of the public that personal information available from census records will be used only for statistical purposes and not for general administrative purposes such as determining tax or military service obligations nor even as a cross-check of individual data in other records will evoke its support for the census and ensure a ready and full response. It is important to note that there will have to be a recognition of the need to maintain confidentiality and restrict access to and use of individual census data within the Government itself. (It is sometimes considered that since the Government has the right to collect individual information for the welfare of the people, it also has the inherent right to use that information either in aggregated form for the common good or in individual detail for administrative purposes. Use of that information in the latter form must clearly be avoided.)

88. Appropriate procedures must be established for maintenance of confidentiality at every stage of the operations - from the initial stage of mapping to the final stages of data processing, release of data and publication. No individual details should be published or released nor should it be possible to identify such details. Obviously, the procedures for maintenance of confidentiality at each of the various stages will be different but the appropriate control and supervision mechanisms must be developed and instituted very early. It will be necessary to stipulate that only those within the census organization will have access to individual data. There will also have to be provisions for penalties for wilful disclosures.

89. In order to maintain confidentiality, it will also be necessary to provide the original records with immunity against litigation. It is particularly necessary to stipulate that original census records cannot be summoned for scrutiny by courts or for use as evidence in any proceedings, civil or criminal, before them.

5. Access to information

90. The law should permit use of the data in aggregated form, the level of aggregation being so selected as to maintain confidentiality. General

stipulations can be included regarding use of census data in an appropriately aggregated form and release of information to research institutions, other government departments, individual research scholars and other users.

91. Census information is collected with great effort and at a relatively high cost. It would be most unfortunate if the wealth of data that the census yields was not fully exploited. Therefore, the law must permit the maximum use of the data, with reasonable restrictions, and state the uses to which the data can be put for administrative purposes such as, for example, the cross-checking and updating of population registers, and the more intensive employment of the frame of living quarters or households for the carrying out of other surveys or investigations.

B. The census budget: its features and content

92. The census is unlike the usual activities in Government that are carried out year after year according to fairly set procedures. In the census, there is a preparatory stage followed by a few years of intense activity that includes cartographic work, enumeration, data processing and publication, after which there is a fall in staff strength and material requirements. Also, the components of activity change over the entire span of a census. The preparatory stages include, among other activities, the building up of the organization, followed by cartographic activities and the listing of living quarters; those stages are followed by the enumeration. Thereafter, the character of the work changes to data processing, publishing and dissemination of data, analysis and reporting, and record management. Those activities do not succeed each other in regular fashion but tend to overlap, particularly because preliminary planning of each distinct activity has to commence even while another is in progress. Such distinct changes in the nature of the components of a single operation or in the functions of a department are unique to the census and must be reflected in the pattern of financial requirements for carrying it out.

93. The following aspects of the census budget need particular attention:

(a) The budget should reflect the change in census activities from year to year. The outlay will vary from year to year, rising to a peak in the enumeration period and tapering off towards the end of the publication programme. If the census is to be successfully conducted and the results are to be fully exploited, these variations have to be recognized and there has to be an assurance of regular and adequate funding for each of the years from start to finish. Inadequate or delayed release of funds for any particular component will throw the entire sequence of activities that make up the census out of gear and seriously jeopardize the completion of operations;

(b) The census budget will be indicative at the beginning but will have to reflect changes each year. To enable the financial authorities to appreciate this feature of the census, including the scale of funding required over a comparatively short period of time, the census budget must be prepared well in advance and almost at the commencement of the preparatory stages. Such a preliminary estimate can be, at best, only an indicative one and will doubtless undergo modifications from year to year to adjust for reasonable changes in the scope of the census, staffing patterns and structures and

escalation of costs. Nevertheless, it will indicate clearly to Government the scale of funding and the annual allocations necessary and assist in a better appreciation of the overall budget requirements of the census and the time span over which the expenditure will be incurred. That the budget had to be revised each year to take into account escalations of costs, wages or equipment prices would ensure that the census operations did not suffer from inadequacy of funds at various stages because the funding or budgetary authorities in Government had not had a clear appreciation of the annual budget requirements of the census;

(c) The census budget should reflect the complete plan of action in detail. One of the primary initial tasks in the preparatory phase will be the drawing up of a work plan that, based on past experience or careful consideration, includes all the steps that have to be taken under each component of activity, with an indication of when each activity has to commence and end. That work plan will be the basis for preparation of the initial total budget estimates of the census, with the annual budgets being prepared at the appropriate time each year;

(d) The census budget must include all operational and administrative costs. It will be necessary both to take into account the costs relating to the general administrative staff needed to support the technical wings and to include all costs of equipment, facilities and supplies. Quite often, sufficient attention is not given to basic items such as office supplies, petrol and transportation charges, telephones and rents for buildings, and this insufficiency of attention can hamper the efficiency of the operations. In general, for each specific activity, the budget should be based on number of employees required by type of work, salary scales and duration of employment; equipment required and cost of creating the facilities for installation and use of the equipment; requirements of office and storage space, duration of need and rents; vehicles and special equipment such as boats and communication equipment; maintenance charges of all assets and running costs; and general office supplies. There may be other costs, too, that must be taken into account. Outlays on publicity, printing and dissemination of publications, meetings of data users and technical conferences must be included. If advisory technical committees are set up, the corresponding costs will have to be estimated and taken into account. These activities are crucial to the success of the enumeration and utilization of the results. If equipment is being imported at the cost of Government, the requirements of foreign exchange should be indicated separately. Even when equipment is funded by international or other foreign assistance, there may be some local costs, such as payment of customs duties and transportation to locations where the equipment will be used, that must be accounted for. The inclusion of these figures gives a more realistic assessment of the funding that will have to be found among national resources;

(e) Costs funded from sources other than the national Government must also be taken into account. Apart from the direct costs that are funded by the national Government, expenditure is also incurred on the census by other authorities such as regional Governments and local bodies including municipalities and other local-area entities. Unless such costs are being reimbursed by the national Government to those other authorities in full or in part, it will not be necessary to include them in the overall census budget because no appropriations are being asked for. The regional Governments or

other authorities will have gone through the same process of preparation of their partial census budgets to obtain necessary sanctions and allocations from their financial authorities for the expenditure they are likely to incur on the census. However, such costs, even in cases where they are not a direct charge on the national budget, must be taken into account for assessing the total cost of the census to the country, for reviewing the procedures for the funding of the census and for developing mechanisms for overall control of expenditure on the census.

94. It should be re-emphasized that the census work plan will undergo changes as the operations progress, and the budget will have to reflect those changes. The initial estimates will get refined as the work progresses because staffing patterns, equipment and other needs, and the corresponding costs will have been determined in clearer terms. Throughout the census operations, the budget will be under scrutiny, thereby giving both the census authorities and Government the opportunity to review periodically the progress in census activities.

95. The overall budget of the census should not be considered as inviolate and immutable. Technical and other considerations may call for changes in census content, procedures and, for that matter, methodology. New conditions or new ideas may arise that compel a change for highly valid reasons. While the need for any such change will doubtless have to be subjected to the most rigorous examination, the fact that a budget has been prepared should not be a factor inhibiting changes that after very careful evaluation are considered eminently desirable and urgently needed. As long as decisions have a sound technical and administrative basis, that budget follows census content should hold, not the converse.

96. Despite the increasing interest in census data by social, marketing research and other organizations, both public and private, the Government is generally still the single largest user of census data. Within Government, while census data continue to be used for administrative purposes, the use of census statistics in the formulation of development plans has increased considerably. The recognition of the utility of the census for planning must be reflected in the development plan itself. The census must be considered part of development activities and the necessary allocations of funds for the census must be included in the overall plan that covers the period of the census and in the relevant annual plans. In other words, the generally prevalent view that the census is an ad hoc exercise must be replaced by the view that it is part of the regular planned statistical activities normally included in development plans.

C. The census organization: general considerations

97. A population and housing census is the single most extensive, complicated and expensive statistical operation that a country undertakes. Therefore, the structure of the organization responsible for the conduct of the census and that organization's placement in the overall framework of Government, its legal authority for organizing and carrying out the census and the budgetary support it receives are important issues. The character of the census organization within the administrative structure of Government is an important consideration.

1. Advantages of a permanent census organization

98. The utility of maintaining a permanent census organization has been recognized for a long time. 15/ Principles and Recommendations reiterates that "there are definite advantages in having an office continuously responsible for census work as an integral part of the statistical system of a country. Such an office assures continuity in census work and is the principal centre for the formulation of the programme and the initiation of preparatory work for the next census. Its permanency permits the development of specialized and experienced personnel and the maintenance of statistical and cartographic information essential for planning the next census". 16/

99. The establishment of a census organization just prior to each census is often time-consuming and involves repetition of the process of planning the operation ab initio. Often, because of the absence of any single authority responsible for maintenance of the records of a census, those records are not available when it is proposed that a subsequent census be taken. Again, in the absence of a permanent census organization, the professional staff are usually reassigned to other positions at the conclusion of the operations and not all of them are available for the next census. This results in loss of expertise. Such developments, though seeming to have only administrative implications, exact a cost in funds, time and expertise.

100. The desirability and utility of maintaining the census organization on a permanent basis must be viewed in the context of the role of the census in a modern statistical system and the continuing, long-term utility of census data. A population and housing census meets major requirements of the national statistical system. Its utility lies in the continuous and intensive utilization of the data, and such utilization will be very much reduced if there are no institutional arrangements for the preservation, retrieval and use of those data. The most appropriate institutional arrangement for this purpose is the census organization itself. This organization collects and tabulates the data and is familiar with their sources and limitations and with the retrieval systems. A permanent census organization would ensure optimum and continuous utilization of the data for national purposes.

101. The establishment of computerized data processing has added a new dimension to the issue. With increasing use of such technology, the possibilities of data preservation and retrieval are enormous. Experience has shown that the demand for census data has rapidly increased and will continue to do so. In most countries, this demand is continuous and not restricted to the few years immediately after a census. With the recognition within Government itself of the utility of census data in combination with other data for planning and monitoring purposes, the demands for census data have increased and will continue to increase. These demands must be satisfied and the trend they reflect must be encouraged, if the maximum utilization of the results of an expensive operation is to be ensured. The system of data preservation and dissemination able to cater to this demand for census data needs continuous supervision by the professionals familiar with both the sources and the utility of the data.

102. Census techniques have also been undergoing change. Enumeration procedures, use of sampling to expand the scope of the census inquiry and other elements need continuous evaluation and experimentation, which can only

be carried out between censuses. There is never enough time for such studies just before a census, with the result that innovation and improvement often seem impossibilities. Such methodological studies cannot be carried out in the absence of a permanent census organization.

103. A permanent census organization has the professional skills to carry out surveys and case-studies relevant to selected demographic and socio-economic aspects of the population in the period between censuses and thus contribute to the statistical information system. Its also being able to maintain and continuously update the cartographic frame would be of invaluable assistance for the next census and useful as well to agencies responsible for other large-scale surveys.

2. Structure and character of the census organization

104. The structure and character of the organization responsible for census operations are dependent on the administrative pattern that prevails in a given country. That organization can (a) form part of the central statistical office, (b) constitute an independent office or (c) be established as an autonomous body without the conventional departmental structure. Whether the census organization should form part of the central statistical office or constitute either a separate department or an autonomous body will be largely determined by the framework of the Government concerned, the administrative traditions that prevail and past practices. There are, as in any administrative structure, advantages and disadvantages connected with each of the three arrangements.

(a) Departmental structure

105. If a departmental structure is being adopted the advantage of locating the census organization within the central statistical office is that issues relating to technical coordination within the statistical system will be reduced to the minimum and that the statistical hierarchies, which are generally permanent, can be inducted into the census. However, such a structure, in which the census organization is a division of the central statistical office, may not be able to cope with both the scale and time constraints of the census, and it may be difficult to ensure day-to-day involvement of the head of the statistical office in census operations, as will be necessary. Such involvement will be possible if the census organization is set up as a separate department, and this may also permit more analytical and methodological activities between censuses than in the conventional structure. If the latter structure is adopted, there will obviously have to be very close coordination and cooperation between the statistical and the census offices. In particular, it will be essential to ensure that concepts and definitions used by the two agencies are consistent. It will be necessary to institutionalize coordination by the establishment of technical committees with a clear indication that the statistical office must be consulted and its concurrence obtained for those concepts and definitions.

(b) An autonomous body such as a quasi-independent commission

106. Such a body is sometimes called the national population commission or national census board. Its membership is generally made up of eminent persons

and may include representatives of the appropriate departments and ministries of Government. Those departments and ministries usually include the departments of finance, statistics, education, social welfare and economic affairs and similar agencies. The role of such a commission or board can be that of a full-fledged executive authority or an advisory commission. If constituted as an executive body the commission or board will assume full responsibility for the organization and management of the census and will have complete executive authority and administrative control over the census hierarchies. In some situations the establishment of an independent executive body may be desirable. The stature of such a commission and the prestige of its members will enable the census organization to have access to the appropriate levels of decision-making in Government, and that access is a distinct advantage at times. It must be recognized that such a commission or board, though designated as independent, is in fact very much a creature of Government. The funds for census operations are almost entirely from Government and external funds, when available, are necessarily routed through Government. Therefore, the working relationship between such a body and the Government will have to be established, and healthy traditions will have to be built up with regard to matters that need Government's approval and those that are well within the competence of the body itself.

107. Where an independent commission or board is set up, the role of individual members of this body will need to be defined. The commission or board will normally take decisions collectively on such technical or administrative matters as may be placed before it by the executive head of the office. However, subject-matter responsibilities may be delegated to individual members, in which case the working relationship between the members and the executive head of the office will need to be specified. Otherwise, such an arrangement in which the members are assigned responsibility and control over specific divisions within the organization could result in some erosion of control and discipline due to an absence of an administrative and technical focal point. Another aspect needing consideration is the degree of administrative and technical independence that the executive head of the office, namely the census director, will be able to exercise, once the direction of the commission or board has been established. In most cases, it may be desirable to establish a tradition of such independence without, at the same time, eroding the inherent powers of the commission or board.

108. The functions of such a commission or board are sometimes of a strictly advisory nature. The advantage in constituting this body as an advisory one is that there will be greater flexibility in the choice of its members. The membership can be made up of specialists in the relevant subject-matters, representatives of the major user departments within Government, and professionals and representatives of other relevant bodies. The census authority will, under this arrangement, have the benefit of the advice and opinions of those concerned with the collection and use of census data, while (taking into account feasibility and its own organizational limitations) retaining at the same time its options of accepting their recommendations.

109. Irrespective of the character of the commission or board, it will be necessary to define its functions and role by specific orders or notifications of Government. If it is constituted as an executive authority, its administrative and financial powers must be well defined, particularly with regard to the reserved powers of Government itself, so that, with procedures

and lines of control clear from the start, delays in decisions' being taken are avoided. The need to maintain coordination with the central statistical office and with the major ministries and departments of Government that are dependent on census data must be specified clearly. The Government may also wish to be consulted before the census plan (including the questionnaires) is finalized, since budgetary issues will be involved and, in some cases, policy issues too.

(c) Relationship with other government departments

110. The need for ensuring full and effective coordination between the census organization, irrespective of its structure, and the relevant departments within Government, especially the central statistical office, must be stressed. Many departments within Government are major users of census data. Their needs must be taken into account while planning the census and, quite often, special tabulations will have to be generated to cater to those needs. Also, the successful conduct of the census operations are dependent on the involvement and assistance of various government departments. The staff and material resources of the latter, such as expertise, printing facilities, transport units, communication channels, and publicity and media links, are utilized to a great extent. Therefore, it is essential to develop an effective liaison with the departments concerned within Government.

(d) Relationship with non-government organizations and users of census data

111. It is equally vital that links be developed with concerned research institutions and university departments within the country so that the expertise and user requirements outside Government are available to the census organization. Links of that kind will be the first step towards ensuring fuller utilization and analysis of census data through involvement of those institutions in studies (subject, of course, to the availability of funds for such purposes) sponsored by the census organization.

(e) Relationship with international organizations

112. It is extremely useful for the census organization to develop links with international organizations concerned with the collection, analysis, dissemination and utilization of data relevant to the study of population and housing issues. Such links will assist in the sharing of experiences and information on a regional and international basis. Many countries have been adopting, inter alia, innovative methods of enumeration of special areas and groups, measures for preservation of records and "marketing" of census information. Some have experienced problems relating to public response, confidentiality issues and financing. The sharing of these experiences on a regional and international basis, while adding to the universal store of knowledge, will help a census authority to adopt a particular measure or modify existing procedures as part of the continuing process of improving its own census methodology.

(f) General organizational issues

113. The census organization, unlike a conventional government department, undergoes extensive changes in its staff strength between the pre-enumeration stage and the final stages of publication of results. Those changes affect

not just the numerical strength of the staff but also its composition. At the pre-enumeration stage there will generally be a need to add to the technical and administrative staff in order to commence planning for the census. The staff will be considerably augmented just before (and for) the enumeration. Upon conclusion of the enumeration, the large number of personnel involved in the field and in supervisory duties is no longer required; however, at this stage a fresh component of staff is needed for editing and coding the data, processing and compiling the results, and analysing and publishing the information. Therefore, subsequent to enumeration, there is generally a readjustment of staff, often involving retrenchments and replacements. This process of expansion and contraction would be easier if the census organization could draw upon qualified staff from within government departments through secondment procedures. Such procedures would render staff reductions least painful because the seconded staff normally revert to their parent units. However, in cases where fresh staff is recruited, the process of staff reduction may not always be so smooth. Some of the temporary staff could be transferred (subject to qualifications and appropriate selection procedures) to new positions for post-enumeration activities, but the rest would have to be retrenched.

114. The continuing role of the census organization has been referred to earlier. That role can be performed well only if the professional cadres that have been built up are preserved to the extent necessary and the subject-matter divisions continued. In particular, a modern census organization will have to maintain the divisions relating to cartography, data processing and preservation, and data analysis and dissemination. The ability of the organization to provide vital input in the planning process has been noted. That function can be performed better when the capacity for analysis of data has been built up and is being maintained.

V. CENSUS ADMINISTRATION

115. The census has to be meticulously planned and efficiently implemented. This calls for high levels of technical and administrative input. The organization of the census authority or department is as important as the professional skills that will have to go into devising the questionnaires, planning the enumeration and analysing the results.

A. Establishing the organizational structure

116. A population and housing census is a complex, large-scale operation that is carried out once each decade or quinquennium. Conditions will have changed quite significantly between censuses and the focus of a particular census may be different from the previous one. Therefore, each census will in effect require a totally new plan of action. The organizational ability to plan and conduct a census must be built up early. While there can be wide variations between countries in the specific organizational pattern of the census authority, certain essential elements will be common to all censuses, namely, the administrative, technical and functional capabilities that must be established.

117. Within the organization technical and administrative units will have to be established (with necessary functional subunits at the operational levels) for carrying out each of the various activities in the census plan. The internal structure must be determined very early, since the actual establishment of the various divisions will take considerable time. The appropriate structure will be conditioned by various considerations - whether there will be regional and subregional offices, the degree of decentralization of editing and coding functions, the need to establish a liaison with local bodies at various area levels and the manner in which local administrative authorities will be inducted into census activities for rendering necessary support, among others. The decisions on these and related considerations will determine the requirements of staff, space and equipment and the costs.

118. Building up the organization for enumeration is, in effect, the establishment of almost all the divisions responsible for specific activities in the census plan. It would be convenient to consider separately (a) the possible internal structures at various levels such as the central office and the regional and field offices and (b) the subject-matter responsibilities of those structures. In considering the establishment of the various functional divisions within the census organization, issues relating to staffing and management will also be relevant.

B. The central office

119. The ultimate structure of the central office will be determined by the scale of operations and the funding available. However, the essential divisions that will have to be established relate to (a) planning, executing and monitoring the census, (b) cartography, (c) data processing, (d) analysis and reporting and (e) administration.

1. The census division

120. The census consists of a series of distinct but closely interrelated activities. The preparation of a census plan that will include each of those activities by their components and the careful monitoring of such a plan will have to be the responsibility of the census division. Its responsibilities will include developing the census plan in consultation with data users, finalizing the questionnaires and associated instructions after conducting the necessary pretests, preparing the tabulation plan and the principles of data processing with the corresponding instructions regarding editing and coding, carrying out census evaluation activities and drawing up a plan of preparation and dissemination of publications and analytical reports. This division will, in effect, be the focal point of census preparation and control of the operations. It will have to function as not only a technical unit but also a monitoring and coordinating office for all census activities. The technical capability of the division is of critical importance and must be built up very early in the initial stage of planning a census. This division is, in effect, the field operations division, and its vital role in the census organization and the dependence of the other divisions on its support will be quite clear from the descriptions of the various activities of the other divisions that follow. The efficiency with which the census is organized and conducted is very much dependent on the manner in which this division is itself organized and staffed.

121. The census division obviously cannot prepare the census plan or, for that matter, conduct, monitor and supervise the census in isolation. The other technical divisions and the administrative division are as much responsible for the census as the census division itself. To ensure coordination between the various divisions, and for control and monitoring of the operations, the establishment of a planning group has been suggested. The census division could function as the servicing wing of the planning group.

2. The cartography division

122. The preparation of maps of the enumeration areas is a basic element in a modern census. The organizational arrangements and professional skills for this activity must be established very early because of the great length of time it takes to collect base maps at the various administrative levels, check and update them, and prepare maps of individual enumeration areas for use during the actual enumeration. The core staff must be in position at the earliest preliminary stages of census planning so that the process of identification of map sources, collection of maps and establishment of the cartography division can commence. Experience indicates that a minimum lead-time of three years is needed if the cartographic activity, including preparation of enumeration maps and lists, is to be carried out at a comfortable pace that will ensure accuracy and complete coverage. The point that the cartography division has to be established at the very early stages of census planning is well worth repeating.

123. The division will need senior-level supervision, with a planning unit that constantly monitors the work relating to the demarcation of enumeration areas and the preparation of maps. The cartographic staff will consist of geographers, cartographers, draughtsmen, phototechnicians and supporting

staff. One important unit within the division will be the record section, which will retain all reference maps and, after the enumeration, will have to receive all maps from the field. There will be continuing mapping activity after the census relating to updating the maps and preparation of maps, diagrams, charts and art material for the census reports.

124. The cartography unit, by the nature of its work, requires more space than most other divisions. The equipment, such as large photographic apparatus and copiers, draughtsmen's tables and record shelves, takes up more space than usual office furniture and equipment and requires special lighting arrangements. The special needs of this division must be met if it is to perform at high efficiency. The estimation of space and equipment needs and costs will be determined by the size of the staff, which can be estimated on the basis of the time schedule and workload.

3. The data-processing division

125. The tabulation sequence will generally consist of editing the completed census questionnaires, coding the relevant entries and then processing the data in order to obtain the prescribed tables. The core professional staff of this division must be in position at the initial stages of census planning because the content and format of the questionnaires, the editing and coding instructions, the format and sequence of the prescribed tables, the priorities of release of data and the time-frame for processing of the census results will very much condition the structure of the division and influence its staffing pattern and equipment needs. Other decisions that will need very early consideration concern the extent of manual tabulation, if any, and whether data processing is to be centralized or decentralized. These and other issues relating to data processing, because of their importance, are discussed separately in chapter nine.

4. Analysis and research division

126. Census results are used extensively by many government departments for planning or evaluating their policies and programmes. Local government agencies or organizations responsible for administering local and urban areas find census data extremely useful. Research organizations, university departments of economics, sociology, demography and environment, and similar institutions concerned with population issues, both national and international, also use census data extensively. In order to ensure the fullest possible use of the data by such users, a well-drawn-up tabulation plan, combined with the early release of information, is essential. However, the utility of the information will be enhanced if, apart from basic tables of raw data, the census organization publishes analytical and technical reports on population-related topics of current interest. The organization will be rendering a service within Government if such reports are oriented to subjects relevant to the areas of responsibility of the ministries concerned with social and economic development. To enable the organization to do so, a division for analysis and reporting of census data must be established. The division could later also carry out methodological studies on census concepts and procedures and surveys relevant to population and related socio-economic

variables. Such activity would develop and maintain professional skills within the organization. 17/

127. The division, in consultation with the other divisions, will have to draw up a programme of data dissemination and utilization and analytical studies, phased over a number of years. The topics for such studies will vary according to the needs of a country at the time of the census and will include descriptive summaries of census results, reports useful for formulation of policies for development in the socio-economic sectors, reports on demographic and other characteristics of the population and technical reports on methodological issues. Some idea at the very commencement of the planning of the census of the type of analyses needed to meet the requirements of planners and policy makers or other data users will be useful. Such knowledge will in fact influence the design of the questionnaires and tabulation plan. The utility of the data that is subsequently available from the census will, to that extent, be considerably enhanced.

5. The administrative division

128. The administrative division will, as is conventional, be responsible for all personnel, budgetary and housekeeping matters. From the preparatory stage to the tabulation stage, this division will have to be expanded to be able to undertake its wider and heavier responsibilities. In particular, the recruitment and management of the very large enumeration staff will add to the workload. The proper management of that staff will be critical to the success of fieldwork and indeed of the census itself. Issues relating to the staff, particularly regarding payments or supplies, will have to receive prompt attention.

129. The publicity unit is sometimes part of the general administrative division since its activities involve public and press relations. In addition, transport and other facilities of the administrative wing can be utilized for those activities, without the building up of a unit that may be underutilized after the census. Deciding whether the publicity unit should be part of the administrative division or constitute a separate division by itself will depend on the scale of publicity and the general principles of departmental structures in the country concerned. Its location must be judged from the point of view of functional efficiency. If the census organization has to undertake extensive publicity and public relations activity by itself and if the involvement of official media agencies is likely to be weak, it will certainly be an advantage to establish a separate publicity division staffed by professional experts in communication techniques.

130. The administrative division must function as a service unit for the technical divisions, so that the latter are relieved of administrative tasks relating to their work. In particular, once technical decisions have been made with regard to procurement of equipment or supplies, the administration wing should be responsible for implementation of those decisions. In general, this division must provide the necessary administrative support to all the technical wings.

131. Traditionally, administrative divisions tend to have a larger say in departments and this is so even within technical organizations. However,

where time is at a premium, as is definitely the case in the census, procedures of administrative scrutiny of proposals will have to be expedited. While the monitoring of the progress of the census plan will no doubt help in expediting matters, the real solution for avoiding delays is adequate delegation of authority, both financial and administrative. How far such delegations should be made will be a matter of judgement in each case.

C. Regional and field offices

132. The need for regional offices, as well as whether in some cases offices at more than one level are necessary, will vary among countries. Where the area is not too large, travel is not difficult and the population is small, regional offices may not be necessary. In such cases, the census can be supervised from the headquarters itself. In countries where the population is not large but the settlements are dispersed over vast areas, or where terrain restricts accessibility, there will be an advantage in establishing regional offices. In countries that are large both in population and size, such offices become a necessity. Again, where there are large administrative units such as States or provinces, offices may have to be established at more than one level. These offices are useful not only for managing the census operations but also for maintaining a liaison with other government agencies and departments for assistance regarding such elements as staff and vehicles. Therefore, in the larger countries, there is an advantage in setting up regional offices at various levels. The office at the first-order regional level will supervise the office at the immediately lower regional level and the latter will, in turn, supervise the field offices in its jurisdiction.

133. Apart from the regional offices, it will be advantageous to establish census offices in the municipal organizations in the metropolitan areas, in the cities and in other urban areas. These organizations are usually established under separate statutes and are rather jealous of their identity, distinct from the general administrative authority of the region in which they are located though certainly not totally independent of that authority. They are often political in nature. It will be necessary to induct these organizations into the census stream and the establishment of census offices in these areas will help in ensuring their cooperation. In the larger urban areas such offices will generally be a necessity owing to problems of identification of boundaries and the need to employ municipal employees as census staff at certain levels. In most cases, it should be sufficient to designate a senior official of such bodies as an ex officio census authority for the area. Such an arrangement will save on costs and establish effective linkage with the concerned local or municipal body.

134. The field offices are those at the last administrative level. They are directly responsible for carrying out the enumeration. Each field office is in charge of a number of enumeration areas. These offices will oversee the work of the enumerators and supervisors in their jurisdictions. The number of such field offices is usually set by the number of areas at the last administrative level. In exceptional cases, where the area is large or the terrain difficult, it may sometimes be necessary to provide the head of the census field office with assistance. It would be undesirable to split the last administrative level between two separate field offices since such a move will create confusion regarding jurisdiction, give rise to staffing problems

and require coordination. At this level, as indeed at the other levels too, unitary control would seem best.

D. Personnel

135. The personnel necessary for planning, organizing and conducting a census of population and housing and, later, for processing the data, carrying out an analysis of the results and producing reports will be of varied nature. The levels of staff and the skills they should possess will depend on their functions. Broadly, the personnel of the census organization can be said, on the basis of skills, to be classifiable by three categories. The first will comprise the professionals - statisticians, demographers, sociologists, cartographers, computer experts, mass communication experts and senior administrators - mainly in the head office and at the higher regional levels. The second will consist of the experienced administrative and executive staff at headquarters, in the regional offices and at other administrative area levels up to the enumeration level. The third will be the very important functional category of enumeration staff at the field level, including the supervisors.

136. The core professional staff will be available at the head office and in the larger regional offices if a permanent census organization exists. Where the latter has to be organized from scratch, it will be necessary to recruit professional staff very early. All census activities do not take place simultaneously and some of them are of relatively short duration. The staff requirements, therefore, are not uniform. Most of the operations demand numerically large numbers of personnel, with the largest number required for enumeration. Most of the staff will be fresh and in position for varying periods. These special features of the census staff render the normal rules regarding recruitment of personnel inappropriate. Special dispensations from Government regarding procedures of selection, placement, emoluments and retrenchment will generally be necessary in order to be able to have the staff in position when required and to manage staffing issues.

137. The estimation of staff needs is a major element in the preparation of the census plan. These estimates are particularly important for formulating the initial budget and for assessing training needs. Staff requirements have to be assessed very early because usually it is not possible to obtain qualified personnel at short notice. The staff estimates can be prepared on the basis of workload calculations and duration of activities. For operations such as editing, coding and data entry the estimates can be worked out fairly closely on the basis of workload, time duration of the activity and average output per day per person. The latter can be determined by actual trials with the pretest questionnaires or with those of the trial census.

138. The method and duration of enumeration will govern the number of enumeration staff required. If the duties of the enumerator are confined to distribution and collection of the forms or to carrying out very limited canvassing, the number required will be less than that for the case where the enumerator has to canvass the questionnaires in every housing unit or household. In that case, the length of the questionnaire and the duration of the enumeration will determine the number of enumeration staff. The norms for estimation of the requirement of enumeration staff will be obtained from the

pretest or trial census in which the agency participates whose involvement in the enumeration is proposed.

139. The selection and recruitment of staff with the necessary professional, administrative and executive skills are not easy. At the senior professional levels it will be advantageous to induct persons with experience, but the relatively short duration of some of the posts and the need to maintain conformity with the procedures and pay structures of Government may, in some cases, give rise to problems. Sometimes these factors can also result in staff turnover at awkward moments. Such rapid turnover is particularly likely to occur among data-processing staff with experience in programming and computer management. One possible solution to this problem will be the induction of senior professional, administrative and executive staff on the basis of secondment, inter alia, from other government departments and research institutions, which could to some extent mitigate the effects of issues such as career prospects and retrenchment, since those persons will normally revert to their parent units when staff reductions occur.

140. The recruitment of enumerators and of staff at the supervisory level immediately above them is a major personnel issue. Unlike recruitment of staff at the head office or even at the regional or subregional levels, enumeration staff is not concentrated in unit offices but widely dispersed. Recruitment of large numbers in a few locations is not possible because relocation of persons in the enumeration areas will be too expensive, apart from the fact that such staff may not be able to function very well in locations that are totally strange to them. Because of these constraints, it may be necessary to formulate special procedures for selection and appointment of such staff.

141. The principles that govern the appointment of the enumeration staff will also depend on the number of enumeration areas, the area of the country, population size, levels of literacy and civic involvement in such official activity. Where supervision can be centrally exercised or temporary recruits depended upon to perform well, the practice has been to employ persons directly and not assign the work to current government employees. There is an advantage in employing as enumerators persons who belong to the locality because of their obvious familiarity with the people and the area. However, where such an appointment is likely to be resented by the local people, it is best avoided.

142. The enumeration staff is employed for a short time and for specific work. That staff's remuneration, if such payment is envisaged, is generally fixed on an ad hoc basis since the regular civil service scales of remuneration are not applicable. Remuneration on the basis of number of households or number of persons enumerated should be avoided as such an arrangement may result in inflation of figures through spurious entries. It would seem preferable to determine the remuneration as a fixed sum and make the enumeration areas as uniform as possible. In addition to remuneration, there also has to be compensation for the costs of travelling to training classes or in difficult terrain.

E. Planning group

143. The census operations, from the initial planning stage to the final publication stage, will need to be controlled and monitored. Though various components of the operations may be the responsibility of different divisions within the organization, it will be necessary to ensure that all activities are in step. It will be essential to establish a system through which the census is always viewed as a single operation whose different components are knitted together towards a common objective. This is best achieved by setting up a census planning and coordination group in the central office. That group must be given the authority to monitor the performance of the various divisions, including that of the census division. It will also be the clearing-house for the recommendations made by each division with regard to any particular activity, so that consistency is maintained between questionnaire preparation, field procedures, editing and coding, tabulations and data processing. The heads of all the divisions should be members of that group so that each division understands the work of the others and is able to assess its own role. The head of the census establishment should be the chairman of the group. Such an arrangement will avoid delays and keep the highest management levels fully apprised of progress in the various activities. Working arrangements such as subgroups for formulating initial thinking can be adopted to assist the census planning group. The census planning and coordination group will have to be set up at least three years in advance of the enumeration.

144. The census planning group will, in effect, be responsible for operations. The first stage will be to determine the broad outlines of the census and will include consideration of the various activities referred to earlier. A good beginning will be a review of past practices and scope of previous censuses. The perusal of previous technical and administrative reports and the study of regional practices and international recommendations would be useful. The census law, if there is one, will have to be reviewed at this stage in consideration of any amendments that may seem necessary for a smoother census. If there is no law, the drafting and promulgation of the necessary decrees and the issue of appropriate notifications or declarations regarding the taking of the census will have to be initiated. The group will also have to prepare an indicative budget of the census operations on the basis of the phasing of the activities.

F. The census calendar

145. Initiating advance action on the various activities that make up the operations and monitoring them effectively can only be done if a work plan is prepared indicating the timing of each activity. The work plan, or census calendar as it is usually called, is an indispensable management tool. It should indicate the sequence and estimated duration of each of the component activities of the census and specify the month, or in certain critical stages the specific dates, of commencement and completion of each activity. In the initial planning phase, a provisional calendar of key activities can be prepared as the general framework for planning. However, this framework must be made firm and a detailed calendar of operations prepared once the basic decisions on the various facets of the census have been taken.

146. The census calendar usually shows the various activities grouped into the three broad stages of pre-enumeration, enumeration and post-enumeration. Each census activity can be associated with one of these stages, but there will certainly be much overlapping of the various stages of work. Some of that overlapping is merely due to the fact that different activities, such as organizing the central office or expanding that office and the cartographic work, may be going on at the same time. Sometimes, however, the overlapping is essential to the proper completion of an activity, particularly (because of their close association) in the case of preparing the questionnaire, formulating the tabulation plan, carrying out census pretests and planning data processing. Although ideally it would be logical first to determine the tabulation plan, then prepare the questionnaire and later formulate the scope of the other connected components, it is rarely possible to determine that a desired tabulation can be obtained until the questionnaires have been tested for the reliability of the information collected.

147. The dates of commencement and completion of each activity are necessarily dependent on the date of commencement of the enumeration of the population. If the housing census precedes the population census, it will be necessary to prepare a calendar for the housing census and integrate that calendar with the one relating to the population census.

148. Though many of the activities overlap, they will have to be shown separately in the census calendar. The different divisions that are in charge of individual activities will find this convenient for internal review. To have effective control over the specific operational responsibilities assigned to it, each division or section of the census organization should prepare for itself a supplementary calendar of operations indicating the steps it has to take and when they have to be taken and completed so that a clear picture is always available of the current status of any activity under its charge.

149. The census calendar is a useful guide for reviewing progress of census activities. Serious delays in performance or errors in time estimates will show up when the status of an activity is compared with that specified in the calendar. The calendar is also very useful in so far as it presents a total picture of the operations. If any modifications are necessary in any activity, the implications for all other relevant activities become obvious. Such an overview will prevent tinkering with the census plan in an ad hoc manner. The important point is that the census calendar must be constantly monitored and rigorously enforced. It should be used as an effective device for controlling the operations and detecting early warning signals of delays in performance or difficulties in execution so that necessary corrective action can be taken well in advance.

G. Coordination

150. It is evident that the successful planning and implementation of a census is very much dependent on the working together in an integrated fashion of all the divisions of the organization. The need to coordinate the activities of the various units is evident and mechanisms must be built up to ensure such coordination. The head of the census organization must perform this function and, through suitable structures, establish a system by which the divisional heads perform a similar role within their divisions. If the census planning

group is set up, the leadership for this group must be provided by the head of the census organization. This is particularly important in the case of the census where no single division is responsible for the entire operation and it is therefore necessary to establish constant communication and integration between all divisions. The committee structure is a suitable mechanism for such a purpose. 18/

151. Apart from the census planning group, which will be at the apex of the organization, it will be very useful to establish a system of internal reviews within each division by the head of that division. Such an arrangement has two advantages. First, as all middle- and intermediate-level professional staff can participate in such meetings and provide their input, a sense of participation in a national activity and staff enthusiasm are evoked. The arrangement will also help monitor progress within the division. Second, the head of the division will be able to present an accurate status report regarding the division's area of responsibility to the planning group.

H. Technical advisory committees

152. The census organization will benefit by drawing upon the expertise available outside the organization. This could be done through technical advisory committees consisting of experts from research institutions, universities, other government departments including the national statistical office, and the professionals of the census office itself. Such committees could be established for specific topics if necessary or one committee could be set up with subject-matter subgroups. The latter will be preferable because consistency and coordination in consideration of issues will be maintained more easily. Generally, the functions of such a committee are restricted to considering the proposals of the planning group and offering its advice. The advantage of setting up such a committee, apart from the benefit of having valuable professional input, will be the opportunity it offers for presenting the rationale for certain decisions relating to the census procedures or content to a wider audience consisting of an important section of users of the data.

I. Administrative issues

153. The successful execution of each of the activities included in the census plan will depend not only on the well-planned nature of each stage but also on the adequacy and timeliness of the physical input needed for efficient performance. Such physical input will include office space, supplies and equipment. The scale of space and of other input required can be estimated on the basis of the method of enumeration, the tabulation plan including data processing, the analytical programme and the publication plan. Apart from such essentials as furniture and the usual requirements of any office, the supplies will include paper and pencils or pens. The paper requirements for carrying out a census are comparatively high. The acquisition of such large quantities of paper will have to be completed within a fairly short time, entailing the advance location of sources, finalization of procurement procedures and arrangements for storage. The acquisition of vehicles, and in some cases of boats, will also require a considerable lead-time. Other essential office equipment such as typewriters, photocopying machines and

telephones will also need to be acquired and installed well in advance. These aspects of census-taking, in comparison with others, may seem mundane and are often relegated to the background but at the risk of loss of efficiency in emergencies. Since census organizations are generally subject to the prevailing government regulations regarding the acquiring of assets and supplies, delays in obtaining such items must be anticipated. It will be necessary to commence the action of estimating and ordering supplies well in advance.

154. Some of the more expensive items such as vehicles and boats must be maintained so that they are functional for the duration of peak census activity, because replacements at short notice will not be forthcoming. It is therefore advisable to consider the possibility of establishing facilities for essential repairs and maintenance within the organization or operating under a fairly liberal delegation of authority to have such repairs and maintenance carried out locally.

VI. PREPARATION FOR ENUMERATION

155. Before the census of population and housing can be carried out, the framework for the enumeration must be built up. The important preparatory activities will include: (a) determination of enumeration areas; (b) mapping of the enumeration areas; (c) determination of the content of the census; (d) design of the questionnaire; (e) carrying out of pretests; and (f) consultations with data users. As has been emphasized earlier, these are interrelated activities and some of them have to be planned and carried out almost simultaneously. The planning and organization of enumeration will also have to be commenced at the same time though the enumeration operations take place after the preparatory stage is over. For the sake of convenience, the organization of enumeration is dealt with separately in the present publication. Training and publicity can doubtless be viewed as belonging among the preparatory activities. However, training is a requirement for all categories of staff, even if that of the field staff is most critical. Publicity activity spans a much longer period than the actual enumeration itself, though the enumeration is its focus. Therefore, training and publicity are also discussed separately. It is evident that activities relating to determination of the tabulation plan, procedures for data processing including editing and coding of the returns, and the publication programme are part of the preparatory planning stage and must be so organized that they commence immediately after the enumeration. However, since these activities commence after the enumeration they are discussed later.

A. The determination of enumeration areas

1. Utility of the enumeration area

156. The enumeration area is the basic operational unit for a census. Enumeration areas are delineated for the following purposes:

(a) To ensure that the census is conducted in all parts of the country and that there is no omission or duplication of areas. Because of the great differences in physical, climatic and demographic characteristics, the criteria for determination of boundaries of enumeration areas may vary from country to country but their purpose is the same, namely, to ensure complete territorial coverage;

(b) To be able to present census data for all administrative area levels. Census data have to be available at all major administrative levels and must be capable of integration at other area levels if necessary. If the data are available at the small-area level, aggregation by the various territorial levels will be possible. Therefore, one of the basic decisions that will have to be taken while planning the census relates to the determination of the various administrative and statistical areas for which data must be generated and of the smallest area for which they will be collected and which, in most developing countries that are predominantly rural, would be the village (usually the smallest administrative unit). The delineation of enumeration areas within the latter will provide census data by the smallest-area level and permit aggregation of data at all higher-area levels;

(c) To meet the needs of local planning and administration. The availability of census data by enumeration area permits flexibility in aggregating data at the small-area level. The availability of data at this level will facilitate analysis of population issues and planning at the local level;

(d) To manage the field operations efficiently. The management of the field operations requires the identification of specific units in which the enumeration can be carried out with satisfactory efficiency and supervision. These units will have to conform to norms of workload and supervision.

2. Basic considerations relating to enumeration areas

157. The enumeration area is the basic operational unit that has to be determined for census operations. It is usually of such a size that a single enumerator can conduct the enumeration within it in the specified period. The size of the enumeration area is determined by either the optimum population size or, where the population may be sparse, by the optimum area that can be covered. A single urban area or a large village may be divided into many enumeration areas, while a small village may constitute a single such area.

158. Census data have to be presented for each village and urban area and for the territorial divisions or regions of the country. It is therefore important that enumeration areas be formed within the limits of such territorial areas and that they not cut across their boundaries, so that aggregations can be made to obtain subregional, regional and national data.

159. In determining the boundaries of an enumeration area, account must be taken of the approximate number of persons that will be included within it, the terrain and consequent constraints on the mobility of the enumerator or special requirements of transport, and the method of enumeration. In urban areas, the method of enumeration will be more relevant than topographical or mobility considerations. If the enumeration is being conducted by actual canvassing of the schedules by the enumerator, the main criterion in the urban areas will be the number of persons that can be enumerated by the enumerator within the period assigned. In the rural areas, on the other hand, the time that the enumerator needs to cover an area will be relevant. An appropriate balance, based on local knowledge, will have to be struck between requirements of reasonable workload and feasibility of accurate canvassing within the stipulated enumeration period. The precision with which enumeration areas are demarcated and mapped will be reflected in the completeness and accuracy of the count of both population and housing.

160. The stability of the enumeration frame must be maintained till the census operations are completed. The efficient management of the census operations, including the administrative arrangements, depends on the non-alteration, till the enumeration is over, of the frame of administrative areas. The utility of the data will also depend on the results' being presented on the basis of this frame. The listing of areas, formulating of the geographic identification code and demarcating and mapping of the enumeration areas are activities that require considerable time and effort. It will therefore be very necessary for the number and jurisdictions of the administrative areas to remain unaltered from about the commencement of planning the census till after the publication

of final results. Any changes in the number or jurisdictions of administrative areas at any level, creation of new urban areas or changes in their jurisdictions during this period will seriously affect the pace of preparation for the census. It is therefore recommended that Governments stipulate that no such alterations will be permitted during the period.

3. Assigning geographic identification codes

161. The presentation of census data by the various levels of administrative areas presumes that a list of such areas is available well in advance of the census. The management of the operations will also need such a list for establishing offices at various levels and determining their functions. To ensure that all areas are covered and that the enumeration areas can be identified with the larger administrative area levels in which they are located, a complete listing of the latter will be necessary. A list of all administrative areas and their subdivisions must, therefore, first be prepared. The list will include the largest administrative areas such as States, provinces and governorates; the subregions within each of these such as districts; and so on down to the smallest administrative area such as the village, in other words, the list will identify every administrative area and establish the hierarchy of such areas from the largest to the smallest and will also group those areas by sequence and nomenclature. Such a list will permit the association of the enumeration areas with the smallest administrative area in which they are located and aggregations of enumeration areas with the higher-area levels.

162. The listing of the administrative areas can commence on the basis either of the list prepared for the previous census or of any other official or reliable list that may be available. The list will have to be updated by reference to all notifications creating new administrative areas or towns or to changes in existing ones. Experience indicates that detailed inquiries have to be made with the various agencies that are concerned with those matters such as the ministries or departments of the interior, urban development, municipal administration and survey, since complete information is generally not available at a single source. It is particularly important to verify thoroughly the lists of villages and settlements such as new project sites, industrial townships and railway or other camps that may exist. The list of administrative areas must distinguish such areas as urban or rural. The places that are designated as urban, based on the definitions that may prevail in the country, must be separately identified in the list. 19/

163. Census records must be identifiable by the enumeration areas to which they refer and by the larger-area levels of aggregation. Such identification is necessary for management of the records when they are collected after the enumeration is over and for control during tabulation, as well as, in processing the data on the computer, for systematic assignment of tabulations of small areas to the appropriate larger areas of which they are a part. It is therefore necessary to develop a system of identification codes that will uniquely identify every administrative unit down to the individual enumeration area. In this system, which is referred to as the geographic code, location code or identification code, numbers are assigned to the largest administrative units and to the regions within each such unit. Within the regions, numbers are assigned to each subregion and to the units of the

next-area level contained within each subregion. This sequence is followed down to the smallest-area level. The enumeration areas contained within each unit at that level are numbered serially. The regions, subregions and other area levels are generally arranged in alphabetical or some other order within the immediate higher level within which they fall. Thus, a set of numbers would identify the enumeration area in relation to the next-higher-area level, and so on.

164. When listing the administrative areas in this systematic manner and designing the geographic or identification code, it will be necessary to distinguish urban areas separately. Data on the levels and trends of urbanization are needed for formulating policies relating to the management of urban areas, perspective planning of urban agglomerations and study of the trends of internal migration and urban growth. The separate identification of such areas in the geographic coding system will facilitate the tabulation of data relating to those areas.

165. Within urban areas, particularly in the larger towns, cities and metropolitan areas, it will be desirable to form enumeration areas within such units as the municipal ward or division, and barrio. This will permit the production of data for the appropriate planning units within such urban areas. In the rural areas, a village, depending on its size, may constitute an enumeration area by itself or may contain more than one enumeration area. In some situations, it may be desirable to demarcate special enumeration areas. For example, squatters colonies requiring special development efforts, refugee camps where other administrative arrangements might be necessary, and the like could form separate enumeration areas to enhance the utility of the data. Operational convenience may also require the formation of separate enumeration areas for such units as large project sites and port and defence areas.

166. The system of geographic location codes of the type discussed above will continue to be useful only so long as the administrative areas are not seriously altered. Similarly, the number codes assigned to the enumeration areas may be of little use in the course of time once new settlements have come up or villages and towns have expanded. In these situations, the use of some system of geocoding would be useful. The two approaches to geocoding that are of significance for census planning are (a) segment allocation and (b) area allocation to grid squares. With segment allocation, coordinates are assigned to nodal points, such as street intersections, to identify segments or blocks. In the grid system, the entire area is divided into a uniform grid of squares using standard coordinates to identify the squares. Among the advantages of geocoding, particularly when based on the grid square approach, are its permanence, clarity and uniformity, as well as the possibility it offers of links with other data sets if those are collected on the same area frame. It must be stressed, however, that these systems are more expensive than the conventional methods of delineation of areas and require much more time and technical expertise than will be usually available in most countries.

B. Mapping of enumeration areas

1. Delineation of enumeration areas

167. As stated earlier, the enumeration area is the operational unit for enumeration, and its size, whether in terms of population or area, must be such as will ensure complete coverage within the specified enumeration period. An optimum size, neither too small nor too large, has to be determined. Although very small enumeration areas permit more concentrated attention by the enumerator and are conducive to early completion of the work, they have the disadvantage of increasing the quantity of forms and the number of field staff that are needed, as well as the training load. Too large an enumeration area will also involve disadvantages, namely very heavy workload, probable unsatisfactory coverage and lack of supervision. In the case of such special areas as project sites, dispersed tribal colonies and reserve forest areas, the general norms governing the formation of enumeration areas may have to be relaxed for pragmatic reasons of operational convenience.

168. It is most important, in the formation of enumeration areas, to ensure that each of them can be distinguished with no ambiguity. Their boundaries must be clear and the features, if any, that distinguish those boundaries must be visible on the ground. Their boundaries should not overlap, nor should there be areas that apparently do not fall within any enumeration area.

2. Utility of maps

169. Maps are useful in a census for a number of purposes. The determination, for the purposes of the census, of the national and internal boundaries of the territory and its detailed subdivision into enumeration areas are dependent on the availability of maps. Reasonably up-to-date maps are also useful for specifying assignments to enumerators, estimating travel time and costs, establishing field offices, assigning geographic identification codes, determining best routes for canvassing within an enumeration area, marking and locating housing units and identifying enumeration areas for revisits or resurveys, and they serve, of course, to present the census results in vivid form.

170. The boundaries of the enumeration areas have to be clear: it should always be possible to distinguish an enumeration area from those contiguous to it. In the field, these conditions are best met if a map of the enumeration area is available that clearly shows the area's boundaries and the identification code numbers of the areas around it. Local landmarks, if included in the map, enhance its utility. In the absence of such maps, enumeration areas will have to be described verbally, largely based on local knowledge of boundaries, and this can very often lead to confusion and error. Different levels of staff may tend, for example, to have differing perceptions of the limits of an enumeration area.

171. The enumerator will find a map of the assigned area very useful. Such a map enables the identification of the enumeration area, indicates its boundaries and helps in deciding (taking into consideration the location of the dwellings, spread of the area and other factors) the best route for

canvassing during the enumeration, as well as in identifying new habitations that have to be enumerated.

172. The supervisory levels will also find the maps of enumeration areas very helpful. Consolidated maps of supervisory areas, which show the individual enumeration areas included therein, will assist the supervisor in planning supervision and identify the units that, because of terrain or population size or other features, require special attention. Those maps will also be useful for assessing the adequacy of coverage through test checks of areas or habitations marked on the map.

173. Maps of enumeration areas, apart from being invaluable guides to the staff involved in field operations, also help in ensuring complete coverage of the country. The maps of the enumeration areas of the smallest administrative jurisdiction will have to be matched with the maps of that area to make sure that no part has been left out and that the enumeration areas do not overlap. The maps of the smallest-area jurisdictions will have then to be matched with the map of the subregion within which they fall. Similarly, the maps of the subregions will have to be aligned with those of the regions, while the maps of the latter will have to be matched with that of the country. In other words, maps will have to be built upwards from the enumeration area through the different levels of administrative areas so as to ensure complete coverage.

3. Mapping procedures

174. An early start for the mapping activity is essential. The work has to be completed before the final training programme commences. In case a trial census is envisaged, the maps for the areas in which this proposed exercise is to be carried out must be available before it is actually held. The mapping tasks include the acquisition and evaluation of maps and boundary information, revision and preparation of maps (which involve fieldwork), training of the staff and preservation and storage of the maps.

(a) Inventory and evaluation of maps

175. The preparation of maps of the enumeration areas and of the larger administrative areas requires accurate maps of the country, of the regions, of administrative areas at other levels and of the smallest-area jurisdictions. Maps of urban areas are also necessary. Ideally, the census organization should collect and update maps continuously between censuses. If this was done, considerable time and anxiety would be saved and the quality of the maps would improve because of the time available for preparation. Unfortunately, in many countries such a continuing mapping programme does not exist. It should be possible to establish links with the organizations in the country responsible for production of maps such as the survey office, municipal offices and the departments in charge, inter alia, of transport, forests and defence and to obtain copies of all officially published maps. This would enable the cartography division of the census organization to be aware of the maps that are available and the gaps that exist. The advantage would be the commencing of the mapping programme well ahead of the census and the maintaining of professionalism in the division. With the recent increasing emphasis on census-taking in most countries, it is recommended that such a

continuing programme for collection and updating of maps necessary for the census be adopted.

176. The collection, scrutiny and updating of base maps have to commence at least two to three years before the census since the process of demarcation of enumeration areas and their integration into maps of the regions and subregions or urban areas need considerable time. The mapping programme must therefore be established at the very commencement of the planning stage so that the maps of all enumeration areas are available before the census count. Mapping operations undertaken too late or with insufficient planning may result in lack of maps or inaccurate ones and leave little time for corrective measures. The lead-time for mapping operations should be comfortably long.

177. The first step will have to be the preparation of an inventory of maps that are available from all sources and a determination of the gaps that may exist. The maps will have also to be evaluated to determine reliability, adequacy and accuracy, as well as whether they are fairly recent or require considerable updating. Several different kinds of maps are needed for census planning, such as: (a) maps of the country on a relatively small scale showing administrative divisions, major physical features and location of cities and towns; (b) planimetric or topographic maps on a relatively large scale; (c) maps of the regions and divisions showing subdivisions, cities and towns; (d) generally large-scale maps of cities and towns showing the internal wards or other area units, roads and streets; (e) maps of the subregions or administrative areas above the village or its equivalent, showing the location of the villages or settlements and important physical features such as rivers, ridges and forest areas that will help in identifying terrain constraints, if any.

178. The maps must be evaluated to determine whether they are useful for census work and need to be revised, redrawn or corrected. Considerations such as clarity, suitability of scale, ease of reproduction, accuracy, standardized use of symbols and date of preparation are some of the criteria that will be relevant in evaluating these maps. All available maps will not generally meet all those criteria, but it is possible to prepare good base maps through use of maps from multiple sources.

179. Aerial photographs and satellite imageries can also be used for preparation of census maps. 20/ Aerial photographs show great detail but some features may be missed if hidden by clouds. The cost of aerial photography will depend on the extent of the area for which such maps are required (usually to fill gaps in the availability of conventional maps), the time for production and interpretation of the maps, and related factors. Satellite imageries provide almost complete coverage but do not depict details in the easily distinguishable form that the census requires. The use of these techniques require special equipment and skills for interpretation and translation to features on the ground that are generally not available within most census organizations. If it is proposed that aerial photography be initiated or satellite imageries used, the expense and time factors must be very carefully assessed. In some cases, access to aerial maps may be difficult. Therefore, if it is proposed that these sources be utilized for obtaining the base maps, the collection and interpretation of material will have to commence very early. The advantages of using such maps should be carefully evaluated by the census planners.

(b) Preparation of maps for enumeration

180. The immediate objective of the mapping programme is to prepare maps of enumeration areas that will serve the purposes during the actual operations indicated earlier. The long-term objective is to be able to prepare maps for such higher-area-level units as subregions, regions and the country itself that can be used for depiction of census data as part of the reporting and publication programme. There will therefore be a wide variety in the maps that have to be prepared. However, the most important requirement relates to the preparation of the maps of enumeration areas.

181. The map of an enumeration area must help in locating the area and in facilitating the enumeration. To be able to do so, the map must (a) indicate the boundary of the area very clearly; (b) include important landmarks that will help in planning the route for enumeration such as major roads, railway lines, bridges, streams, factories, prominent places of worship and government offices, as well as similar recognizable ones; (c) use symbols that are clear and uniformly adopted in all the maps; (d) be of such a scale and size as will make its handling easy without loss of clarity; (e) be reproduced on fairly durable paper since it will have to withstand handling in the field.

182. Ideally, the maps of the enumeration areas should be drawn to scale. However, this may not always be possible, in which case well-drawn field sketches may have to be prepared. Such sketch maps will generally be hand-drawn. While not as accurate as maps to scale, they are quite useful, particularly in situations where reliable base maps are not available or are on too small a scale for easy reproduction. The same meticulous attention to accuracy evidenced by scale maps must be maintained and training and supervision standards must be, if anything, more intensive.

183. The staff for carrying out the mapping work will have to be recruited and trained well in advance. Their numbers and the corresponding requirements of equipment will depend on the magnitude of the work and the time span within which it has to be completed. The work will include the collection and scrutiny of base maps, fieldwork for demarcation of enumeration areas and preparation of the maps of those areas. The staff will consist of the necessary supervisory and technical personnel at headquarters and the field teams for the demarcation of the enumeration areas.

184. The enumeration areas will have to be demarcated on the ground on the basis of criteria referred to earlier such as population size and terrain. This can be done only by actual fieldwork during which the population size and number of housing units will be determined, terrain constraints assessed and the average enumeration block demarcated as a recognizable unit. Simple forms can be adopted for listing of housing units and households, with details of the size of each household. This information, combined with local knowledge of possible terrain or mobility constraints, will be useful for delineating the enumeration areas before the final maps are prepared. Incidentally, the information on the number of housing units and the population will give an indication of the number of forms that may have to be printed and supplied to each enumerator for actual enumeration.

(c) Supervision and monitoring

185. The mapping programme, however well planned and even if sufficiently staffed and equipped, may fail in its immediate objective if the work is not directed and monitored vigorously. The cartography division will have to develop and maintain such monitoring and supervision systems so as to ensure good management. Operational control must be maintained at all times, from the initial stage of collection and evaluation of available maps, through fieldwork and till the final enumeration area maps are available.

186. The central supervisory levels of the cartography division will have to review the fieldwork through personal visits, supervise map preparation in the division to ensure the accuracy and utility of the final maps, and organize training programmes for the field staff and provide the necessary guidance during the actual fieldwork. A well-trained field force will reduce the need for repetitive field visits for the purpose of verification or correction of mistakes, with reduction in such visits leading in turn to a saving on costs and time.

187. The priorities in preparation of maps must also be laid down. The general experience has been that the demarcation of enumeration areas and the preparation of the corresponding maps in the large urban areas require great effort and time. Such areas may therefore have to be taken up early. There may also be large tracts with sparse populations combined with terrain problems or riverine areas, where demarcation and preparation of maps of enumeration areas require more time and effort, including attention to special needs such as transport. Such areas should also be assigned the appropriate priority. The highest priority must of course be assigned to those areas for which there are few or no maps or where the maps that are available are considerably out of date. The sequence of the mapping work can be determined taking into consideration the list of administrative areas, the inventory of the available maps and the priorities.

188. The planning unit within the division will have to ensure that the cartographic work is in step with the census plan. The maps of the enumeration areas in which it is proposed that the second and later pretests or the trial census be conducted must be available by the time those operations are undertaken. These tests will also help in evaluating the quality of the mapping itself. The maps for all the enumeration areas must be ready well before the final training for enumeration begins so that the enumerators can be given the maps of their areas just before the commencement of enumeration.

4. Mapping in non-typical areas

189. There are non-typical areas in some countries that will require special attention in the census, including modifications in mapping and enumeration procedures. Such areas include large tracts with sparse population, rapidly growing areas, congested urban areas and areas with ill-defined boundaries.

190. Large areas with sparse populations such as mountainous areas, forest reserves or deserts will take more effort and time for enumeration unless the area is well demarcated and settlements are clearly identified. The maps for

such areas must show, inter alia, all paths, roads, streams and water-holes as may be appropriate so that the enumerator has a clear idea of the route that must be adopted to ensure full coverage. While physical features cannot be depicted fully on the usual map of an enumeration area because of limitations of size, special physical constraints such as major rivers, mountains and swamps can be depicted by names and symbols. This information will assist the enumerator to plan travel time during the enumeration. Tracts in which nomadic populations reside would be a particular example of areas of the type referred to here. While the special procedure for the enumeration of nomadic tribes is discussed later, it is necessary to note that the maps of those areas must indicate the presence of such tribes as at the time of mapping.

191. Areas in which the population size and settlement pattern are changing rapidly will need special care. Such areas are usually around large cities or project sites. In the case of urban sprawls, it is often difficult to distinguish the notified boundary of the urban area. Such a distinction must be made for a proper allocation of the population to the urban area itself and to the area beyond it. The verification and determination of the boundaries in such cases will have to be done on the basis of the city maps, the relevant notifications and physical inspection of the area. The distinguishing marks must be indicated very clearly. Once the structures are listed and numbered (with numbers painted or affixed to the structures), those numbers will have to be incorporated in the maps of the respective enumeration areas. During the mapping operations, settlements at project sites may be noticed. Even if these are temporary, they must be mapped and assigned a place in the lists prepared during the mapping operations, otherwise they may be missed during the actual enumeration. The reverse situation, of new colonies coming up after the mapping has been completed, can of course occur. The enumeration instructions will have to specify how the enumerator will deal with such situations.

192. There may be areas in which the population is very dense such as slums and new housing colonies. Since maps for such areas will generally not be available, it may be necessary to map those areas through field sketches. Such congested areas will need large-scale or segmented maps for clarity. To ensure adequate and coordinated supervision, the possibility of assigning such areas (subject to workload limitations) to a single supervisor could be considered. The higher supervisory levels in the mapping and census divisions would be well advised to maintain lists of such areas for particular attention during the enumeration.

193. Mapping is difficult in areas with ill-defined boundaries or in cases where boundaries are in dispute. In those cases, the help of the administrative authorities will have to be sought. It will be difficult for the census authority to arrive at an arbitrary view regarding the appropriate boundaries of such areas.

5. Preservation of maps

194. It will be necessary to maintain a well-organized filing and storage system for the mapping division. The base maps, the various maps prepared for the census including those of the enumeration areas, the lists of houses and households, and other material must be stored carefully. The filing system

should permit easy and rapid location and retrieval of such material. The handling of maps should be reduced to the minimum to avoid damage or deterioration. An efficient system of preservation of the maps and associated documentation will facilitate the continuation of the cartographic effort of updating the maps during the intercensus period.

C. Census mapping: some general issues

195. As recommended earlier, the census organization must maintain a cartography division for delineating and mapping the enumeration areas and for carrying out other mapping activities. The scope of the cartographic work that has to be undertaken will be dependent on the assistance that the census organization may be able to obtain from other official mapping organizations. This assistance can range from making base maps available to preparing the maps necessary for the operations. In some countries census mapping is carried out by national mapping agencies and made available to the census organization. 21/ If such agencies are available, the cartographic load on the census organization will be considerably reduced and its staffing structure modified accordingly. In countries where such a tradition of involvement of other official mapping agencies in census cartographic work does not exist, the possibility of such agencies' assisting the census organization must be explored in the very early stages of planning. Such an arrangement will be more cost-effective and help in continuous updating of the maps since agencies whose primary function is mapping and which generally have greater expertise and better equipment will be responsible for maintaining the maps. However, it must be emphasized that the census organization will have to indicate the criteria for and the specifications of the maps necessary for various census purposes and to coordinate activity. The responsibility for ensuring that mapping activity relevant to the census is completed on schedule will have necessarily to be that of the census organization. Suitable liaison arrangements could be developed for this purpose. It need hardly be stated that in the absence of such arrangements, the cartographic division of the census organization will have to be fully built up for carrying out the task.

D. Content of the census

1. General considerations

196. Because of its universal coverage and the long interval between two censuses, the demands on the census are generally heavy. Those demands often range from the highly valid to the impractical, but the inclusion even of valid demands will have to be guided by certain salutary principles of selection founded on the basic objectives of the census and its operational limitations and costs. The effort should be to maximize the return on the considerable investment in the census without overburdening it to the extent of vitiating its efficiency. Deciding the content of the census is therefore a critical task. The content will to a large extent influence the enumeration procedures, the format of the questionnaires, the tabulation plan and the data-processing procedures. The final objective of the process of selection of the topics to be included in a census is the production of a questionnaire that can be well canvassed and that will yield valid information on the desired characteristics at reasonable cost and within acceptable time limits.

Broadly, the content of the census will be determined by the following considerations: (a) the need to satisfy national priorities for data, including data for special groups within the population; (b) the desirability of maintaining comparability with previous censuses; (c) the need to ensure operational efficiency at reasonable cost; and (d) the possibility of maintaining regional and international comparability.

197. One of the primary purposes of a census is to meet national requirements of information on specified characteristics of population and housing. If there are any incompatibilities between national needs and regional or international recommendations, national requirements will take precedence, followed by the desirability to maintain regional and international comparability. The prime consideration will be that the census provide information on topics of greatest interest to the country and yield data of maximum national utility.

198. Subject to national requirements' being adequately met, it would be desirable that international recommendations be adopted to the maximum extent possible. In the context of regional and international comparability, the utility of census data will be considerably enhanced if those data can be compared with similar data of other countries. This will be possible through the adoption of the international recommendations on common topics and through the maintenance of common classifications in tabulations. National and international requirements are usually compatible since international recommendations on topics that could be included in a census, and the corresponding concepts and definitions, have been developed on the basis of global experience over the years and therefore generally meet national requirements with regard to most characteristics. This is particularly true of the recommendations relating to priority topics which are usually common to all censuses.

199. It is recognized that some countries may find it necessary to include topics of particular national or local interest in addition to the topics included in the global or regional recommendations. There may also be special circumstances that compel some departures from those recommendations. It would be very useful if the documentation of the census explained the reasons for inclusion or exclusion of certain topics and for departures from international recommendations, thereby providing a record of national experiences that would be of interest to the regional and international census community.

200. It is desirable while deciding on the topics for inclusion in a census to maintain continuity and comparability with the previous censuses in a given country. Unless there are special technical considerations that warrant a departure, the concepts and definitions of the previous censuses should be adopted with minimum changes for those characteristics that are common to a series of censuses. The maintenance of such historical continuity in the topics included in the census and their definitions permits comparability of data on those topics over a series of censuses. Such comparison over time will enable the study of trends in the main characteristics of the population or housing and the determination of likely directions of change.

201. Historical continuity, desirable as it is, should not become a fetish. If certain topics are not of current interest or if any concepts or

definitions need modification in order to take into account prevailing circumstances, necessary changes will be well in order. It will be useful to review the earlier topics, their concepts and definitions, and the instructions to determine whether there is a need for modification, elimination or addition. This evaluation will have to be carried out very carefully to avoid the temptation of introducing change for change's sake! In some cases, it may be possible to adopt (with suitable expansion or modification) the questions included in the previous censuses without loss of comparability and with the advantage of refinement or increase in the amount of the data. In fact, for some topics, improvement in the instructions alone could achieve this result. The desirability of maintaining reasonable historical continuity will not, in any case, preclude the inclusion, subject to workload and other considerations, of new topics.

202. With respect to the choice of topics, the degree of detail sought in information to be collected and the corresponding questions to be asked, the possible burden that may be cast on the respondent public must be taken into consideration. 22/ Willingness to respond and cooperate will be conditioned by the burden of answering the inquiries, apprehensions with regard to possible breach of confidentiality and to use of the information for purposes other than statistical and the likely feeling of resentment at what is viewed as an intrusion of privacy. Apart from needing to develop effective public relations and communication strategies to overcome adverse reactions due to any of the above-mentioned factors, the census organization will have to take those factors into consideration in deciding on the number and scope of the topics to be covered by the census.

2. Criteria for choice of topics

203. It has been the general experience that extremely heavy demands are placed on the census for information on various topics, many of which are important. The selection of the topics will have to be based on certain criteria, if a useful and cost-effective census is to be carried out. The main considerations will be:

(a) Meeting the specific needs of government. The current data requirements for policy and administration will have to be identified and the relevant topics considered for inclusion;

(b) Filling any gaps in data. It may be necessary to include those topics on which further information is required in order to fill gaps in the data available on such topics;

(c) Determining whether the topic is of major importance. Many topics are important and probably collection of information on all of them will be justified. However, considerations of workload and comparative priorities will compel judicious selection;

(d) Determining whether the topic is suitable for inclusion in the census. The census is not the appropriate mechanism for collecting data on sensitive or controversial issues. An attempt to canvass such topics may sometimes vitiate the entire operation, jeopardizing the collection of essential non-controversial demographic and socio-economic data;

(e) Determining whether the census is the appropriate method for collecting the data. The census has operational constraints. It is not suitable for the canvassing of topics that require detailed investigation, repeated visits or highly qualified staff.

204. In deciding the number and content of the topics that can be included in a census due consideration must be given to their suitability from the operational point of view. It will be necessary to take into account organizational limitations, including the general character of the enumeration agency. Most censuses are manned by part-time enumerators or staff appointed for a short time on fixed remuneration. The enumeration period is also short. It is therefore desirable to restrict the topics to the minimum possible both in terms of number and content. Questionnaires that cover too many different topics or questions that call for investigative probing are unsuitable to a census and will result in unreliable data. The capacity of the field staff to understand and absorb the concepts and instructions and apply them in the field with the same technical excellence with which they have been prepared will be relevant. The workload must be set at such a level as will ensure the collection of complete and reliable data on well-understood topics by the average enumerator.

205. Generally, unless the numbers are small, the training of the various levels of census staff, including the enumerators, is carried out in a decentralized manner. Difficult concepts and complex questionnaires will impose a strain on the quality of training that may sometimes result in a dilution of the intensity and technical adequacy of the training, particularly at the highly critical enumerator level. This is an aspect of the operations that will have to guide the selection of topics and the scope of the inquiry.

206. In many countries, the questionnaires are completed by the head or any other responsible member of the household. Even in such cases, much of what was mentioned earlier with regard to the constraints on the content of the census inquiry will still be relevant. The levels of interest in or understanding of the instructions and questionnaires will vary considerably among members of the public and complicated inquiries may necessitate extensive verification of replies through personal contacts.

207. The overburdening of the field agency by specifying too high a level of detail for a large number of topics could result in unreliable data. In specifying the level of detail for any topic the limiting factor should be the minimum of information that will enable useful analysis to be made and meaningful conclusions to be drawn. The collection of excessive information or expansion into a wide-ranging inquiry are also likely to affect the tabulation and data-processing phases of the census. The system's being overloaded can result in serious delays in production of data or in the possibility that the large amount of information collected will never get tabulated or used. Either result would constitute a wasteful use of resources.

208. The adequacy of the responses and the ready responsiveness of the population that is being enumerated are as critical to the census as the capacity and efficiency of the field agency. Either questions on some topics may not be acceptable or the inquiries may seem too complicated. ^{23/} In the first case, there will be public resentment, which may sometimes jeopardize the entire census operation. In the second case, the validity of the

information collected may be questionable. These factors will also have to guide the choice of topics and the formulation of the corresponding questions. In any case, questions on topics that arouse suspicion in the public mind must be avoided because their inclusion will result in the loss of credibility of the census.

209. The resources available for the census will impose limits on the number of topics and on the complexity of the inquiries. The extent to which the organization has sufficient funding, strong technical expertise, efficient enumeration staff and adequate modern data-processing capacity will strongly influence the census operations. Therefore, the selection of topics must be carefully considered in relation to the resources available, apart from the considerations mentioned earlier. Efficient collection of valid data for a limited number of essential topics, followed by prompt tabulation and publication, is a more rational use of scarce resources than an overambitious, extended inquiry yielding data of doubtful utility or on too large a scale to be tabulated and used in reasonable time.

3. List of topics

210. There are certain topics of national, regional and international interest that are almost universally included in the censuses of countries. These usually relate to the essential characteristics of the population: demographic and social aspects, economic activities, literacy and educational levels, migration features and, in many cases, fertility differentials. The housing topics usually relate to structural characteristics including age, occupancy factors and the availability of facilities within the living quarters. Based on the examination of census experience over decades and taking into consideration the type of information that is generally very useful, international recommendations have been made on topics that can be considered for inclusion in a census. The associated concepts and definitions have also been developed. Moreover, the recommendations have been under review with a view to assessing their adequacy at various points of time. 24/

211. The recommended topics are conventionally divided into two broad categories. The first category consists of priority topics, which are sometimes also referred to in the literature as basic topics or recommended topics of first priority. The second category consists of other useful topics that can be considered for inclusion in a census, subject to need, suitability, cost and organizational factors. The inclusion of topics of the second category should generally be considered only after it has been determined that information on the priority topics will be available. The inclusion of topics beyond the core will depend on the need for data on such topics, the feasibility of canvassing them in a census and the costs of collection and tabulation in relation to immediate utility. Each country will have to arrive at the list of appropriate topics keeping in mind these and other relevant factors. The recommended topics 25/ are not discussed in detail in part one of the Handbook since they are dealt with in another part. 26/. However, they are listed below for convenient reference.

POPULATION CENSUS

Recommended topics of first priority

Geographical and migration characteristics:

Place of usual residence

Place where present at the time of the census

Place of birth

Duration of residence

Place of previous residence

Place of residence at a specified date in the past

Household (or family) characteristics:

Relationship to head or other reference member of household

Demographic and social characteristics:

Sex

Age

Marital status

Citizenship

Fertility and mortality:

Children born alive

Children living

Educational characteristics:

Educational attainment

Literacy

School attendance

Economic characteristics:

Activity status

Occupation

Industry

Status in employment

Recommended other useful topics

Demographic and social characteristics:

Religion

Language

National and/or ethnic group

Fertility and mortality:

Age at marriage

Duration of marriage

Live births within the 12 months preceding the census

Deaths of infants born within the 12 months preceding the census

Maternal orphanhood

Educational characteristics:

Educational qualifications

Economic characteristics:

Time worked

Income

Sector of employment

HOUSING CENSUS

Characteristics of buildings in which living quarters are located:

Type of building

Construction material of outer walls

Year or period of construction

Characteristics and facilities of living quarters:

Location

Type of living quarters

Occupancy status

Type of ownership

Number of rooms

Water-supply system

Toilet facilities

Bathing facilities

Cooking facilities

Type of lighting

Number and characteristics of occupants of living quarters:

Conjugal family nucleus

Demographic and economic characteristics of household head: age, sex, type of activity, occupation

Household

Number of occupants

Tenure

212. Some countries may find it necessary to include in their censuses topics that are of current national importance and interest, in addition to the generally included core questions. In some cases, it may even be found necessary to limit the number of topics from the core group to avoid overburdening the operations. Such variations would constitute reasonable modifications but, as suggested earlier, the reasons for selection of those special topics should be documented.

213. The determination of the topics for inclusion in a census must commence very early in the preparatory stage since a final view can only be taken after a process of consultation with departments within Government and with other data users. There is sometimes an anxious desire to include many topics in order to satisfy as many of the competing demands as possible. Pressures are often exerted on the census organization to include questions of particular interest only to some of the ministries or departments of Government. Whether such particular requirements cannot instead be met through better utilization of the information that is usually already available through the normal administrative reporting systems is a question that must be investigated. (Quite often this will be possible.) It will be necessary for the planning

group within the census organization to take a hard look at all suggestions and demands for inclusion and to determine the clear-cut objectives of the census and, as a logical consequence, the priorities among the topics based on their importance and utility. In determining the content of the census, a reasonable balance will have to be struck between demographic, social and economic items. The highest priority must be accorded to topics that will provide basic benchmark data till the next census. Topics of temporary urgency are best investigated through sample surveys.

E. Questionnaire design

1. General considerations

214. Well-designed questionnaires are crucial to the success of the census. The utility of the information collected in the census depends on what questions are asked and on how they are asked. The preparation of the questionnaire involves the conversion of complex ideas and concepts into queries that are easily understood and correctly answered. Poorly worded questions or confusing formats will generally result in unreliable information. The results of the census can be no better than the questionnaire and therefore the framing of the questions and the design of the questionnaire merit most careful consideration. The handicap of a poorly designed questionnaire cannot be overcome during or after enumeration and no amount of processing will improve the data obtained through such a questionnaire.

215. The format of the census questionnaire is dependent on many factors. It should be consistent with the method of enumeration proposed for adoption, it should be able to elicit for collection all the data required and it should fit into the tabulation procedures. If the housing census is being carried out simultaneously with the population census the possibility of adopting a single questionnaire for both operations could be considered. If separate questionnaires are being used, they should be linked so as to permit subsequent matching and combining of the data relating to living quarters with those relating to the occupants.

216. The method of enumeration proposed for adoption in the census must be taken into consideration. Often the enumeration method is predetermined, in which case the options for designing the questionnaire are already set. A questionnaire that is canvassed by an enumerator can sometimes be more tersely worded than that which the respondent has to complete, the assumption being that training will compensate for brevity of wording. Where the respondent has to complete the questionnaire, it may be necessary to provide elaborate explanations and instructions.

217. The method of processing will also have to be taken into account. There are distinct advantages in anticipating processing requirements while designing the questionnaire, because a suitable format can facilitate obtaining preliminary totals, render editing and coding easier and generally expedite processing operations. If manual processing is being adopted even partially, the questionnaire should lend itself to easy checking and tabulation. If modern data-processing methods are being adopted through the use of optical-character readers or mark-sensing devices, or if the data is

being computerized, the design of the form will have to meet the necessary requirements. The extent of precoding proposed for adoption in the field will also influence the format of the questionnaire.

218. The census questionnaire must satisfy many conditions. It must produce the data required, be understood by the field staff and by the people, be so worded as to be able to elicit accurate information, lend itself to convenient handling in the field and facilitate rapid data processing. Many specific issues will have to be dealt with in designing the census questionnaire, including size, number of questions to be included, wording and arrangement of the questions, manner of recording the responses, and field considerations such as paper quality and durability, and clarity of printing. Its preparation will obviously require the combined input of various specialists. Subject-matter specialists will decide the topics and the wording of the questions. The field staff, through the field trials that have to be conducted, will indicate its suitability for canvassing. The data-processing experts will contribute to its structure, the arrangement of the questions and the coding requirements. The management experts will specify the size and shape appropriate to satisfy the criteria of operational convenience, cost, and avoidance of wastage of paper and printing effort. The ultimate design will obviously be a compromise between the views of these different units.

2. Format of the questionnaire

219. The format of the census questionnaire is usually of one of two types. A questionnaire can be canvassed for each individual or for a household. In the latter format, the details of each individual member of the household will be recorded in the appropriate space in the questionnaire. There can be variations of these basic formats. In some countries, separate forms are used to record information relating to members in collective living quarters or institutional households while in some cases a common questionnaire is used for the group enumeration of special collectivities such as tribal or nomadic populations. The use of the composite household form as the principal questionnaire is generally preferred.

220. Once adopted, a single questionnaire for each household, or for each housing unit in some countries, identifies every member of a household with the household and is easier to handle in the field since there is only one form for each household. The added advantage is that all the members of the household can be listed first, before individual details are canvassed. This reduces the chances of household members' being missed, particularly if the enumerator or the member of the household completing the form is asked to list persons in order of relationship. The listing could start with the head of the household followed first by the spouse, then by each of their children living in the household at the time of enumeration with their spouses and children, then by other relations, and finally by unrelated members of the household, if any.

221. The use of the household questionnaire also enhances the possibilities of tabulations that reflect the characteristics of both the individuals and the households. This simplifies processing on the computer. The size of the household questionnaire will have to be based on knowledge of the average size of the household and experience gained through field trials. Providing for a

large number of members of a household may be wasteful, while restricting the space may result in the using of more than one form for the same household, with consequential problems of record gathering. The optimum size will have to be carefully determined.

222. Some countries have used a combination of the individual form and the household questionnaire. The former records data on the individual members of the household while the latter gathers information relating to common characteristics of the household, such as housing conditions. Identification numbers have to provide the necessary linkage between the two forms. A variation of this system has been the adoption of a single questionnaire in which separate pages are allocated for individual members of the household and a separate sheet for common characteristics relating to the household itself. 27/

223. It is desirable that the questionnaire be kept as brief as possible when field canvassing is adopted. This will prevent lengthy field interviews, which can tire or antagonize the people interviewed or result in an excessive workload for the enumerators with consequent reduction in their efficiency and interest. The size of the questionnaire will necessarily be determined by the number of topics included in the census but must be guided by the experience of field trials to determine public reaction and acceptability and by the operational constraints of the enumerators. A reasonable balance will have to be achieved between obtaining all the information that is sought, retaining public interest and ensuring operational efficiency.

3. Types of questions

224. The manner in which the questions relating to the topics in the census are framed is important. The structure of the questions will affect the size of the questionnaire, the amount of training that may be required and the quality of the information that is likely to be obtained. In the census questionnaire (as opposed to the survey), it is usually impractical to include very many probing questions. Except for some items, it will be equally difficult to include additional questions merely to check on the accuracy or consistency of replies. For example, if a question on age can be supplemented by one on date of birth, the latter will provide a consistency check on age; but the possibility of inclusion of such additional check questions is very limited owing to the large number of topics normally covered by the questionnaire, the need to keep field inquiries direct and free of requiring too much investigation, the need to maintain an optimum workload and the field problems connected with the size of the questionnaire.

225. The questions usually canvassed in a census can be divided into three types:

(a) Direct questions to which responses are single. Such questions are suitable for only a few characteristics such as age, sex and similar topics. With this type of question the alternative replies are sometimes included in the questionnaire, the correct reply having to be identified on the questionnaire itself;

(b) Multiple choice questions for which the appropriate choice has to be identified by each person. Such questions would include those relating to marital status, languages known and status in employment (for example, employer, employee, self-employed, unpaid family worker);

(c) Free-response questions relating to characteristics (for example, work characteristics, occupation and the like) for which there could be a wide variety of responses.

226. In some countries the questionnaire and the instructions have to be translated into other languages. It is absolutely essential to ensure that the questions and the instructions convey the same meaning in all the languages and that nothing is lost in the process of translation. It would be desirable both to have the translations made by a group of people familiar with the language and to try out the translated questionnaires in the field before finalization. The translations must be in the locally understood idiom; it may be more practical to have the translations made by statisticians or administrators who have worked in the area concerned and are familiar with the language. If there are only two major languages, a bilingual questionnaire could be considered but if there are many languages separate questionnaires in each major language will be necessary. Sometimes, translations of the questionnaire in the major languages are printed and then attached to the enumerator's manual, but with such arrangement it is assumed that all the enumerators know the language in which the manual was originally prepared.

4. Wording and arrangement of the questions

227. The wording of the questions is a critical factor that influences the accuracy and consistency of the answers. If the size of the questionnaire permits, it is desirable to use the full form of the question appropriate to a topic. However, this is not always possible and short forms such as illiterate/literate? or educational attainment? that are indicative of the topic under investigation are adopted. The clarity of the instructions and the intensity of the training must then make up for the brevity of the questions. In any case, the wording of the questions is extremely important. Ambiguous words or questions that, because of careless wording, invite vague answers must be scrupulously avoided. The questions should be easily understood by the people and clear to the enumerators as well. The danger of the enumerators' deciphering the intent of a question when that intent is not clear is an ever-present one. The clearer the wording in the questionnaire, the rarer will be the need to provide elaborate explanatory material.

228. The order in which the questions are arranged and asked is important for obtaining consistent answers, retaining the interest of the respondent and ensuring the familiarity of the enumerator with the concepts and instructions, as well as facilitating the recording, checking, verifying and data processing of census answers. Questions should be arranged in a logical and sequential manner so that one leads naturally to the next and confusion and misinterpretation are avoided. This is particularly important when questions deal with the same topic, like those on, say, employment and work characteristics. Some salutary principles could be followed regarding the arrangement of questions. Since some of the questions (those, for example, on

marital status of those aged 15 years and over) will seek information only from parts of the population, they may be arranged according to the following sequence: (a) those that seek information on all persons such as name, sex, age and the like; (b) those relating to topics that apply to most of the population such as educational level and marital and employment status of those aged 15 years and over; and (c) those dealing with topics that are relevant to only a smaller proportion of the population such as fertility of women aged 15-49 years and so forth. In addition, some further principles could be adopted, namely: (a) that general questions must precede the more difficult ones; (b) that questions relating to the same topic (for example, those on employment and work characteristics) should be grouped together and arranged logically; (c) that sensitive questions must be placed towards the end of the questionnaire but not necessarily at the very end, where they may be ignored; (d) that if several connected forms are used, the common items should be arranged in the same sequence (this would be important in the case of identification items); and (e) that where the sequence of questions depends on the answers given at earlier points, the path to be followed should be clearly indicated.

5. Recording of the answers

229. The replies to the questions in the census questionnaire can be recorded in many ways. The answers can be (a) written in full or (b) recorded by entering a code number, identifying a code among alternatives printed in the questionnaire or making a mark against the reply from a list of possible responses in the questionnaire. Each of these different methods has its advantages and disadvantages. Sometimes more than one method is adopted in the same questionnaire. The particular method of recording the information will have to be decided taking into consideration the ability of the enumerators, the data-processing procedures and, in countries where the questionnaire is completed by the respondent, the respondent's understanding of the questions.

230. If the system of precoding is adopted, the acceptable responses can be printed in the questionnaire. The enumerator will then identify the appropriate response by circling the code, marking an X in a box or using some other suitable method. This design will require considerable space, since a full range of possible responses will have to be included for almost all the questions. However, it will eliminate the need for further coding and will expedite tabulation. If the size of the questionnaire and the space available for the responses are considerations, the enumerator can be asked to do the coding. In this case, the correct code would be entered in a box against a question, from among a list of alternatives supplied to the enumerator. A compromise between the two systems would consist in printing not descriptions but only the codes of all possible responses against a question and instructing the enumerator to circle the appropriate one.

231. Some questions do not normally lend themselves to precoding of the responses and need the recording of the information in full. For example, employment and occupational characteristics will have to be described fully since a very wide range of responses will be obtained. In such cases, it is essential for the enumerator to write the answer fully. The coding of such responses will have to be done subsequently.

232. As mentioned earlier, different methods of recording the answers are often adopted in the same questionnaire. Questions (like those on sex) that require a choice to be made between just two alternatives or those (on languages and religions, for example) for which the alternatives are few lend themselves to precoding. Questions that could have very many responses would have to be answered fully. The advantages of precoding are that it reduces enumeration time, saves on space in the questionnaire and speeds up data processing. It does, however, have some disadvantages. It requires extra training and greater skill. There is the possibility of the enumerator's making errors owing to the multiplicity of codes or carelessness in circling (or otherwise identifying) the appropriate code. The entering of codes or their marking in restricted spaces is not always done in the field with the precision expected and may result in confusion in identifying the correct response. Whether the advantages of precoding compensate sufficiently for the possibility of errors will be a matter of judgement, taking into consideration the magnitude of the operation, the skill and training of the enumerators, the level of understanding of such codes among the public and other operational issues. When the adoption of precoding is being entered and the extent of adoption is being decided, the effect of precoding on the quality of the census must be carefully assessed. Generally speaking, the enumerators in most countries constitute a field agency that possesses little experience in survey techniques or census-taking and over which control is likely to be minimum during the intensive enumeration period. However, the possibility of progressively introducing precoding into census-taking would be worth exploring.

233. Two other methods of recording have been developed that allow the use of optical scanning devices for expediting the transfer of data from the questionnaires. These scanning devices are the optical-mark reader (OMR), which reads marks in the questionnaires such as dashes, crosses and dots made by the enumerators and converts them to machine-readable codes, and the optical-character reader (OCR), which reads the characters, letters and numbers entered by the enumerators. The use of these systems requires very careful placement of the marks and letters in the appropriate predetermined positions against each question. Such placement is often difficult to ensure under usual field conditions. Also, the scanners are very sensitive to such factors as extraneous marks and folds in the papers, and such sensitivity may result in high rates of rejection. Since at present, the formats also require precision printing, good-quality paper and careful handling in the field, the adoption of such techniques must be carried out only after their careful evaluation.

6. Physical layout of the questionnaire

234. The physical layout of the questionnaire, another important aspect of its design, includes size, arrangement of questions, printing quality and durability. These elements have much to do both with the ease with which questionnaire can be handled in the field and in the data-processing centres and with its preservation.

235. The questionnaire has to be large enough to accommodate all the questions proposed for canvassing (with sufficient space for recording of codes or responses that have to be written out fully and for manual coding) and to

permit clear and readable printing, but not so large as to be unwieldy for use in conditions that are, if anything, less than ideal. In so far as the field conditions under which it will be used must always be kept in mind, the questionnaire should be convenient to handle, neither too large nor too small, and on paper of durable quality (since it will have to withstand repeated handling in the field, in the tabulation and data-processing offices and in the storage and recording rooms). The size and format must also match, to avoid wastage and reduce costs, the standardized sizes of paper that may be available.

236. The placement of the questions in the questionnaire is also important. It will be preferable to have all the questions pertaining to the same person or housing unit appear on the same side of a sheet so as to avoid any questions' being overlooked and to facilitate editing and coding. Neat printing with good type styles that distinguish the questions will give considerable assistance to the enumerators and to respondents who have to complete the forms. It is possible to achieve these objectives without necessarily increasing costs by imposing quality checks while printing the questionnaires.

237. It is apparent that the designing of a questionnaire that ensures accurate responses and satisfies the other conditions mentioned is a task that requires considerable time and experimentation. The work will therefore have to commence quite early in the planning process so that the content and the form of the questionnaire are decided well in advance of the commencement of the other important stages that are dependent on it, including drafting of the instructions, preparation of training materials, estimation of the numbers of enumerators and supervisors, planning of the content of the publicity campaign, arranging for the massive processes of printing and distribution, and determination of the tabulation scheme, the data-processing procedures and equipment needs. 28/

F. Census tests

1. Importance of census tests

238. Organizing and conducting a census is a large and complex undertaking that, despite the best of effort and intentions, is often beset with limitations of time, budget and experienced personnel. Almost invariably experience has shown that all components of the plan, even when well planned, may not work as well as expected. Such an outcome could give rise to crisis situations, which would then have to be met with hastily devised and usually expensive alternative courses of action, or, if allowed to get out of hand, could seriously affect the efficiency of the census itself. It is therefore essential that all aspects of the census be well tested under actual operating conditions.

239. The importance of carrying out census tests cannot be overemphasized. The failure to pretest concepts and procedures could lead to inadequate results, rising costs and loss of time. The lack of budget, any resources, time or staff should not be a reason for not carrying out census tests. In fact, it is precisely in such situations that those tests are most useful. Because they give valuable guidance in optimizing the use of scarce resources

by indicating the limits of feasibility of the operational plans, such tests should be an intrinsic part of the process of planning a good census.

240. Even countries with considerable experience in census-taking will find it useful to carry out pretesting that is as extensive as possible. Conditions change and the experiences of past censuses, as valuable as doubtless they are, may not necessarily suffice. The type of enumeration agency, induction of inexperienced staff, changes in topics or procedures of enumeration, modifications in the tabulation and data-processing procedures, and similar factors will influence each census. From one census to another, a number of significant social, technological and administrative changes occur that require serious consideration and may quite often compel a reappraisal of the census questions, concepts, definitions and instructions. Questions on complex topics such as the economic characteristics of the population usually call for revisions designed to improve the adequacy of the information. The adoption of modifications in procedures of data collection such as the use of sampling, or improvements in the technology of data processing, have significant impact on the operations. Thus, each census will have to be viewed as a new exercise, all of whose elements have to be tested.

2. Purpose of census tests

241. Census tests can vary in purpose. The term census tests is generic and includes all types of tests connected with a census, irrespective of scope or purpose. The first tests will include those that evaluate field procedures relating to various aspects of the operations such as quality of mapping, suitability of the forms, clarity of the instructions, concepts and definitions, and assessment of workload. Such tests are generally called pretests. The last census test will be the pilot census, sometimes also referred to as the experimental census or trial census, which is generally a comprehensive test of all census procedures taken about one year before the enumeration.

242. The main purposes of census tests will depend on the experience that a country has in census-taking, its resources and the time available. However, the need for some form of field testing is almost universally recognized. It would be desirable to complete the experimental phase, in which different formats and alternative formulations of questions could be tried out, as early as possible. This will allow enough time for repetitive testing of the format in near-final form and for improving it so as to arrive at the final questionnaire.

3. Utility of census tests

243. Since a census consists of many interrelated activities, not only must the content of each activity be fully evaluated but it is also necessary to ensure that the linkages are effective. Pretests and a pilot census will provide opportunities for assessing and correcting any deficiencies that may exist relating to these aspects.

244. Pretests will yield norms of staff requirements in the field and at supervisory levels and give some idea of the magnitude and cost of elements

such as transport, paper requirements and supervision. Data-processing procedures should also be tested to obtain estimates of the time, staff and equipment requirements after pretests and the pilot census. There are therefore direct benefits to be derived from conducting the appropriate census tests.

245. The census tests have certain indirect benefits too. The senior staff and other supervisory levels will gain valuable field experience through organizing and conducting the tests. Either through direct involvement or through supervision the various management levels will have gained hands on experience that will be extremely useful in preparing the final plans for the census. The training procedures and material will also be tested, and the data-processing staff will gain experience in processing field data.

246. Administrative features will also be tested. The management and administrative staff will become familiar with such field realities as channels of communication, flow of records, logistics of distribution, and retrieval and consolidation of questionnaires and other field documents. Even though massive publicity is rarely mounted for the pretests, the reaction of the public to the questions and the understanding of both the public and the field staff of the purpose of the census could be assessed. This will help in planning the communication and publicity campaigns and the strategies for ensuring public cooperation.

247. To sum up, the aspects of the census that such tests will assist in improving include the following:

(a) Maps of enumeration areas: their accuracy, clarity and suitability for use in the field;

(b) Questionnaire design (a wording of the questions that is concise, clear and unambiguous; a sequence and arrangement of the questions that are logical; and form size, printing and other details, including space for recording information, that make the questionnaire convenient for use in the field and later for data processing). In particular, the feasibility of canvassing new topics will be tested, including the wording for such inquiries;

(c) Training (content, adequacy, suitability of training procedures and clarity of training material);

(d) Public reaction (understanding of the questions and their purpose by the public, the motivation that may be needed, possible publicity and communication strategies that may have to be adopted);

(e) Enumeration procedures (adequacy of time for canvassing the questionnaires, determination of output norms, physical or other constraints in using the prescribed forms in the field, logistic problems of transport, adequacy of supervision and other control mechanisms, suitability of procedures for collection and aggregation of forms). If sampling is being adopted, that procedure, and its reliability and utility, can be tested;

(f) Manual editing and coding (suitability of forms, adequacy and clarity of instructions, computation of output norms);

(g) Data entry (computation of output norms and error rates, assessment of staff and equipment requirements and of supervision needed, testing of the equipment itself);

(h) Data processing (suitability of software packages proposed for use, adequacy of computer editing, time norms for processing);

(i) Administrative matters (adequacy and suitability of location of regional and other offices from the point of view of control of the operations, adequacy of enumerators and supervisors, control of and support to the field staff during the critical stage of enumeration, adequacy of channels both of communication with staff and for payments to them).

4. Design and implementation

248. The care with which the pretests or pilot censuses are planned and executed will be reflected in the utility of the experiences that these exercises yield. In designing such tests it will be necessary to consider: (a) the scope of tests that seem desirable, (b) where they should be conducted and how extensive the area coverage should be, (c) when they should be conducted, (d) the number of tests necessary, (e) the duration of such tests, (f) the type of personnel that will be involved in them and (g) the early evaluation of test results.

(a) Scope of the tests

249. The scope of such tests will depend on the stage of the planning process at which it is proposed that they be conducted and their purpose. In the early stages of planning the census, when the concepts and questionnaires are still under initial consideration, the tests can be informal. The questionnaires could be tried out within the office on the staff or in just a few households, after due explanation of the purpose of the tests. Such tests will help in eliminating topics that are obviously unsuitable or wordings that are apparently inappropriate. Later, more rigorous tests will have to be carried out to test alternative forms or procedures. For example, multiple types of questionnaires could be tested to determine the most suitable formulation and to prepare the first draft of the questions. In such cases, it would be desirable that the tests be carried out with different sets of staff and in separate areas so that a comparison of the results could yield maximum feedback. Such initial tests will help in achieving a considerable degree of improvement so that later efforts can concentrate on refinements.

250. In the early pretests, it may be convenient to test various aspects independently. However, the later field trials must bring together connected aspects so that the results of the tests help in evaluating both technical stipulations and management arrangements. The tests could include field testing under real conditions with more rigorous supervision and could also extend to trying out the data-processing arrangements. The final stage of such tests will be the conduct of a pilot census which is in effect a dress rehearsal of the actual operations.

(b) Coverage

251. It will be necessary to determine the size of pretests and the segments of the population they will cover. The pretests will be largely influenced by the purpose of each pretest and the funds available for such tests. If the final drafts of the questionnaire are being tested along with the enumeration procedures, it will be desirable to conduct these tests in a reasonably extensive manner so as to draw maximum benefit from the exercise and to avoid their having to be repeated later in other areas.

252. For pretesting questionnaires and procedures, it is not necessary to adopt sampling procedures for selection of the areas where such tests will be carried out. It is usually more practical and useful to deliberately select the areas that will yield the widest range of experiences. Such areas would include those inhabited by particular socio-economic, ethnic or tribal groups; those with particular terrain problems; riverine areas; and urban concentrations. Selection of areas on the basis of strict sampling principles is necessary only if the results of the pretests or the pilot census are proposed for use in generating estimates of population. In many cases, this may only add to the cost of the tests and even divert attention from their main purpose, which is to evaluate and improve procedures.

253. The pilot census should be conducted in representative administrative regions. Its coverage will have to be carefully determined so that, while providing sufficient feedback on organizational preparedness, it does not call for excessive investment in terms of staff, time or finances. The local, municipal and other agencies involved in the final census will have to be associated with the pilot census. Such an association will help in testing those agencies' preparedness too.

(c) Timing

254. It is essential to allow sufficient time for evaluating the experiences of the pretests and utilizing the findings for making such improvements as are possible in the questionnaire or procedures. The question will therefore be how long before the census must these tests be held. It might appear that the longer the period between the tests and the actual census, the better (in terms of being able to use those tests' results effectively). It would be unrealistic to plan the more extensive tests, except the very preliminary ones, too much in advance of the census. The tests themselves depend on the census plan's having sufficiently advanced to the stage at which the topics and the formulation of associated questions, the enumeration procedures and administrative arrangements, the likely tabulations and the data-processing systems are fairly clearly determined. The timing of the tests must therefore be made realistically. They should be neither so distant from the census as to reduce their utility nor so near as to render the introduction even of necessary and desirable changes neither advisable nor possible. Experience would seem to indicate that the pretests must be conducted within two years of the census (at various intervals for multiple testing if necessary) and well before the pilot census.

255. The pilot census will require about five to six months from the planning stage to completion of evaluation of its results. If any serious deficiencies in the content or procedures of the census are noticed, there should be enough

time to develop and carry out any major modifications that may be vital. Also, the pilot census should simulate conditions that will exist at the time of the actual census. It is therefore necessary to conduct the pilot census a year before the actual census and at approximately the same time in the year as that in which the actual census is expected to be carried out.

(d) Number of tests

256. The number of pretests that should be conducted will have to be decided in the light of a particular country's experience of census-taking, the time available and the costs. Generally speaking, their number should be such as will result in as perfect a questionnaire and as effective a body of procedures as possible. The initial trials of individual elements such as mapping and the first drafts of the questionnaire will not be excessively costly nor will they require excessive organizational effort or funds. The more rigorous pretests in which the integrated systems will be tested should follow one another so that there is a sequential and progressive improvement in the questionnaires and all procedures. The ideal situation would be the conducting of as many such tests as might be necessary for maximum improvement, but such a situation is not always possible. Experience would seem to indicate that the minimum number of rounds should be two so that the possibility of improvements' being made is enhanced.

(e) Duration

257. The duration of the pretests will depend on their scope. The initial tests could be planned and carried out over a few days. However, the later and more rigorous ones, where connected activities are tested together, will need at least two to three months preparatory time even though the tests themselves will be conducted over a few days. It would be prudent to provide sufficient time for planning and organizing those tests so as to derive maximum utility from them.

(f) Personnel for the tests

258. The initial pretests could be conducted by the staff of the census organization itself. In fact, such involvement will give the professional staff some feel for actual field conditions and thereby enable them to better appreciate field realities. The more rigorous pretests will need a greater number of staff and will include the supervisory levels also. The last few tests must be conducted employing the actual agency that will be used for the census itself. This will be essential in order to assess the field staff's understanding of the procedures, concepts and instructions, appreciate field problems that the staff may have; and obtain some indication of the reactions of the public and its understanding of the questions asked. For the pilot census, the field staff must be derived from the same source as will be used in the actual enumeration.

259. Senior- and middle-level professionals from the census organization must be associated with all the pretests and with the pilot census. Indeed, not merely should they be involved in planning and carrying out those operations, but some of them should observe field operations in order to detect difficulties in the questionnaires or procedures that may not be reported by the field staff. Some issues relating to the way in which questions must be

canvassed or to difficulties in interpreting instructions in the field will not be apparent from an examination of the completed questionnaires and can be gleaned only through personal observation of actual operations in the field. It is most important that such observation be non-participatory. Observers should not attempt to guide, correct or advise the field staff. In other words, no attempt should be made to improve upon the work of the enumerator. Such observation without intervention is important because it constitutes the nearest approximation to the field situation during the actual census, when the enumerators are very much on their own.

(g) Evaluating the test results

260. The purpose of the pretests is to identify and correct possible deficiencies or difficulties in the important stages of census-taking from enumeration to data processing and thereby ensure that the actual census will be carried out with a high degree of assurance regarding its accuracy. That purpose can be served only if the evaluation of the results of the pretests is carried out quickly and properly. The reports from the field staff and from observers will provide valuable material for such an assessment. Also, consistency checks can be carried out on the information on associated characteristics to determine difficulties regarding either concepts and instructions or the asking of certain questions in the field. Some basic tabulations should be attempted to be sure that all information for the sets of tabulations envisaged will be available in correct form.

261. The experience of countries in planning, organizing, conducting and evaluating their pretests and pilot censuses will be of great interest and assistance to the countries of the region and internationally. It is therefore recommended that reports by countries regarding the carrying out and evaluation of such tests and the utilization of their results be prepared and published.

G. Consultation with data users

262. The census must produce data that meet the current information needs of the country while ensuring, to the maximum extent possible, comparability with previous census results and consistency with other national data sets. Even while doing so, each census seeks to improve concepts and procedures, including those relating to tabulation and dissemination of results. In order to be able to achieve such improvements, it would be desirable to augment the expertise available within the census organization through consultations with as wide a group of users of census data as possible. Such consultations with major users of census data on topics to be included in the census, concepts, definitions, broad procedures, the tabulation plan and presentation of data will be very useful from many points of view. They will provide valuable technical input in the preparation of the census plan and assist the census organization in planning for a census that, within the framework of the resources available, is as responsive as possible in content and presentation to user needs. Those consultations also foster a better appreciation by the data users of the constraints that the census has to be conducted under, which limit the inquiry's scope.

263. The users who may be consulted will be representatives of government ministries and departments who utilize or need census data; university departments concerned with population issues and related subjects; institutions of eminence carrying out research on demographic, social and economic issues; and individual experts in these fields. In particular, within Government, it will be necessary to include in these consultations the departments concerned with education, social welfare, urban policy, housing, women's programmes, health, rural development, manpower planning and employment, as well as other departments that are primary users of census data. The representatives of the regional or state Governments, if any, and of the larger metropolitan areas must also be associated in these discussions.

264. Given the wide range of interest in the census results, the structuring of the consultations with the data users needs consideration. It will be desirable to expose the tentative views on the census to a larger body of data users. This will provide a forum for eliciting and evaluating demands for census data and also for obtaining wider acceptance of basic proposals for the census. One form of consultation involves the holding of conferences of data users early in the planning stage to expose the initial thinking on the census to expert scrutiny and to obtain reactions and suggestions. The participants in such a large consultative conference will no doubt represent a very wide range of interests and be at different levels of expertise. However, there will be an advantage in bringing them together so that there can be a wider appreciation among professional circles both of the enormous, and often disparate and highly competitive, demands that are made on the census and of its inability to meet all of them.

265. Such conferences would seem useful at two stages: that of selecting the topics and planning the questionnaires and enumeration procedures and that (later) finalizing the tabulation and publication plan. The views of the participants will have to be assessed within the census organization and initial decisions taken on topics, questionnaire design, method of enumeration, tabulation and publication plan and other features. At this stage, the mechanism of consultation can be modified to obtain more intensive technical consideration of issues than would be possible in large conferences. Such intensive consideration can be achieved through meetings of small groups or ad hoc committees of experts, including the technical advisory committee, which will provide the professional advice and assistance that may be necessary for finalizing the technical content of the census. The record of the discussions of the conferences and of the expert groups will form valuable historical material and be useful to those responsible for organizing subsequent censuses.

VII. ENUMERATION

266. The most critical operational phase in the census is the enumeration. During the relatively brief period of its operation information concerning every person and every housing unit is collected and documented. The importance of a complete and accurate enumeration cannot be overemphasized because the handicap of incomplete or faulty enumeration can never be fully overcome.

267. Careful planning will considerably reduce defects in enumeration. Such defects can occur owing to a variety of reasons, including failure to enumerate all persons or housing units that should have been included, failure to collect full information or record information accurately and, sometimes, double-counting of the same person or housing unit. Technical or organizational deficiencies such as poorly worded questionnaires, faulty instructions, inadequate training, or incorrect demarcation of enumeration areas will also have a serious effect on the quality of the census. While deficiencies in the field operations due to mistakes by enumerators or respondents can to some extent be minimized by better supervision, those due to organizational or technical deficiencies are scarcely amenable to much correction once the enumeration has begun.

268. Planning the enumeration phase will involve consideration of such issues as (a) when it should be held, (b) the basis for enumeration, (c) training of staff at various levels, (d) field procedures for control of the operations and (e) publicity campaigns. These issues are considered in the present chapter and the next. At this point it will be useful to recall that no issue is distinct, that they are all interrelated and that planning and, in some cases, preliminary action should commence well in advance.

A. Timing of the enumeration

269. The period of the year during which the enumeration will be carried out is an important consideration. Some of the important factors that will determine the best part of the year for the enumeration are:

(a) Desirability of selecting that period (i) in the year in which the enumeration can be carried out simultaneously in all parts of the country, (ii) that is likely to yield the most typical data and (iii) during which operational problems will be least;

(b) Operational considerations, which will influence the timing of the enumeration. Weather conditions that might hamper field operations or supervision or that call for large mobilization of surface or water transport vehicles will have to be avoided. The mustering of such input may not always be possible and may be expensive too. The safety, retrieval, transport and storage of census field records immediately after the enumeration are important considerations in deciding on the timing of the census;

(c) Seasonal conditions, which should permit the field operations' being conducted with maximum efficiency. Extreme heat or severe cold will affect the performance of the enumerators, while heavy rains may make some areas

inaccessible. In countries with sharply contrasting seasonal patterns in different parts, the most suitable period of the year for the major part of the country could be selected, with additional input of transport, staff or other requirements due to adverse weather conditions in specified areas. Sometimes, such considerations may compel the taking separately of the nomadic population's enumeration;

(d) Change with the seasons, in some countries, in the activity of large proportions of the population. For example, landless agricultural laborers may have a peak period of activity only during the agricultural season or at harvesting time. In such cases, it is better to conduct the enumeration in that part of the year when such activity is closest to the normal or typical situation so that economic characteristics are reflected truly;

(e) Demographic and social factors, which will also be relevant. If there are large migratory movements of the population during certain periods of the year, it will be best to schedule the enumeration for a period when people are likely to be found in their customary places of residence. Seasons of peak agricultural activity should be avoided because it will be difficult to enumerate people who may stay on their lands for only days at a time, and in some countries those seasons of peak activity are also the period during which migration of agricultural labor takes place;

(f) Periods of long holiday festivities, pilgrimages or fasting, which will be important to avoid;

(g) Availability of personnel for the field force, which will be an important consideration. In many countries, officials such as schoolteachers are generally employed as enumerators and supervisors. That period of the year will have to be chosen when this staff is available with least disruption of its normal work. The period when it is likely to be away on leave and for holidays should be avoided. It will be very difficult to induce this staff to report for enumeration duties during such periods.

B. Enumeration procedures

1. Basis for enumeration and population to be enumerated

270. The determination of the total population of a country and its geographical distribution within the country are a common and essential element of all censuses. However, the definition of what constitutes the population of an area varies from country to country. Depending on the definition adopted, the total population may include or exclude foreigners in the country and its own nationals abroad, and it may or may not include certain groups within the country too. While the definitions of total population vary among countries, those definitions are nevertheless categorized under either of the two principal concepts commonly adopted for enumeration, namely, de facto population and de jure population. 29/

271. The two principles of enumeration of population can be described as follows:

(a) De facto population includes all persons physically found present in an area on the date of the census. The total population will comprise all persons present in the country at the census moment and enumerated at the place where they are at that moment, regardless of their usual place of residence. The enumeration is carried out on the basis of where a person is at the census moment;

(b) De jure population comprises all usual residents. All persons present at their places of usual residence will be enumerated as well as those who may be temporarily absent from their places of usual residence, irrespective of where they are at the census moment. Enumeration is carried out on the basis of place of usual residence, irrespective of whether the person is or is not present at that place at the census moment.

272. Before the two methods of enumeration are considered, it will be necessary to briefly consider the definition of the place where present at the time of the census and of the place of usual residence. The former definition is relevant for the de facto count and the latter for the de jure count.

273. The place where present at the time of the census is the place at which each person was on the day of the census, whether or not this place was his or her usual place of residence. In practice and for operational convenience, the concept is applied to the place where the person slept on the night preceding the census day or was present at a defined census hour.

274. If the count is on a de facto basis, the procedures for enumerating persons who may be travelling or away at work during the night preceding the census day must be specified. The practice generally adopted is to enumerate persons who may have been travelling throughout the night preceding the census day at the place where they are found at a reasonably early hour on the morning of the census day. Enumeration staff located, inter alia, at railway and bus stations, ports and airports will enumerate such persons at daybreak, after making sure that they have not been enumerated at an earlier halt. Persons at work on the night preceding the census day are generally enumerated in the places they would otherwise have slept in but for having been away at work.

275. The place of usual residence is where a person usually resides and it may or may not be the person's place of domicile or permanent residence. The latter terms are usually defined in the laws of most countries and need not correspond to the concept of place of usual residence which, as employed in the census, is based on conventional usage.

276. Although most people will have no difficulty in stating their place of usual residence, there may be some confusion in certain cases. The case of persons who maintain more than one residence, of students who stay in hostels, of persons who sleep away from their homes during the week for work-related reasons and only return home for a few days at the end of the week, and of defence and other personnel who live in official accommodations but continue to maintain residences, as well as similar ones, should be provided for in the instructions for enumeration. Precautions will have to be taken to avoid such persons' being counted twice, particularly in cases where the residences or places of stay are located in different enumeration areas. The instructions will also have to provide for such cases as persons who are out of the country

temporarily and likely to return and persons within the country who are at the places in which they were found for a very brief period and are likely to return to their usual places of residence before the expiry of the enumeration period. In such cases, it is usual to prescribe clear time limits of presence in or absence from a particular place to determine the place that should be treated as that of usual residence.

277. It is recommended that a combination of the two methods be adopted to obtain information that is as complete as possible. If obtaining both the *de facto* and *de jure* populations is desired, the questionnaire will have to distinguish between persons usually resident and actually present, persons usually resident but temporarily absent and persons not usually resident but present in the household, with reference to the census day. Information will also have to be obtained about the usual residence of those who are only temporarily present for relocation to their places of usual residence. The collection of such complete information has implications with regard to workload placed on the enumerators, adequacy of supervision and feasibility of conveying the concepts to both the enumerators and the public. The possibility of collecting such complete information will have to be a matter of judgement for each country.

278. The general practice has been to adopt either of the two enumeration methods with some variations. The enumeration method may be modified to reduce conceptual problems for the enumerator and the public. For example, it may be prescribed that if a person is away from his or her place of usual residence for a certain period before the census moment and is not expected to return before that moment, then enumeration will be conducted at the place where the person is found at the census moment. To deal with such variations, careful instructions and good training will be needed.

279. Though there is general agreement on the definitions of *de facto* and *de jure* populations, in practice countries rarely achieve either type of enumeration fully. In the application of the concepts differing principles are adopted with regard to the inclusion or exclusion in the total population of certain groups. These groups include the following: 30/

- (a) Nomads;
- (b) Persons living in areas to which access is difficult;
- (c) Military, naval and diplomatic personnel of the country, and their families, located outside the country;
- (d) Merchant seamen and fishermen resident in the country but at sea at the time of the census (including those who have no place of residence other than their quarters aboard ship);
- (e) Civilian residents temporarily in another country as seasonal workers;
- (f) Civilian residents who cross the border daily to work in another country;

(g) Civilian residents other than those in groups (c), (e) and (f) who are working in another country;

(h) Civilian residents other than those in groups (c) through (g) who are temporarily absent from the country;

(i) Foreign military, naval and diplomatic or defence personnel and their families who may be located in the country;

(j) Civilian aliens temporarily in the country as seasonal workers;

(k) Civilian aliens who cross a frontier daily to work in the country;

(l) Civilian aliens other than those in groups (i), (j) and (k) who are working in the country;

(m) Civilian aliens other than those in groups (i) through (l) who are temporarily in the country;

(n) Transients on ships in harbour at the time of the census.

280. Some of the groups are closely related. However, the groups have been listed separately to emphasize that their enumeration will have to be provided for by special procedures or instructions and, in some cases, by a conscious decision whether or not to include them in the total population.

281. The treatment of these groups is not uniform. The inclusion or exclusion of some of the groups in the enumeration has generally been governed by past practice or by an administrative - and sometimes political - view of who should legitimately constitute part of a country's population. While each country will doubtless have its reasons for such differential treatment, it is recommended that the census documentation indicate the groups that constitute the population and those that are excluded rather than just describe the count as *de facto* or *de jure*. Such information will be very useful in comparing population size and characteristics among countries and will also help in arriving at appropriate decisions in the succeeding censuses in the same country.

282. The importance of a standardized definition of the total population to be applied from census to census must be emphasized, 31/ but at the same time the difficulties in arriving at a common definition, in so far as those difficulties arise from the differential treatment of the groups referred to earlier, must be recognized. None the less, the need for a uniform definition's being adopted within a country is evident. Any serious variations from one census to another will considerably reduce the utility of the data, render the study of population trends difficult and introduce serious errors in population estimations and projections.

283. Variations among countries in the concept or definition of what constitutes total population have great significance in estimations of world population and monitoring of its trend. The absence of uniformity in treatment of the groups under consideration could result in some of those groups' being completely omitted or double-counted in the estimation of the world population. This distortion, the magnitude of which is unknown, may be

growing because of the increase in population of all or some of these groups and the large international movements that have become quite apparent in recent years. The implicit assumption of a few decades ago that the differential treatment of these groups did not have any significant effect on the total population is no longer valid.

284. It would be desirable to achieve some degree of uniformity in the definition of total population and in the corresponding principles of enumeration of the groups under consideration. It has been suggested that of the groups listed in paragraph 279, (a) through (f), (h) and (l) be included in, and (g), (i) through (k), (m) and (n) be excluded from, the total population. 32/

285. It is relevant to note that operational realities must be taken into consideration while defining the groups that should not be enumerated. The determination in the field of categories that should be excluded will involve some degree of probing and the enumerators may not always be capable of eliciting the correct information. In the interests of uniformity of treatment in all enumeration areas, it may be better to structure the questionnaire so as to obtain the information necessary for classification, excluding such special groups as diplomats, on the basis of which groups will or will not be included in the total population. If this procedure is adopted, the enumeration will include virtually all persons present in the country at the census moment, the classifications to be made later at the time of tabulation and presentation of the results.

286. If, for whatever reason, any groups are not included in the total population, it is recommended that a clear indication be provided of the population size of such groups. This presupposes that the enumeration of the excluded groups has been carried out. If those groups have not been enumerated (as may generally be the case for the excluded groups), they should be listed and, if possible, estimates of their size provided from administrative records or other sources.

287. It has been recommended that the residents of a country who are located abroad on a long-term basis be excluded from the definition of total population. However, some countries may prefer to include their nationals living abroad in their total population. Such inclusion is generally based on special circumstances that may prevail in the country and is, in particular, argued as important in the case of countries with small populations of which a substantial proportion lives abroad. If inclusion is desired, the accurate determination of the number of their nationals abroad will be the most important issue. It is very doubtful whether the information on these numbers, when collected through diplomatic channels in other countries or through the country's own representatives, will have a high degree of accuracy. If information on nationals abroad is being sought from the members of their families who are being enumerated in a particular country, the approximate number of those nationals can possibly be obtained, but the quality of any further information on such persons that may be provided by relatives in that country is likely to be very doubtful. If, despite these apparent difficulties, to collect details on the number of a country's citizens living abroad is desired, it is suggested that the inquiry be limited to eliciting information on name, sex, age, relationship to head of household and duration of absence from the country.

288. The estimation of the number of nationals living abroad from administrative statistics has, in general, severe limitations. However, the exchange of information between countries on the number of persons by nationality will provide some reliable data. It must nevertheless be stated that determination of the number of nationals living abroad is generally very difficult and their inclusion in the total population as part of the census count can result in a distortion of the base population that will be used for computing demographic and social indices. The decision regarding both obtaining the number of nationals living abroad and including those nationals in the total population should be made only after very careful evaluation of the reliability of the sources, and the utility, of such information. If the practice of including nationals living abroad in the total population is adopted, it is recommended that the total population enumerated within the country and the total number of the nationals living abroad be presented separately and that the procedure adopted for determining the latter be clearly stated.

289. The procedure for the enumeration of the members of the armed forces and the presentation of those data are matters that need special attention while planning the census. Defence personnel are generally enumerated but cannot be identified from the published data. In particular, most countries would like to so present the data as to prevent the identification of defence camps and concentrations. This is often a matter of State policy and security. The appropriate enumeration and tabulation procedures will have to be developed for this purpose. One of the methods is to allocate individual members of the defence services to their district or region of birth or to their usual place of residence, information on those items being available from the questionnaire or in the official records. Their activity could be categorized (as is the practice in some countries) on the basis of their actual duties, such as those of engineer and doctor.

2. Units of enumeration

290. One of the essential features of a modern population census is individual enumeration. The primary unit for enumeration in a population census is therefore the individual.

291. An individual is generally identified by association with the household to which he or she belongs. The household is therefore usually adopted as an additional unit of enumeration. In so far as the household is also a unit of enumeration for the housing census, the careful identification of households as a step preliminary to enumeration will facilitate the efficient collection of data in both the population and housing censuses.

292. In some countries the social systems may make the differentiation of households within the extended family group difficult. In such cases, the family, or the dwelling or compound, has been adopted as the additional unit of enumeration. However, the utility of the data is considerably enhanced by maintaining the distinction between household and housing unit as separate though related concepts. In such cases, studies may have to be undertaken well before the census to develop the methodology for distinguishing between these two units of enumeration in the field. 33/

293. The concept of household has been described in detail in Principles and Recommendations. 34/ Briefly, the concept of household is based on the arrangements made by persons, individually or in groups, for providing themselves with food. The commonality of cooking arrangements is adopted as the criterion for distinguishing and identifying households. Households may occupy a whole housing unit or part of, or more than, one housing unit, or they may be homeless. A household generally consists of persons who are related to each other but may include some unrelated persons who live with the household. There can also be households consisting of unrelated persons, an example of which would be unrelated persons sharing a house or apartment and maintaining a common kitchen.

294. Persons who are not identifiable with households and live in collective quarters such as military installations, correctional or penal institutions, and dormitories of educational or religious institutions or as inmates of hospitals and so forth are categorized as population in collective households.

295. Persons living in hotels or boarding-houses are not classified as population in collective households. On the basis of the arrangements for cooking and obtaining food, they are more appropriately considered members of households of unrelated persons.

296. The primary unit for enumeration in a housing census is the housing unit or living quarters. These concepts are described in detail in Principles and Recommendations. 35/ The additional units of enumeration are the building and the household. (The latter is particularly important for studying housing conditions.) Living quarters are structurally separate and independent places of abode. Places are considered living quarters when they (a) have been constructed, built, converted or arranged for human habitation (provided that at the time of the census they are used as residences or meant to be so used) or (b) are, although not intended for habitation, in actual use for this purpose at the time of the census. Living quarters would include mobile homes, improvised housing and collective living quarters. In many areas households may be living in quarters constructed with materials that are generally not associated with housing such as zinc sheeting, plastic and cardboard. The population living under such conditions must also be enumerated, if the coverage of the census is to be complete. It may be prudent, at least for operational reasons, to list, number and classify such structures as housing units or living quarters so that they are included in the count. If necessary, they could be distinguished with special marking in the lists or schedules.

297. The population will include individuals or households not associated with housing units or living quarters, such as the homeless who, inter alia, occupy pavements and other public places, and live under bridges and those whose shelters do not, because of the materials used, meet the conventional criteria of construction for classification as living quarters. It is particularly important to ensure that this population is enumerated.

298. For certain topics investigated in a housing census, the household, rather than the housing unit or living quarters that it may occupy, will be the more appropriate unit for enumeration. For example, information on tenure, if investigated in the census, should be collected with reference to the household rather than the living quarters. Similarly, household

possessions such as cars and radios, must be associated with households rather than with living quarters. On the other hand, facilities that are available such as water-supply and electricity are usually more relevant to the living quarters.

3. Census moment or reference time

299. An essential feature of a census of population and housing determines that the principle of simultaneity, according to which each person or each set of living quarters is enumerated with reference to the same predetermined point of time, must be maintained. This census moment or reference time is usually midnight at the beginning of the designated census day. Each person alive at the census moment is included in the count. Births and deaths that may occur after this moment are excluded. Every structure, housing unit or set of living quarters that exists or has reached a defined stage of completion as at the census moment is included in the housing census, irrespective of whether it is occupied. This arrangement will give a true inventory of housing stock. If the housing census is independent of the population census, an appropriate reference time will have to be specified for the housing census.

300. The concept of the census moment is relevant for certain characteristics of the population such as age, marital status and place of enumeration. Not all characteristics are defined in terms of such a specific point of time. Information on many of them is elicited on the basis of other periods of time; for example, for economic activity or work characteristics, longer time-frames are adopted.

301. In actual practice, field enumeration may begin before or after the census day. If before, the questionnaires are either distributed or canvassed over a short period before the census day and verified and collected or updated in a short round after the census moment; if after, the questionnaires are distributed and collected or canvassed over a few days following the census moment. In either case, the information collected will be as at the census moment.

302. Some countries have adopted a moving census moment such as the night before the enumerator's visit or the Sunday prior to that visit. ^{36/} This procedure is not recommended although it has been adopted where insufficiency of field staff, an unsatisfactory cartographic base, absence of sufficient logistic support or other problems forced the extension of the enumeration period over a month or so. The apprehension in such a situation is that the respondents will not be able to recall details of the number and characteristics of the members of their households on a day very much prior to the enumerator's visit and that the census day has therefore to be moved nearer the day of the visit. The adoption of this procedure involving a long reference period, while preferable to no census at all, will increase coverage error and make the interpretation of the data more difficult.

303. If a census day or date has from experience been found convenient and conducive to a good census, succeeding censuses should preferably be conducted with the same reference date. Unless there are very strong reasons to depart from this practice, the timing of every census at the same time in the year

would be most desirable and will enhance the comparability of the data of each census.

4. Duration of enumeration

304. The duration of the enumeration will be conditioned by the magnitude of the census operations, the availability of staff, logistic support and the method of enumeration. In principle, the enumeration period should be as short as possible. In the canvasser method the duration should allow enough time for the enumerator to canvass the questionnaires without being rushed to complete them. If the time provided for canvassing is insufficient, the coverage and quality of enumeration will certainly suffer. On the other hand, a period that is too long may reduce the quality of the census since respondents are likely to be unable to recall numbers or details of individual characteristics with exactitude. In particular, extended periods of enumeration may result in incorrect reporting of numbers. In the mail-out/mail-back system, if the interval between the census day and the date of return of completed questionnaires is wide, there may be a tendency to put off completion of the forms to the end of the period, which could result in inaccurate information's being provided owing to problems of recall.

305. Some countries plan their enumeration so that it is taken over one day. In actual practice in such cases, the forms are either distributed in advance for initial completion or canvassed by the enumerator before the census day and then verified and updated on that day. A one-day enumeration is usually carried out through the requirement that all persons stay at home (or wherever they happen to be staying) on the day chosen. The adoption of the one-day procedure avoids the complexities that may arise due to movement of people during an extended enumeration period; however, it has certain disadvantages. A large number of enumerators are required for completion of the enumeration in all areas simultaneously in one day. The enumerators will have no such opportunity to become proficient as will be possible with a longer period of enumeration. The supervision of fieldwork may tend to be superficial. There are likely to be more coverage errors, especially in urban areas where the optimum workload for a day cannot be predetermined accurately. The content of the census will have to be restricted. The choice of topics and the degree to which information on those topics can be collected will be limited. However, many of the deficiencies of a one-day enumeration are in actual practice mitigated by the fact that pre-enumeration completion of the questionnaires is generally adopted.

306. The adoption of a reasonably long period of enumeration would permit the use of a smaller number of better-trained enumerators. Also, the scope of the census inquiry could be expanded and, as a consequence, its utility enhanced. The enumerators would improve their skills after the start of the enumeration and supervision could be organized in a more effective manner. The inquiry could be conducted at a reasonable pace so as to ensure both accuracy of coverage and quality of information. However, if the inquiry were too long, the likely defects in coverage and quality mentioned earlier might emerge. The actual duration of the enumeration period must therefore be carefully determined.

5. Methods of enumeration

307. There are mainly two methods of enumeration, namely, the canvasser method and the householder method. In the canvasser method, the questionnaires are canvassed by an officially appointed enumerator who conducts necessary field inquiries about each housing unit and about each person who is a member of the household and records the information in the prescribed forms. The records are always with the enumerator and are not handed over to the household. In the householder method, the information regarding the housing unit and the members of the household is recorded in the questionnaire by a member - generally the head - of the household.

308. The canvasser method, in which the enumerator carries out a direct interview with a responsible member of each household, has been adopted in many countries. It has the following advantage: enumerators can be very well trained in the concepts, instructions and procedures and if there are sufficient numbers of enumerators and supervisors, the enumeration can be completed in a short time. Also, in areas of relatively low literacy, the import and purpose of the census questions can be better conveyed to the people than through printed material. Such direct interviews by the enumerators will elicit prompt replies and cases of reluctance to cooperate can generally be settled during the course of the enumeration itself. Within an enumeration area, the information is likely to have fairly uniform quality and consistency. With good training and supervision, quality and consistency in all areas can be maintained. In countries where fairly large proportions of the population are illiterate or not adequately literate to understand the instructions and complete the questionnaires themselves, the canvasser method would be appropriate. In such countries, this method has the advantage that more complex questions can be included in the inquiry than would otherwise be possible. However, the canvasser method has in most cases the disadvantage that every member of a household cannot be interviewed. The realities of field operations do not permit every household member's being interviewed personally, and information has generally to be obtained from the head of the household, sometimes assisted by some other well-informed family member. In other words, with this method, the enumerator usually cannot go beyond the first responsible adult in the family.

309. In the householder (or self-enumeration) method, the questionnaires along with the instructions are distributed to every household in advance of the census date and received back after completion. The questionnaires could be distributed to the households by the enumerator personally and collected after a fixed period of time. The enumerator may merely act as the agent for distribution and collection or, depending on the circumstances in each country, also assist in completing the forms. In some cases, the forms are mailed to households on the basis of mailing lists and received back through the mail. In this procedure of mail-out/mail-back, the role of the enumerator is limited. However, there will be cases of non-response or incomplete response, in which case the enumerator may have to intervene to obtain full information. Such gaps could also be filled through telephone inquiries, where the facilities are efficient and widely available.

310. Except for the identification and location particulars, which are generally entered in the questionnaires prior to their being handed over to the household, the responsibility for completing the questionnaire in the

householder method is that of the head or some other responsible member of the household. This method can be adopted - with the expectation of reliable results at substantially lower costs, particularly if a mail-out/mail-back procedure is extensively employed - in countries where literacy is near-universal, educational levels are relatively high and the postal and other communication systems are widespread and efficient. The householder method is also conducive to the greater involvement in the enumeration process of the other members of the household, since it encourages consultations among family members, which should yield better and more accurate information regarding the individual members of a household. However, the adoption in a census of the mail-out/mail-back procedure presupposes the existence of up-to-date lists of households with addresses. The preparation and maintenance of such a mail directory is quite difficult and expensive.

311. A combination of methods is often resorted to for the purpose of ensuring maximum coverage. The householder method is adopted in areas where the response is likely to be high, while the canvasser method is used in areas where the literacy levels are low or special problems exist. In areas where the mailing system may be ineffective or too expensive or where the terrain or climatic conditions impose constraints, the canvasser method is adopted as being more conducive to a better enumeration. In some cases, the questionnaires with the instructions are handed over to the households by the enumerator with a request that they be completed and kept ready for verification. The enumerator will, in a second round, verify the entries, correct them if necessary through personal inquiries and collect the forms. 37/

312. Other methods of enumeration have been adopted, some of them in recent censuses. One such method consists of listing all households in a preliminary round and then establishing in the enumeration area a census station to which the respondents are asked to come in order to give the enumerator detailed information on each topic. In this method, the enumerator does not visit every household for the purpose of canvassing the schedules. The preliminary listing of households enables the enumerator to keep track of non-reporting households and ensure complete coverage. However, even with the adoption of this procedure, it will still be necessary for the enumerator canvassing the questionnaires to visit some households, such as those where, owing to illness or physical incapacity, no member of the household is able to report to the enumeration station and those of special cases such as the handicapped. 38/ Sometimes, the inhabitants of a village or people living in dispersed settlements are assembled at one place and enumeration conducted. In some cases, the head of the group provides the information regarding its members. In the group approach, abbreviated questionnaires are generally used. The objective in such cases is to obtain as a priority reliable estimates of numbers rather than highly detailed information relating to every member of the group. With improvements in communications and accessibility, and with the integration of previously isolated or special groups in the larger communities, the adoption of the canvasser method even in such cases should increasingly be possible.

313. In recent censuses, with personal awareness of the census increasing, there have been demands for separate enumeration. Those demands are still rare, but some countries permit such enumeration where a person prefers to be canvassed separately. The linkages with the household and the housing unit are maintained through the use of the relevant identification codes. The

questionnaire is so devised that it can be sealed and either posted or handed over to the enumerator. The adoption of this procedure would imply that arrangements have been made for early checking of such returns and amendments through personal contacts, if necessary. A reduction in the numbers of such returns can be attempted by supervisors in difficult cases through personal contacts.

314. The enumeration method that can be adopted is conditioned by the circumstances that prevail in a country at the time the census is being taken. The administrative organization in existence, the levels of literacy and educational attainment, the prevalence of widespread and efficient mailing and communications systems, the general level of response to mail inquiries and the existence of mechanisms for verification and for obtaining information in cases of non-response among other factors, determine the appropriate method that could be adopted or the possible combinations of methods that could be used. In any case, the decision regarding the method of enumeration should be taken in the early stages of census planning since this will influence the budget, the organizational structure, the type of questionnaire and its content, the training programme, the content and scope of the publicity campaigns and the system of management of records.

315. Most countries have, for obvious reasons, tended to adopt the method of enumeration they are used to. Any change in the method will need very careful testing and evaluation before it is introduced. The possibilities of making basic changes in the procedures of enumeration are few. Unless there is remarkable improvement in such factors as educational levels and communication and postal systems, and in associated sectors, changes in traditional systems will be fraught with great danger. However, the total adherence to tradition may sometimes be due to a reluctance to innovate or just greater convenience. Even within traditional systems it will be worthwhile examining the procedures to determine possible areas of improvement. Such an examination and testing of possible improvements can profitably be undertaken during the intercensus period. Such methodological studies should be part of the constant attempt to improve on census practices.

C. Enumeration of special groups

316. Special procedures will have to be evolved to enumerate persons who live in places other than regular housing units. Such persons include (a) those who live in collective quarters, for example, military barracks and correctional or penal institutions, or as inmates of hospitals or other such institutions, and are classified as belonging to collective households; (b) those staying in hotels, boarding-houses and the like; (c) the homeless; (d) those living in boats; and (e) nomads, if any.

1. Persons living in collective quarters

317. The enumeration of persons in military barracks is sometimes carried out by barracks personnel who have been appointed census supervisors and enumerators. The training of such staff will necessarily be handled by the census organization, which will also retain administrative control in areas of that kind over operations extending to distribution, ensuring of coverage and

quality of information, and retrieval of forms. A similar practice would be appropriate for the enumeration of inmates of correctional and penal institutions. However, in cases where security is not vital, the regular census enumerator could conduct the enumeration with the help of the authorities concerned. In the case of hospitals, it will be necessary to make a distinction between long-term and short-term inmates when a de jure count is being carried out, so as to avoid persons' being counted as part of the households to which they belong and also as inmates of the hospital. To avoid such errors, the period of absence from the usual place of residence, through which a person being enumerated would qualify as an inmate of the hospital, must be specified in the instructions.

2. Persons in hotels and boarding-houses

318. Persons staying in hotels or boarding-houses at the time of the census should be considered unrelated members of the same household, depending on the arrangements for cooking and obtaining food. The same questionnaire that is prescribed for the general population could be used for enumeration of such persons. In some cases, however, an abbreviated questionnaire is adopted and the managers of such places are made responsible for collecting the information on the inmates. If the de jure method is adopted it will be necessary, as in other such cases, to prescribe periods of stay in the hotel or boarding-house or periods of absence from the usual place of residence to enable the enumerator to decide whether a person is entitled to be enumerated or not. The assumption in the case of persons not eligible for enumeration is that they have been included as members of the household to which they belong. A modified procedure, consisting in enumerating the persons in such places at a specific time, usually during the census night, is also sometimes adopted. That procedure avoids having to define period of stay as a criterion for eligibility for enumeration in a hotel or boarding-house, but care has to be taken to ensure that persons who have left just before the enumeration are not missed both at the hotel or boarding-house and at their usual place of residence.

3. The homeless

319. The enumeration of the homeless will also need special organizational arrangements. The homeless usually sleep at designated places, even if they move around during the day. It will therefore be necessary to locate and list, before the enumeration begins, the places where the homeless could be found. The actual enumeration of the homeless should preferably be conducted in one night by special squads of enumerators to ensure maximum coverage and avoid double-counting of such persons. If, as sometimes happens, a homeless person refuses to give information or cannot be awakened, it will still be necessary to enumerate that person. The least that should be done in such cases is to complete a questionnaire that indicates location details and the person's sex and (if it can be reasonably estimated) age. The enumeration of the homeless is important. Though they usually constitute a small proportion of the population, their numbers in many large cities may be significantly high and therefore of special interest to civic authorities, town planners and social welfare agencies.

4. Persons living in boats

320. The enumeration of persons living in boats and in other water craft calls for organizational skill, but it should still be possible to canvass the universal questionnaire in this group. More important in the case of those persons will be the determination and listing of their locations before the census, which will both help in ensuring full coverage and save time. It may be necessary to assign special enumerators with the mobility necessary for the carrying out of the pre-listing and for the enumeration itself. In the case of naval vessels or fishing fleets that are likely to be away for a long period, arrangements will have to be made with the authorities concerned to obtain the necessary information. Some countries have set up enumeration stations covering different sections of rivers and lakes and enumerated groups of people as they passed through.

5. Nomads

321. For purposes of enumeration, the nomads are a special group. In some countries they constitute a large proportion of the population. For a successful enumeration of nomads, it is very necessary to plan the methodology and techniques of enumeration most carefully. There is no unique method of enumeration of nomads and each country has to devise the procedures appropriate to its situation. Some of the methods adopted are discussed here by way of indicating the possible techniques that a country could use but the particular method suitable for a country must be determined after detailed preliminary studies and pretests. 39/

322. Several methods have been adopted for the enumeration of nomads and semi-nomads: (a) the group assembly method, (b) the tribal or hierarchical approach, (c) the enumeration-area approach, (d) the water-point approach and (e) the camp approach. Sometimes a combination of some of these methods may be used.

323. In the group assembly method, the nomads in an area are asked to assemble at certain places for interviews on specified dates. The dates and places are determined keeping in mind the convenience of the nomads and the requirements of the census programme. To encourage attendance, such meetings are combined with other official activities such as distribution of identity cards or consumer items and are fixed at watering-points, grazing areas or market-places. Where the writ of the administrative authority runs, this method will prove successful. However, unless there are prior lists of households, it will be difficult to determine the scale of omission. Also, it will be unrealistic to expect all members of every household to attend: some persons will have necessarily to stay away to watch over and attend to animals, tents and other assets. In such cases, the head of the household or his representative may have to be depended upon for information.

324. The tribal or hierarchical approach is more convenient since it operates through the authority of the chief. Information on each member of the tribe can be obtained from the chief personally or from registers that are maintained by him; or, with the approval of the chief and with the assistance of his representative, each household can be contacted and information on the individuals obtained. The unit of enumeration will be not areal but tribal.

Where the chief is effective, this method will yield results. It is not dependent on the delineation of conventional enumeration areas. Nevertheless, it will be necessary to prepare a preliminary list of the tribes and their locations before the enumeration can be carried out. Where the memory of the chief is weak or the accuracy of the records doubtful, there is a likelihood of obtaining incorrect information. In some cases, a few members of the tribe may have settled down and become sedentary. They may, however, continue to be regarded as members of the tribe by the chief, in which case there is the possibility of such persons' being counted twice. Procedures must be developed for identifying those members of the tribe and accounting for them properly.

325. The enumeration-area method consists in the conventional enumeration of tribal households that are found in an enumeration area at the time of the census. Such enumeration areas will have to be demarcated in areas mainly inhabited by nomads after verification of the camp-sites of nomadic households. This method has the advantages of direct contact with the households and possibly obtaining, as in the settled areas, reliable information. The enumeration will have to be carried out by teams of enumerators. In countries where the area over which the nomads are spread out is very large, locating the tribes beforehand, demarcating reasonably sized enumeration areas and finding the required number of enumeration teams are not always an easy task. Also, special transport and communication facilities and the help of local guides may be necessary.

326. In the water-point approach, a list of water-points used by the nomads during the period of enumeration is prepared and the enumeration carried out when these points have been visited. The list is generally prepared with reference to the water-point in the summer season, by which time the temporary ones created in the rainy season do not exist. During the dry season the nomads are generally concentrated around these water-points. Two different procedures are adopted for enumeration. The first consists in locating every household that uses a certain water-point and enumerating it; in the second, an enumerator is located at the water-point and enumerates the nomadic household when one of its members brings animals for watering. The adoption of the water-point approach requires the preparation of an accurate list of such points. While the listing of important water-points is easy, there may be some water sources whose stability during the dry season depends on the preceding rainy one and which are therefore not known. Also, access to water may be achieved through wells in dry river beds. The preparation of the list would therefore be a critical element for the accuracy of the count. Procedures will also have to be prescribed to avoid double-counting in cases where some nomads may visit more than one water-point.

327. The camp approach is based on the fact that nomads live in camps. A camp is a group of households, their number varying from region to region. The size of a camp could also vary between seasons, and the same household need not always be attached to the same camp. In the camp approach to enumeration, a list of camps that also indicates their location is prepared. Enumerators then visit the camps and canvass the questionnaires. The camp is a recognized social unit with the leader knowledgeable regarding its membership and the location of every household within it. However, the accuracy of the lists of such camps is vital for the operations. If a camp is made up of households of

different tribes and the help of the chief of each of those tribes required, the enumeration will tend to become complicated.

328. Whether the questionnaires that are adopted for the rest of the population can be used in the enumeration of nomads and other tribal groups is a matter of judgement for each country. Special questionnaires may have to be evolved for these tribal groups. It would be useful to pretest the questionnaires and then modify them to arrive at the appropriate version. In fact, the geographical identification particulars specified for settled areas may be inappropriate and other location specifications may have to be incorporated in the forms. It will also be necessary to develop a system of questioning that identifies those that should be enumerated as nomads and eliminates former nomads who may be settled at the time of the enumeration. 40/

329. Other methods for enumerating nomads have been tried out. Enumerators were placed at certain points along the well-known routes taken by the nomadic groups during certain seasons and enumeration was carried out as the groups passed. This system is useful where the seasonal pattern of movement of the nomadic groups is known, and known to be adhered to. If information is being sought from the chiefs rather than by individual enumeration, it will be necessary to develop suitable procedures to avoid the double-counting of the members who may not have joined the migratory movement of their tribe in a particular season and are located elsewhere.

330. Depending on seasonal conditions, nomads in some areas have traditionally migrated across international boundaries. Such groups will be included in or excluded from the total population of the country concerned, depending on the season in which the census is taken. The size and characteristics of those groups must be determined for the planning of development schemes oriented towards them or for the obtaining of information on the scale and features of such migration. The conduct of joint studies by the countries involved that provided information on the pattern, seasonal periodicity and other aspects of the nomadic migration streams would be useful. Such studies would help in improving procedures for the enumeration of nomads.

331. The experiences of countries in enumerating nomads and other tribal groups will provide valuable input in the planning of similar operations elsewhere. It is recommended that a full description of the methods and procedures adopted, the rationale for the adoption of those methods and procedures and an evaluation of their advantages and difficulties be incorporated in the documentation of every census.

D. Operational aspects of enumeration

332. The field operations are a crucial phase of the census and the focus of the preparatory activity discussed so far. By the time operations are to commence the questionnaire and the instructions will have been made ready, the tabulation plan decided, the enumeration procedures specified and the staff selected and trained. All that remains to be done will be to actually carry out the enumeration and later process the data. In a sense, the field operations are the final and quite often irrevocable test of the census. It is therefore necessary to ensure that the field organization is well

established, that the staff is thoroughly trained, that the field procedures are clear and that the performance is effectively monitored.

333. The operational aspects of enumeration can, for convenience, be considered under certain broad headings, but it will be evident that all these activities are interrelated and linked with areas about which much has already been stated in the previous chapters dealing with organizational issues. The aspects of enumeration, among others, that need attention are: (a) the field organization, (b) preparation for enumeration, (c) preliminary fieldwork, (d) actual enumeration, (e) monitoring and supervision, (f) retrieval and consolidation of records and (g) special problems in some regions. Two major components of census activity on which the success of the enumeration very much depends are training of the staff and publicity. These components are discussed separately.

1. The field organization

334. The general issues relating to the establishment of the field organization and the principles of recruitment and remuneration of the field staff have been discussed in chapter V. The hierarchy that is established for census-taking must include adequate levels of supervision, monitoring and control, these levels also being responsible for training. The enumerators will be the basic agency at the field level for canvassing the census questionnaires in an enumeration area. A set of enumerators will be controlled by a supervisor, the numbers depending on the field situation. One supervisor will usually be in charge of four to five enumerators. The further higher levels of supervision and control will be dependent on the structure of the administration of the subregions and regions within which the enumeration areas fall.

335. It must be noted that after the commencement of enumeration the field offices will be very much on their own. Emergencies, short of total breakdown, will have to be handled by the immediate-superior levels. There will be little time for referring problems to higher offices and awaiting guidance or instructions. The structures should be so established as to ensure that levels capable of assuming such responsibilities are present. Training and delegation of authority must equip those levels to perform their role adequately.

336. The enumerators are key elements in the census. It is a truism to say that the success of the census is preponderantly dependent on the efficiency of the enumerators and to quite an extent on that of the supervisors. It is therefore essential that the enumerators and supervisors be selected with care even within the limitations of choice that often prevail. The enumerators should be able to understand and absorb the procedures and instructions and ask the necessary questions for eliciting information. Knowledge of the local language will be essential. A pleasant personality will be an added advantage, while preconceived notions concerning the replies or, worse, the topics, will be definite disqualifications.

337. The duties and responsibilities of the supervisors and enumerators will have to be clearly specified and incorporated in the manuals. Broadly, their work can be regarded as unfolding in three stages: (a) the period prior to

the enumeration, when certain preparatory work must be carried out; (b) the period of the enumeration itself, during which fieldwork must be supervised; and (c) the period after the conclusion of the enumeration, when the return of the questionnaires and other census documents to the designated authority must be ensured. The manuals for the supervisors and enumerators must indicate their respective duties and responsibilities during each of these stages.

2. Preparation for enumeration

338. Before the enumeration can commence, the supervisors and enumerators will have (apart from the required transport and communication facilities) to be provided with the equipment necessary for carrying out the fieldwork, which will include (a) the explanatory and instructional manuals; (b) sufficient sets of the questionnaires; (c) the map of the enumeration area with a description of the boundaries; (d) a sufficient number of the reporting and summary forms that may have been prescribed, including material for packing and forms for identifying the census documents by enumeration area; (e) writing material; and (f) materials necessary for the numbering of housing units and living quarters such as paint and stickers. In addition, the supervisors and enumerators must be provided both with the orders appointing them staff on census duty and with identification cards. They will also have to be given funds, as advances against final payments, sufficient for their needs during the enumeration period.

339. The reporting and summary forms that are prescribed should, for obvious reasons, be kept to the minimum. It would, however, be useful to prescribe a form in which the progress of the enumeration could be noted. In some cases, a column for this purpose in which units enumerated are indicated by a suitable mark can be added in the list of housing units, living quarters and households that the enumerator will have, in any case, to prepare. If address lists are being used in the mail-out/mail-back method of enumeration, these lists will be useful for monitoring the receipt of completed forms. In addition, a daily record of the number of households enumerated and of the number of persons enumerated in them will be very useful for monitoring progress, and a statement at the end of the enumeration indicating the total number of households and the total population of the enumeration area will be useful for computing preliminary totals.

340. It will make the task of the enumerator easier if some aids are provided, such as a bag or box for keeping the census documents, and folders or some material hard enough to be used as a writing surface. Giving the orders of appointment and the identification cards to the supervisors and enumerators at the time of appointment or at the first training session will create a feeling of identification with the census operations and will even provide some publicity. The manuals and other instructional materials will obviously have to be distributed at the first training session but the rest of the material, the particularly the blank questionnaires, the map of the enumeration area and the field forms should be given just before the commencement of the enumeration, the last training session being a convenient time to do so.

341. The enumerator must receive all the material necessary for carrying out the enumeration before the date fixed for commencement of fieldwork. An efficient distribution system must be developed to ensure that the material,

which is generally centrally printed, is distributed to the enumerators through the regional and subregional offices. At each stage of distribution time schedules for distribution and procedures for accounting for the material must be prescribed, including dates of receipt and of handing over to the field staff. Since bulk replacements at short notice are generally very difficult, some proportion of all census materials must be maintained as a reserve at all levels. In order to minimize loss or deterioration, the packing of the material deserves attention, particularly in countries where climatic conditions and transportation problems will impair the materials' being maintained in good condition throughout the operations.

342. Just prior to, during and soon after the enumeration, lines of communication must be available among all levels. Despite the most careful planning, unexpected problems that may require interlevel consultations and conveying of instructions can always arise at any level in the census hierarchy. In particular, the enumerator and supervisor should be able to communicate with their immediate-superior officers in an emergency. The telephone and telegraph services and, wherever possible, the wireless network of the police or other authorities must be available on a priority basis to the census authorities. The necessary authorizations by Government for the use of such services should be obtained well in advance.

3. Preliminary fieldwork

343. Before the questionnaires are actually canvassed, the supervisor and enumerator must become familiar with the areas assigned to them. They will also have to carry out certain preliminary tasks that will ensure complete coverage of the area. The supervisor must, in particular, verify that the enumerator has performed these duties. This preliminary stage will normally commence and be completed about two weeks before the enumeration. Such scheduling allows some time for any readjustments of workload and correction of errors in the maps.

344. Before the canvassing or distribution of the schedules commences, the enumerator must go round the assigned enumeration area in order to become familiar with the boundaries and layout of the area. The enumeration-area map will be checked and amended, if necessary, in the course of the enumerator's round. If large changes seem necessary, the supervisor and other superior officials will have to be kept informed. They will have to cross-check the findings of the enumerator, make any adjustments in the enumeration area that may be necessary and finalize the boundaries. If the mapping and demarcation of enumeration areas have been carefully carried out, such situations should rarely occur. In particular, if the boundaries of the enumeration area are not defined by easily recognizable features such as a stream, a road or a railway line, but only distinguished as the edge of a field, the limit of a forest area or some other physically undefined line, the enumerator must become thoroughly familiar with the boundaries of the area assigned. The supervisor must, in such cases, ensure that the enumerator and those in contiguous areas are clear about their jurisdictions.

345. The maps must be checked thoroughly because in most cases they would have been prepared several months before the enumeration date. New buildings may have come up or some existing ones been either pulled down or rebuilt,

streets may have been altered and changes in numbering may have taken place. All such aspects must be checked during this preliminary round. Special care will have to be taken to locate any new colonies of people or collective living quarters such as hotels, orphanages, barracks and hostels that may have been established after the preparation of the map of the enumeration area. The location of the areas with large concentrations, if any, of the homeless can also be determined in this round.

346. During this preliminary round, the enumerator could also decide on the route that will be followed in carrying out the enumeration. The route could be marked on the map so that the enumeration is carried out systematically and is capable of being verified by the supervisor.

347. For ensuring complete enumeration, every housing unit and household must be identified and listed. A list will generally have been prepared as part of the mapping operations but will have to be updated before the commencement of enumeration. If the housing census has been conducted independently prior to the population census, the list prepared during the housing census, if it is to be used as a preliminary frame, will also have to be updated. This updating must be done as part of the preliminary exercise. In some cases, the enumerator is provided with the list prepared at the time of the mapping operations along with the map of the area. To avoid the possibility of the enumerator's merely adopting this list without updating it, the desirability of such a course will have to be judged on the basis of the situation in each country, the nature of the agency and other relevant factors. Such cases of adoption without updating may be very rare but if the possibility at all exists, it will be desirable to instruct the enumerator to prepare a fresh list as part of preliminary round activity.

348. The list will contain the living quarters arranged systematically according to the route that the enumerator will follow while carrying out the enumeration, and will include the identification particulars of the enumeration area and be supported by the map of the area. The identification particulars of each set of living quarters, such as its number, the use to which it is put, the name of the head of the household living in it and the approximate number of persons in the household, will be entered in the list. If there are multiple households in the same set of living quarters, those households will be indicated separately, along with the number of their members. It will also be useful to have a column in which notes identifying vacant houses, hotels, barracks and similar large units can be made. The list will also reflect changes in use, new constructions and new households.

349. The preparation or updating of such a list will help in ensuring complete coverage. It will be useful to the enumerator to keep track of the households and housing units that have been visited and to distinguish those that need to be revisited. The list will also be of assistance in the area of supervision because it will indicate the pace and adequacy of enumeration at any point during the enumeration period. If the enumeration procedure in which questionnaires are distributed by the enumerator and collected later is being followed, such lists will be very useful for ensuring that distribution and collection are complete in terms of coverage. The lists will also ensure that the records of all households are available at the end of the enumeration period since those records will have to be arranged systematically in the

same sequence as the households. Verification and accounting of the completed forms will be possible through the use of those lists.

350. While updating the list of living quarters and households in the manner suggested, the enumerator will have to verify that each structure and household is distinguished by a unique number. In those areas where the numbering of buildings and living quarters, if any, within them is systematic, as will generally be the case in settled urban areas, that numbering can be adopted and incorporated on the map and in the list. However, where such a numbering system does not exist (or where it did at some time but is in disarray at the time of enumeration), the enumerator will have to assign numbers to the structures and living quarters. The numbering must be distinguished by road or street names and local names of areas, among others, for better identification. The households will be identified within each set of living quarters.

351. Where numbers are assigned to these units by the enumerator, they will have to be placed on the structures at convenient places for identification. For this purpose, the numbers could be painted on the doors or special marking materials or stickers used. It will be necessary to ensure, through publicity and personal requests by the enumerator at the time the numbers are affixed, that those numbers are not obliterated by the time of the enumeration. It will be desirable to have the numbering system verified by the supervisor and, in larger urban areas and other major concentrations of people, by higher-level officials.

352. The preliminary round is essential from the operational point of view. It also serves other purposes. The people of the enumeration area will become familiar with the enumerator and will be aware that the census is going to be taken soon. If the enumerator was to take the opportunity of the preliminary visit to indicate that certain questions would be asked during the second round, that decision would help in establishing a rapport with the households.

4. Carrying out the enumeration

353. Normally, if the canvasser method of enumeration is being adopted, the enumerator need visit a household only once. In countries where there is a preliminary inquiry followed by a check on the census day or very soon after, a second visit will be necessary. Revisits will also be necessary in cases where no member of the household capable of giving information was present at the time of the first visit or where the method of enumeration requires the forms' being left with the household for collection later, after completion.

354. Ideally, information should be obtained from each person. However, this is rarely possible. All persons of the household may not be present when the enumerator calls and, in some societies, it is conventional for a senior member to respond to such inquiries. The enumeration is therefore generally carried out on the basis of information furnished by a responsible adult in the household. The assistance of other members of the household is usually available to this respondent. Field realities may sometimes result in a situation where persons outside the household, for example, neighbours, friends or relatives, help in obtaining information, but such assistance

should be sought by the member of the household who is responding to the inquiry rather than by the enumerator.

355. The enumeration staff should be advised to adjust the workload properly. Otherwise, a lot of time may be spent on the first few households, resulting in the staff's having to rush through the rest. If the inquiries are made in a systematic manner and time is not lost in confused questioning, it will be possible for the work to be spread out fairly uniformly over the enumeration period. The ability of the enumerators to do so will be dependent on how well they have been trained.

356. Vacant living quarters and absentee households need special care. If houses are vacant, details of the structures will have to be recorded by observation or obtained from knowledgeable neighbours so that the housing census is complete. If an entire household is absent during enumeration, inquiries should be made in the neighbourhood whether any member of the household is likely to return during the enumeration period, and if so, a note should be made in the list referred to earlier to ensure that that household is revisited. If feasible, a quick revisional round at the end of the enumeration could be prescribed to ensure that no such households have been omitted.

357. In many cases, at the time the enumerator calls the person who can provide information on all the members of the household may not be available or all the members of the household may be away at work. This will be true particularly in major urban areas and will be so also in rural areas if the enumeration has unfortunately been timed during the period of peak agricultural activity. The enumerator's visit should be so timed that repeated visits are avoided. Early morning or late evening visits may be convenient in most cases. In some countries, the enumerator is asked to leave a note in standard printed form or a call-back card indicating when the next visit will occur and requesting that a responsible person be at home at that time. This is a desirable procedure.

358. Refusal to provide census inquiries with information is generally punishable under the law. However, it is inadvisable to attempt to enforce the law or even threaten to do so, except in truly recalcitrant cases. The initial approach should be an attempt to explain the nature of the census and the confidentiality of the information and persuade uncooperative persons to respond. If difficulties continue to be experienced, the supervisor and, if necessary, the senior-level officers should be requested to intervene. Where publicity has been effective, reluctance to cooperate due to lack of understanding of the purpose of the census will be considerably reduced. In some areas, the intervention of local leadership may also be useful.

359. The enumerators will be adding to their workload with little benefit if they have to revisit households because they missed some information at the first visit. They should therefore be instructed to carry out a quick check of the completed questionnaires of a household before leaving to ensure that all questions have been asked and that there are no gaps in the information. One way to accomplish such a check is to require the enumerator to read back to the respondent the answers to each question consecutively for each individual after the enumeration of a household has been completed. That check will also help in verifying the accuracy and adequacy of the answers. A

careful review for the same purpose will doubtless have to be made of all questionnaires at the end of each day, but such quick checks before leaving a household will reduce revisits to the minimum.

360. At the end of each day, the enumerators must be instructed to carry out the verification of the questionnaires, complete the summary data forms that may have been prescribed and put the material for the next day's work in order. The lists of households should be scrutinized at the end of each day to note the households that have to be revisited. Such daily reviews will reduce the possibilities of omissions of both information and households.

361. Informal checks can be established to be sure that coverage is maximized. In the urban areas, for example, selected government officials located in different areas and not involved in the census operations could be asked to report whether or not they were enumerated within a certain period. Every official of the census organization itself should be asked to do so. Corrective measures can be taken well in advance on the basis of such information. Senior officials of the organization could also monitor the enumeration of prominent persons, including journalists, political personalities and large concentrations of the institutional population.

5. Supervision and monitoring

362. The enumeration must be supervised to ensure that it is carried out efficiently and fully. Even if the quality of enumeration is doubtless more dependent on intensity of training of the field staff, supervision and monitoring must also be built into the system to ensure that coverage is complete and quality quite satisfactory and to take care of unexpected field problems. At this stage, because of the brief duration of the enumeration period, supervision and monitoring will be concerned essentially with maximizing coverage.

363. The supervisors must be assigned specific tasks. Soon after the enumeration begins, they must inspect the work of each of the enumerators on their team. This will enable the identification of the enumerators who may need special attention and support. Some proportion of housing units and households already canvassed must be visited and the information recorded in the questionnaires verified. Wherever necessary, guidance to the enumerators must be provided. In all the enumeration areas assigned, the supervisor must make it a point to verify that every housing unit and household has been visited by the enumerator. Such a complete check on the coverage, along with the test checks of some of the questionnaires, will make for a better census.

364. While the pace of enumeration must be monitored, it would be undesirable to prescribe daily reporting forms that, with doubtful utility, will only add to the workload of the enumerators. Monitoring the fieldwork could be carried out through the listings of living quarters and households suggested earlier, in which the units covered would be distinguished by suitable marks.

365. Similar supervisory functions should be performed by as many of the other levels of the census hierarchy as possible. For this purpose, specific areas can be assigned to designated personnel who will be instructed to concentrate on such field duties till the enumeration is completed. Particular attention

will have to be paid to dense settlements, areas with difficult terrain, riverine areas and special groups. The short duration over which it is carried out, the wide dispersal of the field staff and the enormous logistic support that is needed discourage extensive supervision during the intensive phase of enumeration. In actual practice, therefore, as stated earlier, supervision will have to be so organized as to ensure that coverage is as complete as possible.

6. Retrieval and aggregation of records

366. Immediately the enumeration is over, all census documents must be retrieved, including the completed questionnaires; other schedules that may have been canvassed, if any; the blank ones; the enumeration-area map; the lists of housing units and households; and all other documents that may have been given to the enumerators. Well before the commencement of the enumeration, the points at which these documents will be delivered by the supervisors will have to be determined and indicated to the enumerators. Such delivery should not entail excessive travel for the field staff. The manner of packing the documents, the identification marks to be placed on the packages and the procedures for verification of the retrieval of all records must be clearly specified. Unused material, specially blank questionnaires, should be distinguished. In most cases, it will be better to instruct the enumerators to deliver the packed documents to the collection centres to which they are attached. The collection centres can carry out further consolidation and dispatch the records to the tabulation centres specified. At every stage, the completeness of the records must be verified. It will be almost impossible to reconstruct missing questionnaires later and therefore very thorough procedures must be developed to ensure that all documents have been adequately accounted for.

367. The transport of the consolidated documents from the collection points to the regional offices and, in some cases, to tabulation offices or to the central office is a major task. The safety of the documents and their proper care must be ensured at all times and transit time should be minimum. The transport arrangements will therefore have to be made well in advance and responsibility for carrying out this activity assigned to specific personnel at each area level. In many cases, the transport arrangements consist of a mix of official vehicles of other government agencies borrowed for this purpose and those of private transport agencies on hire. Experience indicates that in order to avoid collapse of the arrangements at any point or in any area, it is advantageous to have control over the vehicles to be used for this purpose a few days before the conclusion of the enumeration.

7. Special issues in some areas

368. The conduct of a census in small island countries has certain special features though the process of census-taking in such countries is basically not very different from that of other countries. The scale of the operations may be smaller and, for this reason, some of those operations may seem easier to carry out in small island countries than elsewhere. However, those countries may have unique problems with regard to coverage. The provision of timely and adequate transport and of communications is sometimes an operation of intractable proportions. Lack of links by air or sea, and (where they

exist) the infrequency of such links, aggravate the difficulty of conducting the census and supervising operations. The need for accuracy in the count is universal, but of acute importance in some of the small island countries. Even a small degree of underenumeration can have a serious effect on the demographic indices that are obtained from the census results. Also, due to logistic difficulties, the undercounts may tend to be selective for smaller populations and for the remoter islands. The planning and execution of the census in such countries will have to take these special circumstances into account. 41/

369. The need for special arrangements for carrying out the fieldwork in riverine areas has been referred to earlier. Other areas where special arrangements may be necessary would include forest reserve areas, game sanctuaries, pastoral tracts and desert areas. In most of these areas special teams of enumerators, with the necessary mobility, will have to be established. In the forest areas or game sanctuaries, there will be an advantage in recruiting the personnel of the concerned department for census operations, in as much as they will have the necessary knowledge of the area, will know where people, if any, are located within such areas and will have the necessary transport and communication facilities. The planning of operations in areas of the type referred to will require preliminary information on the location of settlements, the movement of tribal or pastoral populations, the likely language and translation problems, the availability of local guides and persons of the area who can be inducted into the operations and, in some cases, the need for possible questionnaire modification or simplification. Such information must be obtained well in advance. 42/

VIII. TRAINING AND PUBLICITY

370. Training of the census staff and publicity for public enlightenment are two very important pre-enumeration activities. Though integral parts of the census operations, they have special features that require separate consideration.

A. Training

371. The census organization is a multidisciplinary establishment in which the activities of the units, though closely interdependent, are distinct and require a variety of skills. It is therefore essential that those responsible for carrying out each activity not only be fully knowledgeable about the content of their work but also have the skills to perform their tasks efficiently. Training is therefore an important component. The quality and intensity of training of census staff at all levels will have a perceptible impact on the entire operations. The need for adequate and effective training for the success of the census operations cannot be overemphasized.

372. The training requirements of the census organization are wide-ranging. Since the majority of the staff are recruited and assigned work at short notice, training has to be organized and imparted as early as possible to equip them for their tasks. The categories of staff that have to be trained will include: (a) the clerical, administrative and financial cadres, (b) the technical personnel in charge of the census operations at headquarters, (c) the cartographic staff at headquarters and in the field, (d) the executive staff at regional and subregional levels, (e) the enumeration staff, (f) the editing and coding cadres and (g) the data-processing personnel. It will obviously be necessary to structure the content and duration of the training programmes and develop the training material appropriate to those different categories of staff, taking into account the focus of training for the various levels of personnel within the cadres.

1. Administrative and financial cadres

373. The training of the clerical, administrative and financial cadres at the head office and in the regional and subregional offices will be necessary only for fresh entrants. Short training courses for these categories of staff are generally available within the normal training programmes of Government and the staff could be deputed to such courses. However, since such staff is usually recruited only when necessary, it is generally difficult to depute them to courses that are outside the census office or that may entail their being away for a long duration. To avoid the staff's being absent for days at a stretch, training courses could be organized within the premises of the census office itself for a few hours a day for short periods. To the extent possible, such training needs should be minimized by inducting experienced staff from other government departments for the peak years of the census. This will not only reduce the training load but also ensure immediate availability of experienced staff.

2. Professional cadres

374. The professional cadres, which are directly responsible for planning and carrying out the census, range from the senior levels which combine management with technical skills to the middle and next-lower levels where mainly professional skills are necessary. The character of training will therefore have to vary with the level being trained. At the very high senior levels, where persons will generally be professionally well qualified, what seems more useful would be refreshing their knowledge rather than formal training. Professional staff at these levels will benefit by visiting the census organizations in selected countries (having social, economic and organizational similarities to their own) with a tradition of census-taking. Visits to countries in the region that have conducted censuses successfully will be particularly useful. The next-professional levels will benefit from more rigorous and formal training. Selected staff from these levels could be deputed to specific courses in reputed institutions within the country or to training institutions located abroad that have an international reputation of excellence. If the training assignments are arranged well in advance, the staff could be deputed to courses of longer duration since, as the census activity picks up in tempo, releasing professional staff for courses of long duration will become increasingly difficult. The selection of the subject-matter and the duration of the courses must be carefully made, keeping in view the need to develop expertise within the organization relevant to its work and to ensure that that expertise is available at the appropriate time.

375. Apart from developing individual skills, one of the primary purposes of the training of selected officials is to equip them with the ability to train others. The expertise and skills that are acquired by the senior professional staff must be diffused through the other professional levels. This will help in maximizing the return on the investment in training the few senior professionals in the census organization. An intensive internal training programme must be developed and completed before the census activities begin to claim undivided attention. The assistance of experts within the country or in the regional international bodies could be utilized by way of additional valuable input into such programmes.

376. The general principles of the management of training programmes will be applicable to the training of the professional staff of the cartography and data-processing divisions. The focus in the cartography division will have to be on the demarcation and preparation of the maps of enumeration areas and other mapping tasks essential for the enumeration. Similarly, the content of the training of the data-processing staff must be oriented to specific needs of the census organization.

3. Senior cadres of regional/subregional offices

377. The operational components of census activities will include administering the regional and subregional offices; selecting, appointing and training the enumeration staff including the supervisory level; overseeing the enumeration; arranging for the collection of all census records and aggregating them at designated tabulation offices; organizing and managing the tabulation offices; and maintaining records. For successfully organizing and carrying out these functions knowledge of demography at the senior management

levels in the regional and subregional offices will be an added advantage but the professionalism at those levels should, more appropriately, be focused on the organization and management of the functional units that are essential for carrying out the census and tabulating the results. In other words, at those levels executive and management skills are what will be needed. The training of personnel at those levels must therefore be of a different character. The emphasis will be, inter alia, on how the offices at various area levels are to be organized and run, the manner in which training will be conducted and enumeration supervised and how the records will be managed. Also, training must emphasize how every step in each census activity will be supervised in the field and how total control of field operations must be maintained at all times till the enumeration is over and all records are recovered. In order for the staff to appreciate the rationale and importance of each component of the census of which they are in charge, and to understand the importance of ensuring total coverage and quality within specific time limits, the training of the staff must certainly include an exposure to the basic principles of census-taking and to the utility of the data to the country. The emphasis, however, will be on administrative and management aspects and on the importance of those aspects for carrying out a successful census.

4. Editing and coding staff

378. The training of the editing and coding staff must be completed before the census questionnaires are received in the tabulation offices. The training must be based on the editing and coding principles that have to be incorporated into training manuals. Questionnaires that have been filled in with typical responses likely to be received in the field can be used. These training forms should be preferably of a distinctive colour to avoid their being confused with the actual questionnaires that will be received from the field after enumeration.

5. Supervisors and enumerators

379. The training of all levels of staff is important to the success of the census but the training of the field staff, consisting of the enumerators and the supervisors, is absolutely vital. In realistic terms, the adequacy and intensity of the training of this staff will determine the quality and utility of the census itself. Organizing the training of the supervisors and enumerators is more difficult than organizing the training of the other cadres because of the large numbers and wide dispersal of those supervisors and enumerators and the short time over which the census has to be conducted. These features also prevent the adoption of procedures of self-study and extensive on-the-job training. Also, since each enumerator operates independently, the support of colleagues (as in a regular office) in the performance of the assigned task will not be available. Therefore, the training of this staff must be very carefully planned so that no untrained or partially trained personnel are placed in the field.

380. The objective of the training of the supervisors and enumerators, as indeed of all training, is to implant instructions and ideas, instil attitudes towards achieving excellence in performance and develop the skills to translate training into performance. The attainment of this objective is in

fact, a test of the skills of the trainers themselves and their ability to develop training material that transforms dry concepts into understandable and assimilable ideas. The preparation of appropriate instructional material and the devising of suitable methods of instruction will therefore have to receive careful attention. The organization and duration of the training sessions, the type of instructional material produced, the training methods adopted and sometimes even the location of the training centres are all important elements that influence the attendance and interest of the supervisors and enumerators.

381. Instructions describing the duties of the enumerators, explanations of the questions in the questionnaire accompanied by illustrative examples, an explanation of the manner in which the questions have to be canvassed and the public approached and the principles regarding the daily management of records, as well as instructions on other aspects of the enumeration, can be incorporated into a field manual. This manual will in fact, be the basic training material too. The manual must be written in simple language and, where necessary, translated into the language of the area in which it is proposed that the manual be used. If the questions are too numerous or the topics complicated, there may be an advantage in incorporating the instructions with simple explanations in one booklet and detailed explanations and examples in another, since putting all the material together in one large book may disconcert the enumerator at the very first session. Both booklets will of course have to be used for training and in the field.

382. There is nothing so conducive to indifferent performance as lack of appreciation of the importance of one's task or role. It is therefore essential that the enumerators understand the vital importance of their role and the significance of the census itself. This will have to be explained and communicated in an effective manner at the very beginning of the training programmes. The instructional manual must also include some of the basic information on such topics as the purpose of the census, the utility of the data, the manner in which the enumerator could organize the work so as to avoid omissions or duplications, the use of maps and control forms, the basic rules of interviewing including how one should approach households and develop skill in public relations, and maintenance of confidentiality, as well as associated aspects.

383. The manual for the field supervisors will consist, in practice, of two parts. The smaller part will explain the duties of the supervisor and describe how the work of the enumerator has to be supervised, and the other part will constitute the enumerator's manual itself, with which the supervisors must obviously be thoroughly familiar. The field supervisor's manual will, in particular, have to cover aspects relating to: (a) responsibilities with regard to training of the enumerators and all preparatory activities, (b) inspection of fieldwork and monitoring of progress, (c) ensuring of full coverage, (d) handling of difficult cases and reporting of refusals or obstructions to enumeration and (e) ensuring of recovery and consolidation of the records of the enumerators.

6. Organizational aspects of training

384. The manuals constitute the most important documentation for the enumeration and an essential input in the training programme, but since the

training has to be imparted to large numbers of field staff in a fairly short time and since there is nothing so tedious or probably so ineffective as straight lecturing, the content and method of training must be enhanced by the use of other training materials and aids. The use of visual materials, video presentations of field situations, charts and other interesting material will enhance the utility and impact of the training. Large prints of the questionnaire and field forms can be prepared and, in conjunction with blackboards, used for local illustrations and for repetitive practice in the method of recording information. Audiovisual aids will also be effective for presentation of field situations simulating those that the enumerator is likely to meet with. Training is usually most effective when the trainees have to participate actively in question-and-answer sessions and mock enumeration of each other. Such innovations will evoke and retain the interest of the enumerators and supervisors and to some extent relieve the tedium of an essential thorough reading of the manuals.

385. The training must include actual fieldwork. Areas close to the training centres could be selected where the trainees perform all the preliminary tasks necessary for enumeration, carry out actual enumeration and complete the control forms that may have been prescribed. The enumeration of the entire area is generally unnecessary but enumeration should be carried out over a sufficient number of households to permit the trainees to experience different situations. The forms used will have to be identical with the ones that will be canvassed in the actual enumeration but must be distinguishable from the latter. It is best to use training forms printed on paper that has a distinct colour or to overprint an indication such as for training only on those forms proposed for use in training. The quality of the practice enumeration carried out by each enumerator must be carefully evaluated. The knowledge of the supervisors could also be assessed by asking them to carry out this evaluation and then examining the results. The mistakes should be discussed in group meetings and good work should be appreciated to build up morale. Sometimes, if the performance of a group or large proportion is poor, it may be necessary to conduct more than one field exercise. This will be the only way to ensure that all the enumerators and supervisors understood the instructions and to develop an acceptable average level of efficiency in enumeration.

386. Census training, like all adult training, must recognize that concentration span and ability to devote days of attention to instructions will be limited. In preparing the instructional material and developing the training methods these realities will have to be taken into consideration. The adequacy of training and its impact no doubt depend heavily on the excellence of instructional material and the competence of the trainers, but an oft-forgotten element is the environment of the training centres. The location of those centres must be easily reached without too great expense, even though that expense may be compensated. Physical essentials such as chairs and tables, and fans where necessary should be provided and other conveniences and refreshments should be accessible. Otherwise, time will be lost between sessions and all trainees may not be present all the time.

387. The number of trainees at each centre and the number of training centres will depend on the total number to be trained, their concentrations and sometimes on constraints of terrain and communications. Too few training centres will result in overcrowded classes which may make the training ineffective. Too many, on the other hand, may stretch training facilities and

personnel so thin as to result in insufficient training or even in a breakdown of the training programme. Both the numbers of centres and trainees per centre will have to be carefully determined.

388. The duration of the training will depend on the complexity of the questionnaires and enumeration procedures. While no optimum period can be recommended that will fit all situations, the duration should be sufficient to ensure that every supervisor and enumerator has been trained and has participated in the field sessions. The training should be repeated over at least two to three rounds so that the pressure to absorb the instructions is always present till enumeration commences. Such multiple rounds of training will also help in improving the capacity of the weaker elements, which can be identified on the basis of their performance in the classes and in the field sessions. To the extent possible, it would be desirable to replace those who are found to have an extremely poor capacity to absorb the instructions at the very first stage of training. Not only will replacements later on be difficult but they may result in a set of poorly trained field staff. Some turnover of field staff is usually inevitable. Special training will have to be organized for replacements. Also, some proportion of reserve enumerators and supervisors will have to be trained for meeting emergency situations during the enumeration period.

389. The training of census field staff constitutes one of the largest training programmes undertaken in a country. As stated, the numbers are large and spread out and the time for training is brief, but the quality and adequacy of the data will be very heavily dependent on the impact that the training has had on the field supervisors and enumerators. The training has to be conducted at many locations simultaneously and repeatedly. A large number of trainers at various area levels will therefore be required. Because of these special features of census training, it will have to be structured in a decentralized manner. The first step will be the training of the trainers, which will have to be organized at headquarters and will include personnel at senior and middle levels, some being drawn from the regional offices. Those personnel will constitute the core training team. These trainers will in turn train senior- and middle-level staff in the regional and subregional offices. Training must comprise not only providing both sets of trainers with the instructions and enumeration procedures but also equipping them with training skills. Together, the two sets of trainers will then have to conduct the training classes for the field supervisors and enumerators. A separate session for supervisors will be necessary to instruct them on their specific functions, but they should also participate in the subsequent rounds at which the enumerators under them are trained to ensure that they get to know their teams of enumerators well before the enumeration commences.

390. The location, dates and duration of each training round and the trainers who will be responsible for each round must be laid down well in advance. Such specific timetables and assignments will help in monitoring the training rounds and arranging participation by senior staff members. Periodic reporting must be specified to be sure that every session has been held or, if a round has not been held, that it has been repeated. The monitoring of training sessions is very important and must be stipulated as being among the vital management functions of the concerned division and of the regional and other personnel who are responsible for conducting training. Monitoring functions should include recording and clarifying the doubts and queries on

the interpretation of the instructions that may be raised in the training sessions. In the more difficult cases, references to the head office must be insisted upon to ensure adoption of a common approach and to avoid local interpretations of the instructions.

B. Publicity and public relations

391. The census is no longer the low-profile operation it used to be a few decades ago. The demands for census data have increased enormously both within Government and from other data users, resulting in a critical interest in census results. At the same time, with the enhanced emphasis on social and economic topics in recent censuses, public awareness of the census has increased considerably. In some countries the general reaction against the gathering by Government of what is considered excessive personal information has been directed against the census too. These trends no longer permit the census-taker to operate in relatively comfortable anonymity. The success of the census is, at the present time, dependent not only on the efficiency of the operations but also on the acceptance by the people of the country concerned of the fact that the census is a useful exercise, and on their co-operation. The public's confidence in the census therefore must be built up through publicity and its active cooperation obtained through public relations activities.

392. Publicity campaigns for the census must convince the public of its utility, dissipate the public's anxiety regarding the purposes for which information is collected or the use to which it will be put, explain the reasons for the choice of topics and provide some guidance regarding the manner in which the questions have to be answered and the nature of the information to be provided. If these objectives are to be satisfied, census publicity will have to commence fairly early - in any case, soon after the decision to conduct a census has been announced. The character and content of census publicity will change along with the activities of the census itself and build up to an intensive phase just before and during enumeration. 43/

1. The stages of census publicity

393. Census publicity can be regarded as developing over the following three stages:

(a) The pre-enumeration stage, during which the main objective is obtaining public acceptance of the census and active cooperation. The focus will be on acquainting the public with the purpose and scope of the census, its utility to the nation and the people, the maintenance of confidentiality and the main topics that will be canvassed;

(b) The enumeration stage, during which the focus will be on indicating the contents of the questionnaires, the type of information sought, how and when it will be collected and the method of completing the questionnaire or furnishing information to the enumerator. An important component will be wide appeals to ensure full coverage and avoid all omissions;

(c) The post-enumeration stage, during which the initial results will be published and interesting presentations made of the data.

The tempo of the publicity campaign will naturally vary in each phase. Massive census publicity in the first and second stages will help in carrying out the fieldwork smoothly. After the enumeration is completed, publicity will doubtless be in a lower key, but must not be neglected. At the post-enumeration stage, the intention will be to keep the public informed of the census results through release of preliminary data, articles and general reports of popular interest on facets of the subject of population. Such post-enumeration publicity will help in convincing the public of the utility of the census operations and, more important, create an awareness of the utility of its involvement. Incidentally, such post-enumeration publicity will help in building up over time a census culture in the community.

2. Target groups

394. The target connected with the need to build up a census culture is not limited to the public. There is quite often a need to convince authorities in Government of the utility of the census and to induce decision makers to allocate sufficient funds for the purpose of census-taking. The communication strategy regarding the census has, in reality, three distinct target groups. The first consists of the political and administrative decision makers in Government; the second, of other official agencies within Government; and the third, of the general public. The general public may itself, in fact, be regarded as consisting of two groups, the first comprising intellectuals and makers of public opinion and the second, the public at large.

395. In some countries the obtaining of political and bureaucratic support at the very highest levels for the census operations may still be necessary. Such support and approval for planning and undertaking the census must be obtained very early. It would be an unfortunate waste of resources were the census operations discarded halfway through or, worse, reduced in scope or efficiency by budgetary cuts during critical phases. Even in countries where the taking of a census is accepted as a routine responsibility of Government, there could sometimes be difficulties in easily obtaining sufficient budgetary support. Obviously, the obtaining of such sanctions and support is a matter of internal communication within Government and not one of general publicity. However, the fact remains that in some cases such communication links must be established well before the tempo of the census is built up.

396. It will be necessary to establish dialogues with official agencies and departments within Government soon after the decision to conduct a census is made. As noted earlier, many agencies will be interested in the content of the census and their views will have to be elicited. Also, the census organizations in many countries draw upon the staff and resources of other departments and official agencies for carrying out the census. To be able to avail themselves of such assistance with least difficulty, the census organization concerned will have to establish communications links with these departments and agencies. It will be to the advantage of that census organization to develop those links in the early stages. Many issues relating to including or excluding topics and making available the assistance required could be settled through interdepartmental consultations, through which

long-drawn-out and sometimes frustrating inter-agency discussions in the higher echelons of Government would be avoided.

3. Focus of census publicity

397. The general publicity campaign must be directed towards all sections of the community and all areas. The content of the components of the campaign will have to be designed keeping in mind the particular sections of the public that are being addressed and the specific activity of the census that is being publicized. Perceptions regarding the census will vary among sections of the community. The urban and intellectual groups may be more concerned with possible use of the data for taxation or deprivation of privacy, while dispersed rural sections of the population may fear use of the information for local taxation, military conscription or some other unforeseen purpose. There are communities in which it is considered unlucky to give the ages of the very elderly or state the number of children. The influence of such social compulsions will have to be mitigated by a combination of publicity and involvement of local leadership.

398. Obstacles to public cooperation have been experienced not only in countries with little census experience but also in those with long census traditions. Such obstacles are present not only in countries with low levels of literacy and public awareness but also in those with very high levels of education and public knowledge of activities such as the census. The likely type of opposition or reaction to the census will therefore be different among countries. The publicity and communication campaigns will have necessarily to be adapted to the intensity and nature of the problem in each country. Publicity methods and communications media will similarly vary among countries. One common requirement, however, will be the need to commence publicity early and synchronize its scale and intensity with the increasing tempo of census activities. Thus, at the stage of initial census planning the stress will be on the general aim of the census, its utility for development planning both at national and very local levels and the need for public cooperation. After the questionnaire has been finalized and enumeration procedures have been decided, the focus will shift to enlightening the public on the rationale for the selection of topics, the questions proposed and the kind of information that is being sought. On the eve of enumeration, as well as while it is in progress, the emphasis will be on constantly reminding the public both that enumeration has commenced and that it is their duty to be enumerated. Post-enumeration publicity should, as suggested earlier, relate to release of basic census information.

399. Of the stages of census publicity, those just prior to, and during, enumeration are very important. These must be periods of intensive publicity having the objective of ensuring full public knowledge of and cooperation in the enumeration. An intensive campaign over a census publicity month just prior to enumeration would be an effective way of evoking public interest and imparting knowledge of the content and purpose of the census.

400. The publicity both on the eve of the enumeration and while it is being carried out is critical. The focus will be on ensuring complete coverage and for this purpose every possible method of publicity should be used. Towards the end of the enumeration period, massive publicity should be mounted with

the specific purpose of capturing the attention of those who have not yet been enumerated. Such publicity has necessarily to be highly local in impact and will in effect constitute a have-you-been-enumerated campaign. In this phase, the massive publicity campaign must be enhanced through intensive supervision by and the personal contacts of all those responsible for enumeration.

401. In some countries, strong political movements or groups of intellectuals concerned with government activities may mount pressure against taking of a census. In such cases, the opposition is not so much against the census per se, since its utility is generally recognized, as against Government itself. The census, being so visible an activity, is merely the target, not the cause, of the opposition. In recent censuses in some countries, surveys have been conducted to study the attitudes, opinions and views of the public on the census. The general conclusion has been that a very high proportion of the population agreed that a census was useful and must be undertaken. The reservations appeared to relate to possible misuse of personal data. 44/ In such situations, it would be desirable to orient the publicity campaign towards conveying assurances regarding the statistical use of the data. The major focus of the publicity campaign will not be to furnish the public with information regarding the taking of the census but rather to obtain public acceptance and cooperation. Such campaigns will have to be mounted well before the census becomes an emotional issue or becomes politicized. It will also be necessary to direct the communication efforts in the initial phases towards the opinion-making groups such as professionals, intellectuals in universities and other academic institutions, journalists and the like. The character and content of the campaign to publicize the census and obtain public cooperation will have to be determined carefully, taking into consideration the social situation in the country and the perceptions of the census by the public.

4. Organizing census publicity

402. The planning of the publicity campaign will have to be taken up soon after it is decided to undertake the census. For this purpose, the publicity unit in the organization must be strengthened by the induction of experts in mass communication and publicity techniques. In those countries where much of the publicity will come through official media channels, the induction of such experts from the ministry or department responsible for government publicity will be an added advantage and help in establishing the necessary liaisons. In countries where mass media organizations outside Government are well established, it will certainly be an advantage to utilize their expertise too. The plan of the publicity campaign spread over the peak years of the census operations must also include cost estimates so that the requirements for funds are built into the indicative census budget and available throughout the campaign.

403. Almost every method of publicity will have to be used for conveying the census message. Articles on the census and on a wide variety of subjects connected with the census, in newspapers, popular magazines, professional journals and the like, will cater to the educated and professional sections. Such articles could be written by the senior staff of the census organization, and some could be sponsored through professional bodies, university departments and research organizations. Seminars on the census will also

provide good publicity. Popular articles on the scope and utility of the census should also be published as extensively as possible to cater to the non-professional public.

404. The widest possible use of the radio and television networks must be made to reach as large an audience as possible. Brief announcements regarding the census can be built into the news bulletins and special broadcasts of sports events, and if the budget permits, commercial advertising could also be utilized. There are many other channels of communication that could be used for spreading the message of the census. The network of social clubs, youth organizations, farmers' clubs, women's organizations and similar bodies can be requested to help through talks, messages in their journals, discussions in their meetings and messages to their members. The large organizations of commerce and industry can be requested to issue bulletins to their members regarding the census. Large establishments such as government departments, major industrial undertakings, trade unions and the like could assist by circulating a brief message on the census to every one of their employees. In particular, such organizations could request their employees to indicate the correct description of their work characteristics to the person in their household who is most likely to answer the questions of the enumerator.

405. Educational institutions are a major line of communication. The census should be discussed, obviously in general terms, in classes and students should be encouraged to convey the message to other members of the household. Essay competitions can be organized, with due publicity for the winners. Plays and skits are also very effective ways of passing on the census message. The conventional methods of posters, films and slides, and other audiovisual media must of course be fully utilized. The use of mobile units with audiovisual equipment will have high impact, with the advantage that they can be used repeatedly. In some countries census commemorative stamps and postcards have been issued and special franking stamps used during the census year.

406. Census publicity, while being intensive, must be accurate. It will be necessary for the planning group to prepare detailed descriptive material that explains the purpose, utility, content, methodology, procedures, timing and other aspects of the census, including the importance of public cooperation. Such authentic material could be widely distributed for use by media experts or by those who intend to speak or write about the census. Such material should also be used in the training classes for all levels of staff so that responses to public queries are fairly uniform and accurate.

407. National publicity can be undertaken soon after basic decisions on the census have been taken. If a census proclamation or notification is being issued, as is often statutorily necessary, high-level dignitaries in the country could be requested to speak on the occasion and appeal for public cooperation. At the national, regional and subregional levels, the active support of leading personalities will be helpful. A short film of just a few minutes incorporating an appropriate message from the Head of State regarding the census will provide effective publicity.

408. In addition to direct publicity, the active assistance of local authorities and, in some situations, of local leadership too must be obtained. Local authorities, even if official bodies, are generally under

political control. Similarly, at the subregional or small-area level, there could be local leaders who have a say in the affairs of their areas. The cooperation of this leadership, which may consist of elected leaders, hereditary or elected chiefs, traditional rulers or others, is often essential. It may not be advisable to induct them as notified census officials since this may result in factional friction, but their help may have to be solicited for obtaining public cooperation and ensuring coverage. Such personalities could be given due prominence at inaugurations of training classes by being asked to speak at publicity sessions or to introduce the census officials to the local community. In tribal areas or among nomadic tribes, it will not be possible to obtain access to the community without the assistance and cooperation of the chiefs, and in such cases their role will be prominent.

409. One major component of census communication is the public relations that the census officials must establish with leaders in the community. During inspection visits, when participating in training classes and whenever they pass through or halt in an area, senior- and middle-level census officials must make it a point to call on local dignitaries and leaders wherever such personalities have a prominent social role. Similar contacts must be maintained with regional and subregional administrators and other officials. At these area levels, such contacts will be very useful at least to the extent that they eliminate possible areas of friction, and in some cases they may yield the benefits of assistance.

410. In many areas, the adoption of traditional ways of imparting messages to the public - which include the use of drum beaters, town criers, village councils and the local schoolteacher and the encouragement of local ballad singers, dramatists and similar extremely local but highly effective agencies - will continue to be relevant. In forest reserve areas, game reserves and tribal areas, such methods will be useful but the census and local officials will have also to enhance publicity through extensive personal contacts. The nature of the terrain and the character of the communities that live in these areas will necessitate a different approach. In riverine areas too, special publicity measures must be planned.

IX. DATA PROCESSING AND TABULATION

A. Planning for data processing

411. The census questionnaires that are received from the field staff on the conclusion of the enumeration will contain information on various characteristics relating to individual persons and housing units. These innumerable bits of information have to be converted into statistical tables, which are the final product of the entire census operations. This task of conversion of raw data into usable form should follow immediately after field operations have been concluded. It will be wasteful if data processing is so prolonged that - as has indeed happened in some countries - the statistics lose their current value and become of only historical interest when finally available. The data-processing system must therefore have been established and tested by the time the enumeration commences.

412. The planning of the data-processing system must be commenced very early, even as the questionnaires and enumeration procedures are being planned. As noted earlier, the format of the questionnaire and the data-processing system are closely linked since processing needs may influence the structure of the questionnaire, including size, kind of paper used and method of recording responses. The determination of the tabulation plan, including the sequence in which tables are produced, will also depend on the processing system adopted. Also, the rapid changes in the technology of data processing that occur in the long interval between two censuses will invariably render the planning of the data-processing system at each census a totally new exercise. Therefore, planning of the data-processing system will have to be part of initial thinking, even though data processing constitutes almost the penultimate stage just preceding publication.

413. The plan for the processing of census data will be determined by (a) the time-frame within which the tabulations have to be produced and the phasing of the sets of tables within that time-frame; (b) the proposed extent of the manual tabulation to be carried out; (c) the proposed extent to which computerization is to be adopted, the proposed type of equipment to be used for data entry and associated technical considerations; and (d) the organizational issues, including availability of personnel. The requirements of staff, the capital costs of equipment, running and maintenance costs and administrative overheads will be determined by these factors.

414. The initial step in data processing is naturally the collection of the completed questionnaires, field lists and control forms for verifying that all questionnaires have been received. With the arrival of these records in the data-processing division, data-processing activities will commence. These activities will include (a) manual editing and coding of the questionnaires and preparation of preliminary tables of total population on the basis of record totals; (b) converting of the edited data on the questionnaires into machine readable form by use of data-entry equipment, optical-mark readers and optical-character readers; (c) processing on the computer and production of specified tabulations; and (d) preparing the tabulations in the formats specified for publication.

415. The organization of the data-processing division has been briefly referred to earlier. The structure of the division will be influenced by the proposed extent of the manual tabulation, if any, to be adopted; the manner (centralized or decentralized) in which data processing will be organized; the extent of computerization; the time-frame within which tabulations have to be produced; and other factors. These issues are discussed in the present chapter.

B. Manual tabulation

416. Manual tabulation methods are useful for the quick production of tables of an elementary nature soon after enumeration is completed. If the establishment of a computerized data-processing centre is difficult or unlikely within a reasonable time, the adoption of manual tabulation (which will at least ensure the generation of some basic tables within a reasonable time) will have some relevance. It would be advisable to limit manual tabulation to the production of simple tables relating to total population at various area levels including, if desired, distribution by sex and other essential characteristics. The tables sought for generation through manual tabulation should be those that would normally be available as record totals at the field level. After checks for arithmetical accuracy, those tables could be aggregated to yield the figures at higher-area levels and for the nation. However, with the impressive change in recent years in the technology of data processing, the adoption of manual tabulation seems retrograde. Apart from the fact that it can only yield very elementary tables, it does not permit extensive cross-tabulations of data and renders later retrieval of data almost impossible. The utility of the data is severely restricted by the rigidity of the system. The staff requirements for manual tabulations are generally high because of the various levels of verification that have to be established to ensure minimum reliability of the tables produced.

C. Computerized data processing

417. Recent developments in computer technology have enhanced the potentialities of data processing to such an extent that the system of tabulation should be based on this technology. Nearly all countries now have access to, and can take advantage of, computer technology. It is therefore evident that the adoption of computerization for processing census data will be increasing at a rapid pace. In fact, the first use of computers for data processing in many countries has historically been associated with the census. The benefits of computerization for processing of census data are not restricted to the flexibility and convenience of the system but extend to the enormous potentialities of preservation, retrieval and continuing use of the data long after the census is over. Because of such potentialities, the conventional view that census activity ceases with the basic publications is no longer valid. It is now recognized that the census, after satisfying its immediate purpose, continues to constitute an enormous database of demographic and socio-economic information that can be drawn upon continuously. The stock of data that are available has, in fact, gained in prominence over immediate tabulations. In other words, "while the regular tabulations included in the publication programme of the census are traditionally considered the most important visible product of the census, the census data base itself is more

and more seen as the primary product, representing a rich source of information available for a variety of purposes". 45/

418. In planning a computerized system of census data processing, certain technical and organizational aspects will be important. These will include (a) method of data entry; (b) choice of processing system; (c) software for processing; (d) editing and coding; (e) possible control systems including quality control; (f) tabulation plan which may include adoption of sampling; and (g) organization for data processing, including the choice between centralized and decentralized structures for such processing. The availability of microcomputers has, in recent years, added new dimensions to this issue. These aspects obviously cannot be considered in isolation since they are closely interrelated. In fact, the procedures for data dissemination after the main tabulations are completed must also be kept in view. The likelihood of demands for data in the intercensus period and the manner in which such demands will be serviced will have an important bearing on the system of data processing that is being planned.

1. Data-entry methods

419. Data entry, also referred to as data capture or data conversion, is the process of converting the information in the questionnaire to a form appropriate for processing on the computer. The data recorded in the questionnaires have, in other words, to be converted to machine-readable form.

420. For many years the punched card was the major means of data entry. However, this technology has become obsolete and has been replaced by processes that are more efficient and convenient. The current alternatives are key-to-tape and key-to-disk systems and the use of optical readers. Those systems are more rapid, more flexible and reliable, and have high record lengths. The number of data-entry units that will have to be installed as part of the complete data-processing system will depend on the volume of data that has to be processed and the time schedule within which data entry has to be completed. The time schedule is dependent on the capacity of the main processing unit. If that unit is unable to match the output of the data entry systems, there will be no advantage in overinvestment in such systems. A balance will have to be struck between time schedules for tabulation, data-entry output and processing unit capacity.

421. Data entry can also be carried out by the use of optical readers. The optical-mark reader (OMR) reads marks that have been made by the enumerator on the questionnaires to record information, while the optical-character reader (OCR) reads the handwritten characters and symbols made by the enumerator. The adoption of either system of data entry has certain attractive advantages. Keyboard operations are avoided and there will therefore be no need for keying equipment or operators. With keying eliminated, the accuracy of the data entered will be greater, since information is entered as edited (without keying errors). The time taken for data entry will be less because it is accomplished as one operation. However, the adoption of OMR or OCR technology will require strict adherence to rather stringent conditions. At present, most scanning equipment places limits on the size of the questionnaire so that questions will have to be abbreviated. The printing will be relatively expensive since good-quality paper will be required. Different

inks will have to be used to distinguish what should and should not be read, and spaces for codes will have to be in precisely the same position on all forms. This assumes the availability of printing characterized by uniform quality and adherence to high standards. The forms will have to be handled very carefully, avoiding curling or damage. Otherwise (unless the damaged forms are recopied), the rejection rate will be high. Before this technology is adopted, the feasibility of its adoption should be thoroughly tested under actual census conditions. The tests should permit an evaluation of printing capacity and excellence, paper quality, storage and field handling problems, editing issues and machine performance. If this technology meets all conditions and satisfies the stringent evaluation tests, its adoption will be an advantage.

2. The computer system

422. The computer system must be able to process the census data within the desired time and costs limits. The adequacy of the existing system or of the one whose installation is being sought must be evaluated on the basis of estimates of workload, time and costs. The workload estimates will be arrived at by determining the volume of data to be handled and the numbers and types of operations to be performed on the data. The time required for carrying out all these operations should be determined by trials or on the basis of experience with similar operations. The estimates of workload and processing time will help in determining the capacity needed for the completion of the data processing within the time-frame specified for this activity in the census plan. Similar computations will have to be made for the matching of the data-entry equipment to ensure that the entire data-processing unit functions with maximum efficiency within the set time-frame.

423. The required data-processing capacity may be to some extent available within the census organization, in which case a decision will have to be made whether the acquisition of additional capacity will be alone sufficient or whether a totally new system should be installed. As mentioned earlier, during the long interval between two censuses the options regarding data-processing technologies will change and more cost-effective and versatile alternatives will become available. Therefore, it will be useful to carry out an objective evaluation of the adequacy and costs of running and maintaining the existing system to determine the relative advantages of continuing to use that system versus replacing it with a more recent one. The augmentation of capacity by acquiring more recent equipment while retaining the old system may often result in incompatibilities between machines with attendant problems and also may not always be cost-effective. In evaluating existing equipment, questions regarding the ability to maintain that equipment for a further long period and the availability of efficient maintenance facilities will need also to be considered. A breakdown due to sheer ageing will disrupt the tabulation plan.

424. Another consideration before in-house computer capacity is built up will be whether the census organization can use the data-processing facilities that may exist in other organizations. Spare data-processing capacity may be available in such installations but the most important consideration will be whether access to such facilities will be available to the extent necessary and when required. There are distinct disadvantages in having to depend on

other agencies for computer facilities. Such dependence usually results in total inability to maintain time schedules since little or no influence can be brought to bear on the availability of computer time. The priorities of the agency with the computer facility may change and its perceptions of the importance of census data may not always be to the advantage of the census organization, with the result that the urgencies of maintaining time schedules and uninterrupted processing may not be appreciated. It is also unlikely that any single organization will be able to provide sufficient spare capacity to process census data without interruption. It would be undesirable to permit census records to be distributed among many data-processing units in different agencies. The management of such an operation and the maintenance of confidentiality will be very difficult.

425. In some countries national and regional large-scale government computer centres have been established as service organizations for almost all official statistical data-processing activity. However, experience has often been that these centres have continuous commitments mainly relating to conventional data sets that usually result in serious delays in the processing of census data. The contracting out of the processing of census data to private organizations would be undesirable, since maintenance of the security and confidentiality of records will then be very difficult. The use of private computing facilities, even if under the total control and guard of the census organization, will have the same disadvantages as using dispersed official facilities discussed above.

426. There is therefore a distinct advantage in establishing capacity for data processing within the census organization itself. The entire operation will be under unified control, management and technical skills will not be dispersed, and record management and safety will be assured. The equipment will be in use for retrieval and dissemination of data over quite a few years. Such an arrangement will also be very useful for the analytical and methodological studies that the organization may undertake between two censuses. In fact, the availability of such facilities will often encourage the conduct of work of that kind.

427. It is essential that the data-processing system be installed and tested before the enumeration records are received. The evaluation of available equipment, the preparation of the sites for installation of that equipment and the process of acquiring, installing and testing it will take at least two years. Therefore, the process of selection, acquisition, installation and testing of the equipment must commence as early as possible.

428. The choice of data-entry equipment and of computer equipment for processing will have to be based on both technical and operational considerations. The technical considerations have been briefly indicated earlier. The operational considerations will include the time required for delivery and installation of the equipment, the training facilities offered, the availability of spare parts and other maintenance facilities, and special site requirements. If other organizations within Government have large data-processing units, their evaluation of the equipment and experience in using it will be very helpful.

429. The support capability of the equipment supplier or manufacturer is an important consideration, particularly if the equipment is being imported. The

installation and trial runs must be undertaken by the manufacturers or their authorized agents and the professional staff of the census organization must be trained in operating the equipment. The availability of maintenance personnel in the country, and at short notice if abroad, and the assurance that spare parts will be available whenever necessary are important considerations. Maintenance contracts must be entered into which will ensure repairs and maintenance with least delay. This will be particularly important in the few critical years of peak data-processing activity.

430. The computer installation of the census organization will be used intensively for quite a few years and will continue to be used to an optimum extent thereafter. Therefore, it will be more advantageous to acquire rather than lease the equipment. Renting of sophisticated equipment is generally more expensive in the long run than acquiring it and there is little protection against increases in rentals. The processing of census data is not a rapid operation. It is generally spread over a few years, and as noted earlier tabulations may continue to be generated even after the basic tables have been produced. The leasing of equipment over such long periods is therefore unlikely to be cost-effective.

3. Software for processing census data

431. With the adoption of computerization, consideration must be given to the availability of software for processing the data and generating the tables in the formats desired. Various software packages that can be readily used are doubtless available. However, these packages do not always completely satisfy processing requirements. Modifications are sometimes needed or additional, specialized programmes may have to be prepared. Also, there are always likely to be special tabulations that may be required but that the software packages may not be able to generate. It is therefore desirable for the census organization to have internal core programming staff capable of preparing special programmes, if necessary. Such core staff will also be useful (even with the employment of software packages) for the purpose of supervision during tabulation.

432. A large number of software packages are available that can be used with great advantage for the processing of census data. They cover a wide variety of operations, from the editing and coding of the data to the production of camera-ready tabulations. It will be very useful to collect and maintain information on such packages and explore the possibilities of their utilization in data processing. 46/ Considerable resources, measured in terms of money, professional skills and time that would otherwise be spent on developing programmes, will be saved.

433. Before an available software package is proposed for use, it is essential to determine its suitability and utility. The factors that must be taken into consideration in evaluating such programmes are:

(a) Whether the software was developed by persons who had experience in census operations;

(b) Whether the persons who developed the programme used it themselves or have the documented experiences of those who might have used it;

(c) Specifically, whether any census organization has used it and if so what their experience has been;

(d) Whether the package needs computers of predetermined capacity or whether special hardware must be obtained before it can be used;

(e) Whether it needs any auxiliary programming;

(f) How error-free the programme is;

(g) Whether the user's manual is sufficiently detailed and whether other documentation is freely available;

(h) Whether the agency supplying the software package is inclined to provide training facilities and on-site professional advice.

434. Such a critical appraisal of the available programmes will be particularly necessary if it is proposed that they be used with the existing computer equipment. This may not always be possible owing to capacity or processing limitations of the already installed equipment. The testing of the software will indicate the suitability of the programmes and the computer time required for editing and tabulation operations. The computer time required will in turn determine whether additional computer capacity must be installed for completion of data processing within the time limits set or whether the existing configuration is sufficient. Such evaluation of the software will be necessary for similar reasons even if a new system is being installed.

D. Editing and coding

435. In the field, careful supervision of census questionnaires, unlike that of surveys, is difficult. When canvassed by enumerators they are at best test-checked by the supervisors, whose major concern will be ensuring full coverage. A large proportion of the questionnaires will therefore reach the tabulation and data-processing centres with entries as recorded by the enumerators. In the self-enumeration and householder methods too, the questionnaires will arrive at those centres with information as recorded by the respondents or, where these questionnaires were collected by the enumerators, as checked or completed by them. It is a universal census experience that the information recorded in the questionnaires is not always complete or consistent. It would be unrealistic to expect all questionnaires to have been fully entered or to have the same degree of accuracy or internal consistency. It will therefore be necessary to edit the entries before they are coded and before further tabulation is attempted.

436. Editing entails the inspection of responses recorded in each census questionnaire and, if necessary, their correction or the imputation of responses where these are absent, according to a set of rules. The purpose of editing is to check that the information recorded in the questionnaire is complete, has been entered in the stipulated manner and is internally consistent. Where a response is considered unacceptable or improbable, it will be replaced by another as prescribed in the editing rules. Where an entry is missing, the imputation of an acceptable or plausible answer will be made. The editing rules that prescribe such corrections, revisions and

imputations will be based on the criteria of logical inference and internal consistency.

437. It is therefore important that the process of cleaning the data be the first stage of data processing. In large countries, there may be an advantage in carrying out edit operations in regional offices, as close to the source of data as possible, so that the edit can take into consideration local or regional variations that may exist with regard to certain socio-economic characteristics. The editing rules will of course have to specify the appropriate regional variations that are acceptable.

438. The types of errors likely to be noticed during editing are:

(a) Omissions, which are items against which an entry is required though none has been made. In many cases, the correct entry can be determined from other entries in the questionnaire for the same person or from entries for other members of the household;

(b) Inconsistencies, which are cases where the entries for two or more interrelated items are not consistent;

(c) Impossibilities, which are entries that are illogical or prohibited by the coding system, for example, an entry of 3 for sex when the only permissible codes are 1 and 2.

There can also be errors of unreasonable magnitude for such items as income or housing that are inconsistent with connected items.

439. There are usually two stages in editing. The first is that of manual editing before coding and data entry and the second comprises computer editing. Manual editing is the desk-checking of the entries to correct obvious mistakes or fill gaps in information. At this stage, clerical errors such as lack of full identification particulars on the questionnaires or wrong batching and the like will also be corrected. The manual edit will have to be carried out by competent officials who have been trained in the editing procedures. They will have to be thoroughly familiar with the census concepts, the questionnaire and the enumerator's instructions. Manual editing can be organized so that one person scrutinizes a questionnaire completely, or sets of entries of interrelated characteristics can be edited by groups of editing staff. For example, the edit of the block of questions relating to work characteristics or fertility could be edited by separate editing teams, with the editing responsibility for the rest of the entries assigned to other teams. The edit by one person of all entries will no doubt ensure all-round internal consistency, but the alternative arrangement may result in more rigorous editing of difficult questions by specialized staff, though it has the disadvantage of multiple movements of records.

440. In computer editing, either of two procedures could be adopted. The first would be to use the computer to locate errors and then correct them manually. The second would be to carry out the corrections on the computer also. With the first method there will no doubt be the advantage of being able to refer back to the original record if necessary. However, this method has several limitations: it is extremely time-consuming and continues to have the same disadvantage of possible errors in interpretation and lack of

uniformity in corrections and imputations. Carrying out the edit on the computer, on the other hand, will not require referral to the basic records, will be very much more rapid and will maintain uniformity of editing. It will also be possible to obtain statements of errors encountered and corrections made.

441. One method of resolving errors is to draw upon information recorded against other items in the questionnaire and thereby maintain consistency. If this cannot be done, a method of imputing responses, known as the cold-deck procedure, could be adopted. With this method, imputation of responses will be made on a proportional basis from a distribution of known cases. The other method is the hot-deck procedure, in which the valid response of the last person in the batch with similar characteristics will be used for imputation. This procedure assumes a certain degree of homogeneity between contiguous records. These methods can, in principle at least, be adopted in manual tabulation also. However, it becomes evident that such a step will be extremely difficult in terms of record management and very time-consuming. Both methods, on the other hand, can be adopted on the computer with relative ease.

442. Computer, or machine, editing is a more rigorous and systematic application of the edit rules. Computer editing is preferred because it does not have the limitations of manual operations, such as possibilities for human error and varying application of the edit rules, nor the management problems associated with employment of large sets of temporary staff over long periods. However, it will not be possible to eliminate completely the stage of manual editing, which it is necessary for carrying out the essential preliminary checks referred to earlier. The scale and intensity of the editing tasks to be performed at each of the two stages will have to be carefully determined. The large volume of census data makes computer editing an attractive procedure since it saves time, ensures uniformity and may permit economizing on staff costs.

443. Although editing improves the quality of the data by removing inconsistencies and filling gaps, to some extent it does result in an alteration of what was recorded by the enumerators. Excessive or inappropriate edit procedures may have the effect of distorting the data and possibly reducing their validity. Therefore, the edit rules will have to be very carefully formulated so that data cleaning, while enhancing data quality and utility, does not inadvertently distort the information on record or compensate for bad fieldwork to an excessive degree. Such careful formulation would imply that corrections and imputations were being kept to the essential minimum. The important issue will therefore be the extent or degree to which editing should be permitted. This issue is relevant for that of manual editing too, but is more critical at that stage of computer editing.

444. The adoption of computer editing has doubtless vastly expanded the scale and scope of data cleaning, reduced the time that is taken for editing vast quantities of data, and improved data consistency. However, excessive editing on the computer can sometimes significantly alter the data and may at times permit unjustified confidence in what would otherwise be poor data. In the absence of carefully drafted and sensitive rules, the edit procedures may result in the masking of situations by the rather ruthless application of general editing principles built into the programme. Exceptional cases, whose

presentation has been one advantage of a census, may be masked through the application of editing rules that seek too much uniformity in the data. In populations undergoing changes in social and economic structures as part of the process of development and investment in human welfare and manpower resources, the existing assumptions regarding some of the characteristics or their interrelationships may not always be valid. It will be unfortunate if those changes are masked owing to overgeneralizations having been built into edit programmes. In fact, during evaluation of the edit packages that may be obtained from other agencies, this aspect has to be kept in mind. 47/

445. It was mentioned earlier that one of the advantages of computer editing is the ability to obtain lists of the errors noted and the imputations made. Such a record must be maintained even for the stage of manual editing. A careful study of those lists will provide an indication of the possible deficiencies in questionnaire design, instructions and training. Such an analysis, if recorded, will be of great assistance in the planning of studies between censuses to improve the methodology for a subsequent census.

446. After editing of a questionnaire is completed, the entries will have to be coded. Codes will have to be assigned to the entries that were not precoded in the field. Usually, clerical coding at the stage of data processing will relate to the more complex questions in the questionnaire. Since the assignment of codes is the prelude to data entry, it is important that precise coding instructions be developed and incorporated in manuals and charts for use by the coding staff.

447. Coding can be carried out by the same staff that perform editing. However, there are some advantages in separating the edit and coding functions. Such a separation will usually enhance the editing and coding skills of the sets of staff to whom these functions are assigned and quite often the coding stage will provide an opportunity for a review of the quality of the editing itself. If there are constraints that do not permit separate sets of staff, the separation of functions can be limited to sets of important and interrelated characteristics. For example, the coding of descriptive items such as industry and occupation requires some degree of specialization owing to the large number of codes that are difficult to memorize and require repeated referral to the coding manuals. In this case, there would seem to be an advantage in separation of the two functions, which may speed up both editing and coding. It may also be possible to organize separate teams that carry out both the editing and coding of interrelated questions so that movement of records is minimized.

E. Quality Control

448. The quality of census data is determined by the efficiency with which each of the operations in the census plan is carried out. In operational terms, measures for the maintenance of quality must be part of all technical activities and supervisory and training procedures. However, the application of quality-control measures in the more formal sense is possible at the stage of data processing. The establishment of good control systems in the data processing operations will improve the quality of the product and reduce processing time. 48/

449. There are various techniques of quality control that can be adopted at the data-processing stage. The focus is on verification of performance, and sophisticated sampling techniques are available for this purpose. According to the general principle, the objective is to establish quality standards of a desired level for each of the operations, including manual editing, coding, data entry and computer editing; to specify the procedures for evaluating and verifying performance of the staff in carrying out each task; and, on the basis of such an evaluation, to take timely action to correct deficiencies noticed.

450. The ideal approach would be to organize verification of manual editing, coding and data entry on a complete basis, with the work of one person being fully repeated by another. This is obviously impractical in terms of the number and costs of staff, and the time it would entail. It is also very doubtful if such a system would be error-free. The fact that the verifier would be checking the forms on which entries has already been made by the editor or coder would condition the verification process. In any case, as the staff pick up experience, such complete verification will be unnecessary for a large proportion.

451. The adoption of a particular verification technique will depend on the quality standards desired and the type of operation on which it is proposed that verification be carried out. Whatever the technique adopted, the implementation of a quality-control system requires careful planning. It must provide effective monitoring of quality of performance at key points without slowing down data processing. The monitoring system must itself provide for quick flow of information on the evaluation of the verification process, because delays to management in such feedback will result in unsatisfactory work flowing on to the next stage. The system also calls for immediate and effective corrective action being taken where necessary.

F. The tabulation plan

452. The main objective of the census is to compile and make available to data users, including Government, information in usable form on the characteristics of population and housing at the appropriate area levels as soon after the enumeration as possible. The presentation of the data will be through the tabulation plan which is, in effect, the output of the data-processing operations.

453. Consideration of the tabulation plan must commence along with the initial formulation of the first draft of the census questionnaire. The two are closely related. The questionnaire determines the scope of the tabulation plan, while the tabulation plan may impose certain conditions on the content and format of the questionnaire. With changes in the questionnaire, the tabulation plan will doubtless undergo modifications, but its simultaneous development will assist in finalizing the questionnaire by bringing out inconsistencies between the questions and envisaged tabulations. It will be possible to assess whether unnecessary questions are being asked, whether any essential tabulations are being lost and whether it is possible to gather the type of information required for tabulation. Because of this close relationship between questionnaire design and tabulation plan preparation, it is apparent that consideration of the latter must commence well in advance.

454. The planning of the data-processing procedures will be dependent on the tabulation plan since the sequence of the data-processing operations and the priorities of the tables to be produced will be set by the latter. Some of these considerations will have relevance in the determination of the specifications for computerization and the assessment of staff requirements.

455. The tabulation plan usually represents a compromise between the total tabulation of all the information gathered in the census and the limits imposed by practical considerations. The scope of the tabulation plan will be governed by the costs of processing, the costs of publication (if the intention is to publish all the tables that are produced) and the method of dissemination of data. An important consideration will be the need to produce priority tables within a reasonable period after the enumeration. All the tables included in the tabulation plan may not have the same urgency and will therefore have to be ranked by priority. This ranking will, in turn, influence the sequence of data processing. Principles and Recommendations specifies the tables that can be generated and indicates those that can be considered priority items. 49/ For reference, these are listed below. Those with an asterisk preceding the number are the priority tables.

Population characteristics

I. Geographical and migration characteristics

- *1. Total population and population of major and minor civil divisions, by urban/rural distribution and sex
- *2. Population in localities by size class of locality and sex
- *3. Population of principal localities and of their urban agglomerations, by sex
4. Native and foreign-born population by age and sex
5. Native population by major civil division of birth, age and sex
6. Foreign-born population by country of birth, age and sex
7. Population by duration of residence in locality and major civil division, age and sex
- *8. Population ...years of age and over by place of usual residence, place of residence at a specified date in the past, age and sex
9. Population by place of usual residence, duration of residence, place of previous residence and sex

II. Household characteristics

- *10. Population in households by relationship to head or other reference member of household, marital status and sex, and number of institutional population
- 11. Heads or other reference members of households by age and sex, and other household members by age and relationship to head or other reference member
- 12. Heads or other reference members of households ... years of age and over by activity status, status in employment and sex, and other household members ... years of age and over by relationship to head or other reference member and activity status
- *13. Households, population in households and number of family nuclei, by size of household
- *14. Households and population in households by size and type of household
- 15. Multiperson households and population in such households, by type and size of household
- 16. Multiperson households with one or more family nuclei and population in such households, by type of household and family nucleus and by size of household
- 17. Households and population in households by size of household and number of economically active members
- 18. Households and population in households by size of household and number of members under... years of age

III. Demographic and social characteristics

- *19. Population by single years of age and sex
- *20. Population by marital status, age and sex
- 21. Population by country of citizenship, age and sex
- 22. Population by religion, age and sex
- 23. Population by language (mother tongue, usual language or ability to speak one or more languages), age and sex
- 24. Population by national and/or ethnic group, age and sex

IV. Fertility and mortality

- *25. Female population 15 years of age and over by age and number of children born alive
- *26. Female population 15 years of age and over by age and number of children living
- 27. Mothers 15 years of age and over with at least one child under 15 years of age living in the same household, by age of mother and by age of children
- 28. Female population 15 years of age and over by age, number of children born alive and educational attainment
- 29. Female population 15 years of age and over, in their first marriage or married only once, by age at marriage, duration of marriage and number of children born alive
- 30. Female population ... to 49 years of age by age, number of live births within the 12 months preceding the census, and deaths among these live births
- 31. Population by maternal orphanhood and age

V. Educational characteristics

- *32. Population ... years of age and over not attending school, by educational attainment, age and sex
- 33. Population ... to 24 years of age attending school, by educational attainment, age and sex
- 34. Population 10 years and over by literacy, age and sex
- *35. Population ... to 24 years of age by school attendance, single years of age and sex
- 36. Population that has successfully completed a course of study at the third level of education, by educational qualifications, age and sex

VI. Economic characteristics

- *37. Population ... years of age and over by activity status, marital status, age and sex
- *38. Economically active population by occupation, age and sex
- *39. Economically active population by industry, age and sex
- *40. Economically active population by status in employment, age and sex

41. Economically active population by status in employment, industry and sex
42. Economically active population by status in employment, occupation and sex
43. Economically active population by industry, occupation and sex
44. Economically active population by occupation, educational attainment, age and sex
45. Economically active population by industry, educational attainment, age and sex
46. Economically active population by occupation, place of usual residence, duration of residence, age and sex
47. Economically active population by educational attainment, place of usual residence, duration of residence, age and sex
48. Economically active female population by occupation, marital status and age
49. Economically active female population by status in employment, marital status and age
50. Population not economically active by functional categories, age and sex
51. Employed population by hours worked during the week, age and sex
52. Economically active population by months worked during the year, age and sex
53. Employed population or total economically active population by time worked, occupation and sex
54. Employed population or total economically active population by time worked, industry and sex
55. Economically active population by monthly income, occupation and sex
56. Households and population in households by annual income and size of household

Housing characteristics

- *1. Households by broad types of living quarters and number of homeless households
- *2. Households occupying housing units by type of housing unit
- *3. Households in housing units by type of housing unit, cross-classified by type of household

4. Households in collective living quarters by type of living quarters
- *5. Households by type of living quarters, cross-classified by sex and age of head of household
- *6. Households by type of living quarters, cross-classified by type of activity, occupation and sex of head of household
7. Homeless households by sex and age of head of household, cross-classified by type of activity
8. Vacant conventional dwellings by type of vacancy
- *9. Conventional dwellings by year (or period) of construction of building (in which dwelling is located), cross-classified by type of building and construction material of outer walls
10. Conventional dwellings by number of dwellings in the building
- *11. Housing units by number of rooms, cross-classified by type of housing unit and number of occupants per housing unit
- *12. Households in housing units by type of housing unit occupied, cross-classified by number of households and number of rooms per housing unit
- *13. Living quarters by type, cross-classified by water-supply system
14. Living quarters by type, cross-classified by water-supply system and source of water-supply
- *15. Occupied living quarters by type, cross-classified by type of toilet facilities
- *16. Occupied housing units by type, cross-classified by type of lighting
- *17. Occupied housing units by type, cross-classified by availability and type of cooking facilities
- *18. Occupied housing units by type, cross-classified by availability of bathing facilities
- *19. Households in housing units by type of housing unit, cross-classified by tenure of household and, for tenant households, ownership of housing unit occupied
20. Households in housing units by type of housing unit, cross-classified by type of owner of the housing unit, availability of piped water and availability of toilet facilities in the housing unit
21. Renting households in dwellings by rent paid, cross-classified by type of owner of the dwelling, furnished or unfurnished and tenure of the household

- *22. Renting households, classified by whether space occupied is furnished or unfurnished and amount of rent paid monthly by the household, cross-classified by type of housing unit and number of households in the housing unit
- *23. Rented housing units, classified by furnished or unfurnished and amount of rent paid monthly for the housing unit, cross-classified by type of housing unit and number of rooms
- *24. Rented housing units, classified by furnished or unfurnished and amount of rent paid monthly for the housing unit, cross-classified by availability of piped water and toilet facilities

456. With the adoption of computerization, the options with regard to the scope of the tabulation plan and the sequencing of the tables are more flexible. It may, in some cases, be more cost-effective to produce all tables, including those of second priority, at the same time since reprocessing the tapes to obtain those tables may be much more expensive than obtaining printouts during the first run itself. In such cases, priority requirements could be met by publishing the second-priority tables after the first-priority ones have been released.

457. The tabulation plan must indicate the formats of the tables that are proposed for production and, if any priorities are being set, the sequence of production and release. The table formats must be presented by topics to be covered, levels of presentation and cross-classifications, if any, of related demographic and other characteristics. It has been suggested elsewhere that it would be desirable to consult data users on the proposed tabulations so that the tables are of maximum utility. After the tabulation plan has been finalized, it would be equally desirable to publish it so that data users are aware of the table formats and the sequence of production.

458. The determination of priorities among the tables will depend on the particular needs of a country at the time the census is taken. However, tables that present population figures at various area levels, including the small-area level, by sex and age distributions, literacy and educational characteristics, and similar basic data will probably be categorized as of first priority by all countries. In general, those tables that provide data input for development planning will acquire priority. In preparing the tabulation plan, the data requirements at small-area levels must be kept in mind. The planning group will have to determine the data sets and cross-classifications that may be useful at this area level.

459. The number and scope of tabulations will have to be a matter of careful judgement. The fact that a census is an expensive operation would, on the face of it, appear to support the view that producing as many tabulations as possible makes good economic sense. However, this conclusion is not always valid. The production, publication and dissemination costs involved, which are directly linked to the volume of tabulations, are generally quite high. The technologies of data preservation and retrieval that are currently available permit the sequencing at any time of the production of tabulations by need. It is therefore possible to limit initial production to the priority tables needed soon after the census is over and to meet specialized demands for data later. The tabulation plan must be very carefully formulated. It

must avoid both the risk of producing too much material of marginal benefit at excessive cost and the criticism of producing too little material and that little of minimum utility!

460. A few operational checks will have to be applied as the tables are produced. Before final tables are obtained, it would be desirable to produce a few test tables. The scrutiny of such tables may indicate any major flaws in the processing system or the desirability of some changes in the tabulation plan. For example, too many cells in the tables may be empty, cases may be too few or values may be so small as to justify aggregations. Incidentally, such aggregations will also be relevant at the publication stage for the purpose of reducing costs of publication and making the tables more intelligible. Checks will also have to be carried out to ensure consistencies between tables.

461. Some tables may have to be produced very quickly through advance tabulations. Where such advance tabulations are required or in cases where the level of presentation and the particular characteristics being presented permit, it is possible to adopt sampling for generation of the tables. The possible adoption of sampling at the tabulation stage must be considered at the preliminary stage of drawing up the tabulation plan, and the tables that are produced on the basis of a sample must be clearly distinguished when they are released for use.

462. Soon after the enumeration is over, Government and most data users, as well as the general public, will be anxious to know the size of the population and its distribution at least at regional levels. Sometimes, there may be a demand for data with categorization by sex, and by urban/rural distribution. These tables can be generated by aggregations of the field totals for each enumeration area, with checks for arithmetical accuracy at each area level. It would be desirable to publish these basic figures as soon after the census as possible and to so structure the tabulation plan as to be able to do so. Long delays in release of such data may, in sensitive situations, detract from the credibility of the census.

G. Organization for data processing

463. The organization of the data-processing division has been briefly referred to earlier. The general principles regarding the establishment of functional divisions in the census organization, personnel matters, management and training will be applicable to this division too. However, there are certain specific issues relating to its activity that will have to be distinguished and considered separately. The more important issues are referred to in the present section.

1. Structure

464. As noted earlier, data-processing is carried out in the following sequence: editing of the questionnaires, coding, data entry and then computer processing. The tabulation plan will specify the extent of manual tabulation, if any, and other aspects relating to the production of the final

tabulations. The data-processing division will have to be organized so as to manage the various stages mentioned.

465. The tabulation offices for receiving the questionnaires and other records from the field and for performing editing and coding operations must be set up prior to the enumeration stage so that those operations can commence as soon as the records are in. The personnel for the editing and coding units could be recruited wherever possible from among the enumeration staff through suitable selection processes. The advantage will be that the expectation of continuity of employment over a longer period may induce the staff to perform well in the field. Also, their familiarity with the census concepts and instructions should help in having the editing instructions applied with better understanding. The number of editors and coders can be determined through trials conducted earlier with the records of the pretests or of the pilot census.

466. The data-processing division will consist of sections relating to editing and coding, systems analysis and programming, data entry, computer processing, and management. There will, of course, be the higher echelons of expertise and management such as the general managers of each wing, a coordinating director and supporting staff. The size and structure of this division will depend on the magnitude of the data-processing operations, the time schedules, the availability and capacity of the equipment and other considerations.

467. The staff at all levels should be in position and trained well before the work commences. Training needs will vary from country to country but even where experienced staff is available it would be desirable to organize refresher courses. Where equipment is being installed for the first time or significantly upgraded, intensive training will certainly be necessary.

2. Management issues

468. Record management is a major and very important aspect of data processing. It need hardly be stated that the safety and confidentiality of the records must be maintained at all times. This means that the access to records should be limited to authorized personnel and those records accounted for at each stage of movement. Processing procedures will require the records' being transferred to more than one official and it is essential to ensure that they can be located whenever necessary. A regular system of stacking and identification must be established, with control over release of records and monitoring of their return after all operations on a given set are complete. It will be necessary to maintain separate record rooms for the census records and for the computer tapes. Maintaining a separate room for the latter is particularly important to avoid mishandling, unauthorized processing, damage to data and loss of tapes.

469. There are other management issues that seem obvious but (probably because of their apparent obviousness) sometimes do not receive sufficient attention. These include matters relating to adequacy of space, a good working environment not only for the equipment but also for the staff, assured power supply with stand-by generation capacity if necessary, and operational control. If the data processing is carried out centrally, concentrating tens of thousands or even millions of copies of questionnaire forms in a few

locations and achieving the method and sequence of their transfer to the processing centre are major tasks that must be well planned. In data processing that is carried out in regional centres, the concentration and processing of questionnaire forms do not differ too much from centralized processing except in the matter of scale. The method of transfer of data from the regional centres to the central processing unit would have also to be determined. Land-lines such as the telephone system can be utilized or the tapes from the regional centres could be transported to the central unit. The system adopted will necessarily depend on the reliability of the land-lines system. In those countries where almost all systems work under strain, it may be better to adopt simpler methods of transfer of data, including physical transfer of tapes. It would seem prudent for the census organization to maintain control over its operations within itself, without having to depend excessively on other agencies.

470. There has to be constant monitoring of the pace of work at every stage and coordination of the various stages of data processing. Coordination must also be established to avoid any breakdown in the flow of records. The sequence of movement of records will proceed according to the stages of editing, coding, data entry and return to the records unit. Each stage will have to be monitored to ensure availability of work for each of these activities, with sufficient input for the next, without loss of quality.

471. The preparation of the sites where the data-entry systems and the computer will be located must commence early. Air-conditioning systems and a dust-free atmosphere will have to be provided. In some cases, stand-by power-supply systems may have to be installed. The setting up of the data-processing centres, whether in each region or at a central point, may involve construction of buildings or modification of existing ones to conform to requirements. The creation of capital assets of this nature usually takes time within Government because procedures may require many agencies' being consulted or the work's being carried out by a government agency independent of the census organization. This component of the census plan must therefore be commenced early and should, in any case, be completed well before the equipment is available for installation.

3. Centralization versus decentralization

472. Before detailed planning of the procedures for data processing is commenced, it will be necessary to decide (a) whether this activity should be carried out at a central location or decentralized; (b) if decentralized, the extent of decentralization; and (c) whether decentralization should be restricted to the manual operations, if any, or whether machine operations will also be included. The decisions on these issues will determine the structure of the data-processing unit, its staffing pattern and equipment locations. The various matters relevant to data processing discussed in the previous paragraphs will have to be considered in relation to the type of organization proposed. In fact, those matters have been mentioned before consideration of this major issue in order to point out the aspects that will have to be taken into account in deciding whether a centralized or decentralized structure should be adopted.

473. Centralized tabulation will ensure more uniform quality of supervision, least movement of records or tapes and easier monitoring of progress. However, in some cases, the choice between centralization and decentralization may be dependent on other factors. In cases where the quantum of records is very heavy, it may not be possible to organize tabulation at a single location. (The size of the office in relation to space requirements and staffing needs will be important considerations.) Also, it may not always be possible to recruit large numbers of staff at one location for the relatively short period of tabulation, particularly for editing and coding. Where the questionnaires are canvassed in different languages, centralized editing and coding may be impractical because competent personnel proficient in all the languages may not be available at one location.

474. In some circumstances, the decentralization of tabulation activity has its advantages. Where the tabulation workload is high, as in countries with large populations, there may be an advantage in organizing the work in a decentralized manner. The editing and coding can, in such cases, be carried out in different locations on a regional basis. Centralization in such circumstances will impose a strain on administration with no compensating advantage. Obviously, prudent management and efficiency requirements would both indicate that the number of such regional units must be kept to the minimum. Too many editing or coding centres will also impose an excessive strain on the supervisory levels. Even in terms of record management, there will be no major advantage in having a large number of centres because, in any case, the records will have to be moved for final storage either to the regional centres or to a central location.

475. One of the main issues will be whether data-entry and processing should also be decentralized. If editing and coding of questionnaires are carried out in regional centres, it will be advantageous to locate the corresponding data-entry units in these offices. Such an arrangement will ensure least movement of records and permit the coordination that will be necessary between the three stages of edit, coding and data entry. However, the requirement of technical supervisory personnel may be greater and their availability in particular regions is not always certain. These difficulties will have to be taken into account and necessary administrative arrangements made through transfer of personnel or by adoption of an incentive system that will induce technical personnel to accept temporary relocations.

476. The processing of the data and the production of the final tables are generally carried out at one central location at which the main computer will be installed. There are advantages in such centralized processing. The technical supervision of processing and the evaluation and correction of software problems, if any, will be more rigorous and uniform. Maintenance and repairs could be more effectively managed. Where there are shortages of well-trained and experienced manpower this structure will result in optimum use of the technical expertise that is available. Centralization of the main data-processing unit would seem appropriate unless there were distinct advantages, combined with availability of technical and management skills, in decentralizing this activity. However, the impact of the use of microcomputers in data processing and the options that may be available by their use will influence this view in future.

477. The issue of centralization versus decentralization of data processing, even when limited to only some specific activities, will have to be resolved in terms of the efficiency and effectiveness of the pattern adopted. Most often, it is the lack of managerial and technical capacity and of the essential infrastructure such as buildings, power supply, communications and the like that will discourage decentralization. The possibility of partial decentralization of specific operations, such as editing and coding only, will also be conditioned by these factors. If there are apparent deficiencies in availability of the necessary management or technical capacity or of infrastructure, it will be pragmatic to locate the data-entry units at one location. This will at least ensure that the computer-linked operations are all centralized and subject to the supervision and coordination they require. Even where a decentralized data-processing structure is preferred, it will be evident that the number of locations should be the minimum possible. Each country will have to decide on the structure best suited to its circumstances.

4. Coordination between census and computer specialists

478. There are direct links between computer data processing and issues of questionnaire design, including field coding of responses, editing and coding in the data-processing unit, formats of the tables proposed for production, sequence of production of tables and the publication programme. 50/ Therefore, it is particularly important to establish coordination between census subject-matter specialists and the data-processing experts.

479. Such coordination is essential irrespective of the technology that is being used. The adoption of computerization will need fresh approaches to the systems of management of records and the preservation and retrieval of data. The editing principles, whether at the stage of manual editing or on the computer, will be generated by the census specialists but they must satisfy the formats and procedures required for computerization. The table formats, while satisfying the tabulation plan proposed for adoption, must also meet the requirements of the computer system. The preparation of the appropriate software or the evaluation and utilization of existing software packages must be in conformity with the tabulations proposed. The sequence of the tabulations will doubtless be determined by the census specialists but must necessarily be matched with the sequencing of editing and coding, data entry and processing. In particular, if it is proposed that sampling be adopted for production of advance tabulations or for the generation of some tables in final form, the procedures must take into account the possibilities and limitations of the data-processing system.

480. It will be evident that the links between issues relating to data collection and data processing have to be established at the initial stages of planning the census. The early availability and utility of data to the user are dependent upon the extent and sequence of the tabulations and the ability and capacity of the entire data-processing system to maintain the time schedules specified for data processing. Coordination between the divisions concerned must therefore be established and maintained throughout the census operations and later. The data-processing experts must be members of the census planning group so that they can understand the purpose, scale and objectives of the census. Such affiliation will enable them to understand the rationale for the design of the questionnaire, the formulation of the editing

principles and the specifications of the tables and also to appreciate the operational constraints and compelling reasons for certain decisions. It is equally important that the census specialists appreciate the advantages of computerized data processing and what can and cannot be asked of it. Interaction with the computer experts will enable them to accept the modifications in formats or procedures that may be necessary to enhance the utility and benefits of the data-processing system. It is the responsibility of the senior management levels to establish and maintain such coordination in an effective manner.

H. Use of microcomputers for data processing

481. Towards the early 1980s the availability of microcomputers introduced a qualitative change in the technology of computing. The microcomputer is more easily distinguished from the mainframe and minicomputer by its size than by its computing capacity since many of the modern ones have as much computing power as the larger units. The rapid evolution of the microcomputer, combined with the significant reduction in its cost and the availability of user-friendly software, is an important development that census organizations must take note of.

482. The use of microcomputers for census data processing has certain advantages. The rather rigid specifications relating to environmental conditions (such as temperature and humidity) required for mainframe systems do not apply to microcomputers. With elementary precautions against too much dust and rough handling, most of them will be able to operate under a wide range of conditions. Expensive site preparation for the equipment will therefore generally be unnecessary.

483. In many countries, large stand-by generators have had to be installed to power the computer system, due to unreliability of the general power supply. Considerable investment is necessary to establish and maintain such stand-by power supplies, but quite often there will be no alternative if the data processing is to proceed satisfactorily. The power requirements of the microcomputers are much smaller even when many of them are located at one centre. The investment in stand-by power supply will therefore be much less. Where single units are located, even battery power could be used for tiding over during periods of failure in supply.

484. The most serious constraint in the maintenance of large imported mainframe systems has been the likelihood of a lack of such facilities within the country, delays in supply of spares and slow response from the manufacturers or suppliers. Repair and maintenance of the microcomputers are, in contrast, relatively easier. It is generally possible for trained personnel in the data-processing unit to identify faults and to carry out simple repairs. The replacement of machines that have failed and upgrading of the system are more convenient and less expensive with microcomputers. For countries that have budgetary difficulties, the use of microcomputers in the data-processing centres has the advantage of permitting the adoption of modern computing technology with lower initial investment.

485. The decentralization of data processing will be facilitated with the use of microcomputers. However, the issues relating to the establishment of a

decentralized structure for data processing that have been referred to earlier will still need careful consideration. If control systems are well established and well-tested programmes are being used, decentralization will be possible to a greater degree through the use of these machines. Regional tables could be generated in the regional centres and national aggregations carried out on appropriate systems in the headquarters processing unit.

486. With the increasing availability of microcomputing capacity, there has been a proliferation of microcomputer-based software. The relative ease with which these systems and the software can be used has a significant influence on the location of computing power within the census organization. It is now possible for statisticians, after basic training, to carry out both data-processing and analytical tasks with only minimum assistance from data-processing experts, which is not to say that the category of such experts will be eliminated in the near future. Their professional assistance will continue to be required by the census organization. However, their tasks are likely to become more specialized and to relate to furnishing advice on technical alternatives as the technology continues to improve and on how these alternatives could be utilized to meet the requirements of the census organization. How far these trends will be relevant to a particular organization will depend on its structure, the intensity of continuous analytical activity that will induce adoption of better technology as and when available, the availability of sufficient funding for such operations and related factors.

487. It would be relevant to mention that microcomputers have been used by some countries for processing their census data. The general experience has been that such technology is convenient in terms of management and utility and appropriate in terms of investment. Census organizations that intend to establish or restructure their data-processing units must consider the use of this technology and determine for themselves the feasibility of its adoption. 51/

X. EVALUATION OF CENSUS RESULTS

488. Time, effort and investment in the census have the single objective of making it as successful as possible, with full coverage and maximum accuracy. However, it is an accepted fact that a population and housing census will be subject to some error. The presence of error does not detract from the value, utility or acceptability of the results, provided the magnitude of error is known and does not affect the major uses of the data. Therefore, information on the basic measures of the quality of the data must be determined and made available to the user of the data. These would give an indication of the degree of confidence with which the results can be used for various purposes. It is therefore good census practice to evaluate the completeness and accuracy of the results. Principles and Recommendations urges that a post-enumeration evaluation must be an essential part of the operations. 52/

A. Objectives of evaluation

489. While the existence of errors in the census is accepted, there is a need to determine the sources and magnitude of such errors. The objectives of an evaluation of the census results will therefore be to measure the accuracy of those results and to identify the sources of error.

490. The importance of census results for modern administration and innumerable users outside Government, and the role census data play in economic and social development planning, make it imperative that the degree of their reliability be known. Since the results of the census are utilized for various purposes and at different area levels, such knowledge of the accuracy of the data will be essential for assessing their reliability for each of their applications and thereby rendering both the use of the data and the conclusions drawn from those data technically acceptable.

491. The identification of the sources of error is also essential. The data user will then be aware of the relative magnitude of error in the data relating to particular characteristics and of the relative importance of the various sources of error. For example, the evaluation may indicate larger margins of error in specific age groups or that those margins of error pertain to certain specifics such as work description. Knowledge of the sources and magnitudes of errors will enable users to utilize the data in the appropriate manner.

492. In addition to indicating the magnitudes of errors and identifying their sources, the evaluation process provides valuable information to the census organizer on the efficiency and effectiveness of the operations. Deficiencies in questionnaire design, instructions, training programmes and enumeration procedures will be revealed through this evaluative procedure, and this knowledge will be very useful in planning the next census and carrying out improvements in those aspects that need attention.

B. Types of Errors

493. Census errors can occur owing to several reasons. Poor formulation of concepts, poor drafting of the instructions, insufficient training resulting

in lack of understanding of the instructions by the field staff, deficient procedures and weak operational controls can all contribute to errors. The errors that occur in a census can be regarded as belonging to either of two categories. The first category comprises errors in coverage; the second, errors in content. 53/

494. It is necessary to state that the discussion has been restricted to the non-sampling errors that may arise in a complete census enumeration. If sampling has been adopted to elicit information on some characteristics, both sampling and non-sampling errors will have to be assessed.

C. Coverage error

495. Coverage error is the error in the total count of people or housing units caused by persons' or housing units' having been missed or included erroneously. These errors are attributable to (a) omission, (b) duplication and (c) erroneous inclusions. These distinctions are important because the contribution of each of these factors must be estimated in the evaluation study to obtain the net coverage error.

1. Omissions

496. Omissions, or underenumeration, can occur when living quarters, households or persons entitled to inclusion in the enumeration in a certain area have been omitted.

497. Living quarters can be missed if parts of the territory of a country have been excluded owing to faulty mapping and inaccurate delineation of enumeration areas or if the enumerator has not covered part of the area assigned owing to problems of terrain, disinterest or lack of supervision.

498. The omission of households is mainly due to the omission of the living quarters in which they reside. However, omission can also occur in the case of households that have more than one place of residence and are not covered at either, one-person households where the person is usually out when the enumerator calls and those that may have changed residence during the enumeration period. In particular, the possibility of omission could be high in the case of households living in hotels, boarding-houses and the like; households in transit at the time of the enumeration; and homeless households.

499. There can, in addition, be cases where the enumerator, not fully understanding the instructions, fails to distinguish separate households sharing the same living quarters. Although such omissions of households will not affect the population count, they can cause distortions in the assessment of housing needs in crowded localities. The likelihood of omission of households living in very remote areas and of nomadic households is also very likely. In fact, the omissions are likely to be greater in those very groups whose enumeration requires the most care and supervision, unless special operational safeguards are employed.

500. The omission of persons can occur owing to carelessness in enumeration, oversight on the part of the respondent or incorrect application of the

definitions regarding those eligible to be enumerated. The enumerator's understanding of the definitions regarding eligibility for enumeration will be an important factor. Unless the concepts and instructions regarding place of enumeration, members absent and other features relating to eligibility for enumeration are clear, omissions of such a nature may occur. In particular, where persons are enumerated at their usual place of residence, respondents may fail to indicate members of the household who are in hospitals or prisons or away on short visits. Those who are unrelated members of a household, such as servants, may be omitted by the respondents. It is also necessary to note that omissions of infants are often a distinct possibility. In areas where there are doubts about the use to which the information may be put, there could even be deliberate omissions, for example, of persons eligible for military service.

2. Duplications

501. Errors of duplication, or overenumeration, result from the inclusion more than once of living quarters, households or persons in the enumeration. This will cause an inflation in the population and in other totals. However, overenumeration, while present, is usually much less so than omission. The net effect is usually an undercount.

502. Overenumeration is generally due to overlapping of enumeration areas because of inadequate or faulty mapping and incorrect delineation of such areas and lack of coordination between enumerators of adjacent areas. Many of the causes of omissions can also be linked to duplications, for example, of those in transit or in hospitals and of households that have temporarily moved. Where the period of enumeration is long, the chances of duplication are greater.

3. Erroneous inclusions

503. Erroneous inclusions include living quarters, households or persons that were enumerated in the census though they were not entitled to be and those who, while entitled, were enumerated in the wrong area. Although duplications are also erroneous inclusions, the latter refer to enumerations that either should not have been made at all or were made in the wrong place.

504. Erroneous inclusions can occur owing to lack of care in carrying out the inquiry, wrong interpretation of the eligibility stipulations or incorrect understanding by the respondent of who should be reported. For example, babies who were born after or persons who died before the census day may be included owing to such reasons. Similarly, those living abroad or aliens who should not be enumerated may be counted. These inclusions affect the count.

505. The placement of living quarters, households or persons in the wrong enumeration area derives from the same broad set of reasons indicated earlier. Such inclusions will not affect national totals or the totals of the larger regions in which they may lie, but they do distort the distribution of population in local areas.

D. Content error

506. Content errors are mistakes in reporting or recording of information concerning the details of living quarters and households or of the characteristics of persons. These are errors that affect the quality of the results in contrast with coverage errors, which affect magnitudes.

507. Incorrect canvassing of the questionnaires by the enumerators due to carelessness, insufficient knowledge or vague and insufficient information from respondents can contribute to such errors. In some cases, where sensitive questions are involved, false information may deliberately be furnished, or to avoid the task of eliciting information on such matters, those questions may not be canvassed adequately by the enumerator.

508. Lack of sufficient training or of clarity in the instructions can be contributory factors to such errors. Poorly designed questionnaire formats can also be a cause. For example, adequacy of space for recording entries or separation of coding boxes will be important for avoiding the recording of entries in the wrong spaces by the enumerator.

509. Content errors can occur with regard to almost any query in the questionnaire. However, in many cases they are noticeably frequent in the reporting of age and economic characteristics. The accurate reporting of ages is influenced, among other things, by knowledge of one's age and the local customs in reckoning age. The incorrect description of economic characteristics is often due to that description's being provided by a respondent other than the person being enumerated. These errors, as mentioned in the earlier discussion on training and publicity, must be mitigated by operational improvements.

E. Evaluation methods

510. Errors in the census will have to be determined through rigorous and technically acceptable methods. ^{54/} These will include (a) carrying out a post-enumeration survey (PES) in which the census returns are matched with those from the post-enumeration survey in sample areas; (b) comparing census results, either at the aggregate or individual record level with information available from other inquiries or sources; and (c) using techniques of demographic analysis to evaluate the data by checking for internal consistency, comparing those data with the results of previous censuses and checking for conformity with the data obtained from the vital registration and migration data systems.

511. If the results of household sample surveys are available, these will be useful for carrying out an evaluation of the census results. The records of such surveys can be matched with the corresponding census documents to estimate coverage and content errors. Those surveys may have been conducted as part of a continuing household survey programme or for ad hoc purposes. The comparison of those sets of records presumes the easy availability of the survey records. To be useful, the survey records have to be as close in time to the census as possible, in which event they may not be easily available since their processing may be in progress. Also, unless there has been prior coordination, the characteristics common to the census and the survey may be

few in number and not always comparable. This will reduce the scope of the evaluative exercise. For these reasons, it would seem expedient to carry out a post-enumeration survey as a continuation of the enumeration operations themselves so that the evaluative procedures are self-contained.

512. An evaluation of census results can also be carried out by the comparison of census returns with administrative records, including the registers of births and deaths and population registers. Such records, if efficiently maintained, will be able to provide information on some of the characteristics of the persons in the sample selected for evaluation. The possibility of evaluating the census results through the use of such records will be limited by the accuracy of the latter. Where the administrative records are of doubtful quality, such comparisons should not be undertaken and the evaluation should be carried out through an independent post-enumeration survey.

513. In addition to a post-enumeration survey, indirect techniques of evaluating the results of a census could be adopted through the application of demographic analytical methods. These techniques are based on internal consistency checks and comparisons with data from external sources. Where demographic information is fairly extensive and of reasonable quality, demographic analyses can provide measures of errors in census data. Some of the evaluative procedures will relate to a study of the age-sex distribution, stable population analysis of age distributions, analyses of successive censuses using the data on components of population change and analysis of cohort survival rates. 55/

514. While any or all of these methods can be adopted for evaluating census results, it is recommended that a post-enumeration survey be considered an essential component of the overall census operations. The post-enumeration survey is a direct method of evaluating census coverage and content. In such a survey, a re-enumeration of a sample of enumeration areas is carried out for the purpose of estimating coverage error while a sample of households or persons who have been enumerated in the census are re-interviewed for estimating content error. The returns of the post-enumeration survey are matched with the corresponding census records on a one-to-one basis to identify persons found in the survey and also included in the census (matched cases) and those missed (unmatched cases). This will provide a measure of the coverage error. The variation in the descriptions of characteristics of persons between the post-enumeration survey records and the census returns will provide a measure of the content error for specific characteristics.

515. The post-enumeration survey must be carefully planned and intensively supervised. Special precautions will have to be taken to avoid errors in the information collected in the survey, which should be conducted as close as possible to the enumeration because (a) there will have been minimal movement of population between the completion of the census and the start of the survey, (b) respondents will still be able to recall much of the information given at the time of enumeration and (c) public cooperation is still likely to be strong since the impact of census publicity may be continuing to operate. It must be ensured that the field personnel engaged in the post-enumeration survey have no access to the original census records. Precautions must be taken against announcing in advance while the enumeration is going on the sample areas and households selected for the post-enumeration survey to ensure

that the results of the survey are not vitiated. Such prior knowledge may cause the field agency to perform at a level that is much better than average during the actual enumeration in these areas, thus defeating the purpose of the post-enumeration survey.

516. To be of maximum utility, the post-enumeration survey should meet three conditions. It should (a) constitute a separate count, independent of the original enumeration; (b) be representative of the whole country and of all population groups; and (c) involve one-to-one matching and reconciliation of records. To the extent that any of these requirements are not met, the estimates of error derived from the post-enumeration survey are themselves subject to error.

517. The sampling units selected for re-enumeration in the post-enumeration survey should be clearly defined, drawn from the same frame of enumeration areas used in the census and selected through appropriate statistical techniques so that they are representative of the geographical area and population groups. The sample should be large enough to yield error rates for the regions, in addition to those for the country as a whole.

F. Organizing evaluation

518. The planning and management of the post-enumeration survey require the same meticulous attention to detail that is necessary in conducting the census itself. The credibility of the results of the evaluation will depend on how well it was organized and conducted. It will be necessary to determine the scope of the post-enumeration survey well in advance, namely, such aspects as (a) whether it is meant to yield measures of both coverage and content errors or only of those of coverage, (b) the area levels at which coverage error is to be determined or whether it will be restricted to the national level, (c) the characteristics that will be included for estimation of content error and (d) whether measures relating to specific groups such as tribes or nomads will be necessary.

519. The scope of the post-enumeration survey can range from a single objective to multiple objectives. Obviously, the greater the number of objectives, the greater the need for careful planning and technical capability. The costs of carrying out the survey and the time and technical input necessary for analysing the results will also be important considerations. It will be relevant to keep in mind that most of the professional staff of the census organization will be fully engaged in the data-processing operations immediately after the enumeration. Therefore, an extended post-enumeration survey may only result in diverting essential staff from this activity without necessarily yielding better evaluation. It would therefore be desirable to restrict the post-enumeration survey to the essentials.

520. The questionnaire and instructions for the post-enumeration survey will have to be developed as soon as possible and tested in the field by the senior staff to assess their sufficiency and operational feasibility. The staff that will be employed to carry out the survey should be appointed and trained immediately after the enumeration is completed; therefore, initial selections could be made earlier. The control and supervision of the post-enumeration

survey should be carried out by senior levels since, as mentioned earlier, the results of the evaluation are utilized not merely to arrive at magnitudes of error but also to identify lines of possible improvement in methodology and procedures relevant to future censuses.

521. It is recommended that the results of the evaluation be published. The methodology should be fully explained. The documentation should also indicate the organizational arrangements and other features of the operations so that both the results of and experiences connected with the exercise are of maximum utility. Such complete reporting is useful to the census authorities of the country itself in organizing future censuses and to those in other countries in carrying out evaluation studies.

522. The evaluation of the census by adoption of techniques of demographic analysis or other record-based methods could be considered a part of the regular and continuing activity of the analysis and research division or any other division responsible for such technical work within the census organization. The demographic techniques to be adopted, the identification of the other data sources and the collection of the required information, and the scope of the evaluation will have to be decided well in advance. The scope of the activity will have to be such that the results of the evaluation are available within a reasonable time.

523. The process of evaluation, including the conduct of post-enumeration surveys, follows the completion of enumeration. It will be necessary to ensure that this activity does not delay the commencement and completion of the tabulation process or the publication of the principal results of the census. As stated in Principles and Recommendations, the results of the evaluation of the completeness and accuracy of the data can be issued after the initial publication of the census results. 56/

XI. USE OF SAMPLING IN THE CENSUS

524. The universally increasing need for extensive and reliable data on various characteristics of the population and of housing has caused most census undertakings to be of great magnitude and complexity. If all such needs are to be satisfied through complete enumeration, the size and costs of the operations will generally be considered unreasonable in the context of allocation of resources among competing demands. Since data on all characteristics are not always necessary on the basis of a total enumeration, these demands can be met through the adoption of sampling. Sampling has a role in censuses both as an integral part of the planning, execution, analysis and evaluation of the census and through its involvement in the use of the census as a sampling frame for subsequent sample inquiries. 57/

525. The adoption of sampling has certain advantages among which are economizing of resources, shorter duration for tabulation and analysis, better quality of information and results and possibility of appraising accuracy. Strictly speaking, a sample inquiry may require relatively better input if it is to be designed and carried out satisfactorily. Consequently, the per unit cost of a sample inquiry may be slightly higher than that of a total enumeration, but the total cost of the inquiry will be much lower than that of the latter, with very good data output. It is also possible to canvass more difficult questions with greater ease in a sample inquiry than in a census. Better control and supervision are possible in a sample inquiry and therefore the quality of the data will be very high.

526. There are limitations to the extent to which sampling can be adopted in the census operations. Where data are wanted at the small-area level or complete counts are required by legal stipulation, total enumeration will be the only acceptable method. In very many countries, population distribution is a crucial factor that influences, among other benefits, allocations of political representation and financial grants. Decisions regarding allocation of investments to schools, hospitals, communication and transport systems and major infrastructure facilities in general, are often dependent on population size. For meeting these essential requirements it will be necessary to carry out a complete enumeration.

A. Features of acceptable sampling operations

1. Accuracy

527. With regard to accuracy of estimations obtained through sampling, Principles and Recommendations states the following: 58/

" The use of sampling in a census involves an awareness of the precision desired in a sample estimate. The higher the precision, the larger and/or more complex the sample and hence the more expensive. A distinction is to be made between precision of a sample estimate, as measured by the sampling error (which gives the difference between the estimates obtained from a sample and from a complete enumeration under the same general conditions of the inquiry) and accuracy, as measured by the difference between the true value (which is generally unknown) and

that obtained from an inquiry, whether on a sample or a complete enumeration basis. For this reason, in the case of a sample inquiry, accuracy includes both sampling errors and non-sampling errors.

"For the successful execution of a scientifically designed sampling plan, it is essential that strict selection procedures be followed. The procedures must be such that a known positive probability of selection is assigned to every unit in the population. These probabilities are needed for estimating population values and for calculating the measures of precision of these estimates. Good selection procedures require that deviations from prescribed standards or instructions be minimized.

"Although estimated results based on samples are subject to sampling errors in addition to whatever errors may be present in data based on a complete operation, the smaller scale of a sample operation may make it possible to employ interviewers of higher calibre, to devise and pose questions of greater detail and to minimize response errors.

"Consideration should be given to the use of parallel samples, that is, interpenetrating networks of samples, to supply controls at the point of collection of the data and also estimates of the margin of uncertainty of the sample estimates.

"Recognition should be given to the importance of computing estimates of sampling variances, at least for the major items of interest. Simplified methods, in conformity with the sample design, such as methods based on the use of random groups or on the summarization of basic data for individual primary sampling units could be used for this purpose." 58/

2. Resources

528. Effective planning of sampling operations requires the judicious matching of the requirements of accuracy with optimum use of available resources. The scale and scope of sample operations will be conditioned by the availability of financial and technical resources and management ability. In adopting sampling as a part of the census operations, these considerations must be borne in mind.

529. The cost of the sample inquiry is an important issue. Numerous factors influence the cost of such an exercise and it is essential that each one of these be assessed carefully before the carrying out of the sample inquiry is decided upon. The costs of sampling operations must be considered in relation to the utility of the results. The utility of sampling lies in the early availability of the results and in their accuracy, both of which are influenced by sampling's scale and scope. It will be necessary to define the magnitude of the sampling error that can be accepted for some of the estimates so that the size of the sample is maintained within reasonable limits.

530. There is often the temptation to expand the scope of the sampling operations beyond what would be consistent with the limitations of the sampling design. Similarly, there could be pressure to expand their size beyond the capacity of the available management skills. Both these courses of

action would add to the cost of the operations and could seriously affect the quality of the results. The technical advantages of the adoption of sampling would be lost if the sample were so large as to be subject to the high proportion of non-sampling errors of the full enumeration itself or if, due to sample size, the operations were to suffer from lack of supervision or competent staff.

531. The integration of sampling procedures with the census operations presupposes the availability of competent statistical professionals in the organization. The entire sampling operations must be under the guidance, supervision and control of such professionals so that the procedures and results may stand the most critical scrutiny. Otherwise, the exercise could be a waste of resources and the results unacceptable. It is also recommended that the selection of the sample units be carried out either in the central office or in the regional offices under the direct supervision of the statistical personnel. This will avoid any bias in the selection of the units.

B. Adoption of sampling in census operations

532. The adoption of sampling can enhance the utility of the census by permitting expansion of the scope of census inquiries, by enabling measurements of the accuracy of the data and by providing flexibility in tabulation procedures that yield results more quickly or reduce costs. The use of sampling for certain topics of the census can result in the rational use of resources such as funds and personnel. In the extreme situation of a census's being difficult, sampling could be adopted to obtain usable estimates on essential characteristics of the population, subject to the availability of an adequate frame.

533. Sampling can be adopted in one or more phases of the census operations such as: (a) testing of census procedures; (b) obtaining of data on topics for which universal coverage is not necessary; (c) post-enumeration surveys; (d) quality control of data processing; (e) advance tabulations of data on particular topics; and (f) production of final tables for some characteristics on the basis of a sample.

1. Testing of census procedures

534. Planning the various activities of the census often involves making a choice among several alternative procedures. The testing of those procedures on a sample basis will help in determining the one that is most suitable, taking into consideration the resources and expertise available. In planning such tests, it is not always necessary to adopt random sampling. Non-random or purposive sampling could be used for testing the effectiveness of procedures where the final choice need not be based on quantitative measures derived from the data obtained in the test and particularly where the biases introduced are not of very great significance for the issues being investigated. However, where quantitative measures are necessary for comparing the efficiencies of different sampling procedures, as, for instance, in examining the anticipated response errors arising from different systems of enumeration, random sampling must be adopted.

535. Census pretests, including the pilot or trial census, can be conducted on a sample basis to test out enumeration procedures, the questionnaires and other components. It will be sufficient to conduct these tests in sample areas selected in a purposive manner. In the case of the pretests, the sample, while not yielding measures or estimates, should be so selected as to permit an evaluation of field procedures, deficiencies in questionnaire design, adequacy of processing procedures and time requirements for various activities. In the case of the pilot or trial census, the sample should be such as will permit a proper evaluation of the system's preparedness for carrying out the enumeration.

2. Obtaining data on topics not requiring universal coverage

536. The topics that are included in a census can be regarded as belonging to either of two types. The first type comprises the basic items for which information is required at the smallest level of administration; the second type, items for which information is needed only for the larger-areas such as regions and subregions. The basic items will include topics for which data have to be collected on the basis of a complete count by law and those for which data must be available at the small-area level for policy purposes. The collection of data on these topics will have necessarily to be achieved through complete enumeration. The second group will include, in addition to topics for which information is sufficient at the larger-area levels, those that are more complex or require more intensive interviewing. Information on those topics can be obtained through sampling. The use of sampling will make it feasible to obtain data on such topics with acceptable accuracy (with the other advantages of sampling indicated earlier) and will also permit the inclusion of new topics on which information is required at the higher-area levels. Sampling can therefore increasingly be adopted to broaden the scope of the census.

537. The canvassing of the special questionnaire for the topics on which information is being collected on a sample basis can be carried out in different ways. The same enumerator can canvass all the questions, including the sample ones, in the sample area or sample households, or a specially trained enumerator can canvass the sample questions only. The first method has the advantage that the household is visited only once, but presupposes that the usual enumeration procedures suffice with, of course, additional training for the enumerator. Where extensive probing is necessary, the use of a special enumerator would be necessary. However, the operational limitations must always be kept in mind. Households may not always welcome two visits by the enumerators, where the questionnaire in the sample is very large or complicated, supervision and quality of enumeration are likely to suffer, given the realities of the time factor and the scale of the operations. The choice of method will have to be very carefully determined, taking into account the costs, the accuracy likely to be attained, the availability and competence of the staff, the management issues of training and supervision and the need to integrate the canvassing of the sample into the operational time-frame of the census.

538. The point that the selection of the sample must be carried out centrally was made earlier but bears repeating. Serious biases have been encountered in the results when enumerators were permitted to make the selection of the

sample housing unit, household or person. It will be necessary to decide the sampling techniques (whether area sampling or list sampling should be employed), the enumeration procedures and other aspects well in advance and to carry out the required pretests. In other words, all the rigour of planning and execution will apply, with added force, to the sample operations.

3. Conducting post-enumeration surveys

539. The need for post-enumeration surveys and their organization was discussed in chapter 10. As stated therein, the selection of the areas in which the survey will be carried out will have to be determined on the basis of sampling techniques. The scale of the sample will depend on the scope of the inquiry, including the regional or other levels at which errors to be determined are sought.

4. Quality control in data processing

540. The application of quality-control techniques in data processing was referred to in chapter nine. Sampling can be used effectively for measuring and controlling the quality of operations, including the editing and coding of questionnaires and data entry. Sample inspections, with the application of quality-control techniques, make it possible to control the quality of data processing effectively and economically.

5. Production of advance tabulations

541. The completion of data processing and the making available of the initial tables usually take considerable time. Meanwhile, the urgent demands for advance data on certain characteristics will have to be met through special tabulations prepared on a sample basis. The advantage of processing a sample of the census returns for the purpose of obtaining advance tabulations on particular topics is that the data will be both available for immediate use and of current interest.

542. If sampling has been adopted as part of the enumeration procedure to broaden the scope of the census, the same sample of individuals, households or housing units will constitute the sample provided for the advance tabulations. Even where no sampling has been adopted in the field, the sets of census returns provide the frame for selection of the appropriate sample of records for advance tabulations.

543. The preparation of advance tabulations through sampling has certain implications that must be carefully considered before the extent of such tabulations is decided. The results tabulated for the sample units have later to be integrated with those tabulated for the non-sample units in order to obtain the final tabulations. These operations increase the total time that will be necessary for completion of the tabulation, and there will be an added cost too. To minimize the influence of these factors, careful coordination must be maintained between the sample tabulations and the processing of the rest of the records. Otherwise, the advance tabulations may represent a mere buying of time from the main tabulation schedule, with no overall advantage.

544. The relative advantages of advance tabulations on a sample basis, or indeed in some cases the need to undertake such a procedure, will also depend on the scale and capacity of the data-processing unit. The speed of most of the modern equipment available and access to ready software packages may, if such equipment and software are available in the census organization, to a very large extent reduce those advantages.

545. It must be emphasized that the effort to complete the essential tabulations as expeditiously as possible should not be in any manner reduced merely because certain advance tabulations have been produced. The latter are not a substitute for the regular tabulations. The tempo of data processing must be maintained to achieve the completion of the tabulations envisaged in the census plan within the time limits set therein.

6. Production of final tabulations for some characteristics on the basis of a sample

546. The main constraints on completely tabulating all the information collected in a census are the time and costs involved in doing so. Consequently, many tabulation programmes provide for the complete tabulation of data on only those demographic and socio-economic characteristics for which information is wanted at the level of the smallest administrative areas. The data on the other characteristics are generally tabulated on a sample basis. Sampling, in this case, ensures the early availability of census data on the characteristics concerned at optimum cost. The tables that could be produced on a sample basis will have to be carefully decided well in advance, taking into consideration the total tabulation plan, priority needs and other factors.

547. The production of final tables on selected characteristics on the basis of a sample of the returns is justified where information on these characteristics is required only at the higher-area levels or at the national level. Through sampling, it is possible to obtain tabulations for large areas for those characteristics with reasonably small sampling errors, at lower cost and in shorter time than would be necessary for tabulations on a complete basis. The savings in time and costs will be even greater in the case of cross-tabulations which are considered adequate if available at only higher-area levels. However, the feasibility of sampling is to some extent determined by the lowest area level at which the tables are to be available. In order to obtain data of acceptable precision, the lower the area level, the higher the sampling fraction that will be necessary in view of the great variability as well the high intra-class cluster correlations for certain characteristics. There may be instances where even the use of high sampling fractions fails to yield results of acceptable precision. In such cases, it would be inadvisable to adopt sampling methods for the tabulations.

548. A possible criticism regarding the generation of tables from a sample of the records for the characteristics for which data are available on the basis of a full enumeration is that the resources spent on collection of the information will be wasted since much of that information will not be utilized. If (the argument could continue) the intention is to tabulate only a sample, the enumeration could just as well be carried out on a sample basis. However, in many situations it is simpler, in terms of technical and managerial capacity, to carry out a universal enumeration of certain questions

even when the intention is to process the data on a sample basis. The planning, organization and management of a sampling operation in conjunction with the complete enumeration of the basic topics may, in some cases, strain the capacity and skills of the census agency and result in the unacceptable quality of the data. In such a situation, it may be simpler (and possibly cheaper since a special set of enumerators will not be necessary) to collect the information from all persons or for all housing units and to process only a sample of the returns.

549. Unlike advance tabulations that are produced on the basis of a sample of the records and meant to provide urgently needed data while the complete tabulations are awaited, the tabulations referred to here are not intended to be generated later on a complete basis. Therefore, utmost care will have to be exercised in determining the sample design so that maximum accuracy, within permissible costs, is attained. The processing for these sample tables could be undertaken after processing of the data for the characteristics for which complete tabulations are desired is completed.

C. Use of the census frame for sampling

550. During the intercensus period, the census will provide the frame required for many sampling purposes. The sampling frame provided by the census may consist in the listing of enumeration areas, of structures and housing units or of households and persons. Before a sample selection on the basis of this frame is undertaken, it is necessary to ensure that the sampling frame is free from defects such as inaccuracy, incompleteness, inadequacy and obsolescence. Inaccuracy in a frame may arise not only from wrong information about the units listed within it but also from the listing of units that are actually nonexistent. The frame will be incomplete if units that ought to be included have been excluded. If some units have been included more than once, the frame will contain duplications. Certain aspects relating to the units in the frame might have been omitted, in which case it will be inadequate. A frame that was accurate, complete and free from duplication at the time it was constructed may no longer be so at the time it is required and therefore may be rendered obsolete.

551. The census frame becomes outdated rather rapidly. It will have to be updated before being adopted as a frame for subsequent sample selections. Such updating will have to be carried out by field inquiries that are conducted as close as possible to the time of use of the frame. However, it would be desirable to consider establishing continuous maintenance of the frame. The possible administrative mechanisms that could be established for this purpose will be discussed in later sections.

552. The use of the census lists as a frame for sampling will be subject to the stipulations in the law governing census-taking. For example, it may be against the law to release the names of the heads of households with any other details. The legal restrictions, if any, on the use of the lists must first be determined before those lists are used or released to other agencies for use.

XII. PUBLICATION AND DISSEMINATION OF CENSUS DATA

553. A census can be said to be complete only when the results are available, in usable form, to Government and other data users, including the general public. The preparation of census data for publication and dissemination is therefore an important activity that must be considered a continuation of the census operations. The euphoria at the successful completion of the enumeration must not be allowed to diminish the urgency or tempo of this activity. The publication and dissemination of census results must be accorded the same priority as their collection in order to avoid long delays in availability of data.

554. The value of the results of a census diminishes rapidly with time and delays in publication can soon render the data derived from an expensive and difficult operation of only historical interest. It is therefore important to include the publication programme in the census plan as an essential component. The publication programme must be based on a realistic appraisal of the resources available. The use of obsolete printing and reproduction technology, sometimes for want of an alternative, can delay publications or result in badly produced ones of reduced utility. The constraints of inadequate financing and non-availability of the latest printing technology (with adequate capacity and under the control of the census organization itself) are likely to persist in many countries for some time. The publication programme must be planned in a realistic manner, taking these likely constraints into consideration, to ensure the early release of the census results.

555. The components that will have to be considered while preparing the plan for the publication and dissemination of census results include: (a) scope of the publication programme, (b) format of the publications, (c) procedures for distribution, (d) procedures for and principles governing the meeting of additional demands for data through systems of data retrieval and (e) organizational arrangements for effectively carrying out this activity. The planning of measures for enhancing data dissemination is also important.

A. Scope of the publication programme

1. Determining factors

556. The publication programme is closely dependent on the sequence of the output of the tabulation and data-processing operations and the arrangements for printing. The scope of the publication programme will depend, among others things, on: (a) the detail and levels of reporting, (b) the sequence of publications, (c) the need to adhere to stipulations regarding release of data and (d) possible purposed production, apart from the conventional tabulations, of special reports.

557. It would be impractical to attempt to publish all the data sets that will be available from a census nor will it be necessary to do so. Some tables, including the basic tabulations on the size and distribution of the population by sex and other selected characteristics and basic data on housing, will obviously have to be part of the publication plan. The publication and

dissemination of those tables should be so organized that immediate data needs with respect to such important characteristics of both population and housing are met as soon after the enumeration as possible. There will also be a need to release the more complicated cross-tabulations and analytical reports as soon as possible thereafter. Further specific demands for data need not be a matter of general publication: requests for special tabulations could be met separately. It will be necessary to indicate the priorities of each of the data sets that are included in the publication plan, keeping in mind the sequence of output from the data-processing stage.

558. The stages and manner in which it is proposed that data be released will also be important factors. Soon after enumeration, it will be useful to publish a relatively brief statement incorporating the basic results of the census in the form of a booklet or press release. This will demonstrate the utility and efficiency of the operations. The regular publications, consisting, inter alia, of the volumes of tables and analytical reports, will then follow.

2. Levels of presentation of data

559. An optimum tabulation plan, as suggested by Principles and Recommendations, has been presented in chapter nine. The inclusion of the tables set forth in that optimum plan along with other tables that may be part of the tabulation plan in the census publications and the sequence of presentation in those publications will have to be planned well in advance. The scope of the publication plan is set not only by the data sets proposed for publication but also by the levels of presentation, the extent of cross-classifications and the degree of aggregation of data at larger-area levels. Certain data useful for administration and planning, such as population by sex and by rural/urban distribution and information relating to characteristics such as literacy, work and economic activity by broad category, will have to be published for all small areas on the basis of the full count. It is doubtful, however, whether other sets of data need necessarily be published at this level. In fact, some data, especially those whose numbers are small, may not lend themselves to such presentation without either breach of confidentiality or identification. The presentation of extensive data at small-area levels increases the costs of publication with, in most cases, inadequate returns in terms of utility. Taking into consideration the types of uses to which data are put at different area levels, it would seem unnecessary to publish a large number of data sets at the small-area level, particularly in cases where the data is computerized and special tabulations could always be generated to meet special demands for specific information at that level, subject to maintenance of confidentiality.

560. The amount of information published for each area or geographic level is an important factor. The range of presentation in the publications could be progressively reduced by presenting information on all characteristics at the national and regional levels and somewhat less detailed information at the subregional levels, with presentation at the small-area level restricted to basic characteristics, as indicated earlier. Such a judicious presentation of data would satisfy the requirements of both utility and optimum cost.

561. The manner of presentation of data will also influence the scope of the publication plan. The general practice is to publish tables in separate volumes for each of the characteristics of the population and housing at the national and regional levels. Sometimes, depending on the requirements in a particular country, such volumes may also be published for the major urban areas. This method of presentation is useful since data on each major characteristic are available for all large administrative levels in the same table or volume. However, depending on the size of the country and the regions, the publication of a consolidated volume for each region and wherever necessary, for the next-lower area level within the region that gave information on some of the more important characteristics at these levels in the same volume could be considered. Such volumes presenting data pertaining to a region in a consolidated manner would be very useful for administrative and planning purposes at the regional level. It must, however, be recognized that there would be a duplication of presentation between two such series of volumes, one for characteristics and the other for regions, and that the duplication would increase the total cost of publication. The need for separate series will have to be assessed by each country.

562. The topics that could be canvassed in a census, as indicated in Principles and Recommendations, have been listed in chapter six. These can, generally speaking, be categorized as dealing with demographic characteristics, social characteristics and economic characteristics. The data for each of these groups are usually presented in a separate series of volumes. This is a convenient division for the user too, since specific volumes alone need be referred to depending on the user's area of interest. Some specific topics within these broad categories are important and unique enough to merit separate volumes of tables. Such topics that may need single volumes for themselves include fertility, educational levels, migration and the like. The need for the publication of such single-topic volumes will have to be determined while formulating the publication plan.

3. Sequence of the publications

563. The order in which the publications are produced is set according to the priorities attached to the data relating to the various characteristics of population and housing. Those priorities must be determined while the tabulation and publication plans are being prepared. It will be necessary to plan the pace and sequence of the tabulation and data-processing stages in such a manner as to obtain the tables in the order of priority that may have been decided. The tables on the size and distribution of the population and on general housing characteristics will normally have the first priority.

564. Due to unforeseen circumstances, the publication of some series of tables in the order of priority may not be possible. This should not hold up the publication of other series that may be ready. The concern at all times must be to make the results available as and when they are ready.

4. Reporting

565. The primary responsibility of the census organization is to publish quantitative data on all population and housing characteristics in as detailed

a manner as possible. The publication of the tables as quickly as possible will therefore take priority. In addition, it would be highly desirable to produce a few general publications that were of interest and utility to the general reader, administrators and policy makers and had considerable technical content, presented, however, in a style oriented to this special clientele. The production of those publications should be part of the marketing of census information that will be referred to later. Such publications would include a general report on the census results, an atlas volume and an administrative report.

566. The general report on the census will analyse the data in some detail and present an overview of the main demographic issues so as to supplement the analytical notes that are normally included in the regular volumes of tables. There could be a discussion of the size, growth and distribution of the population, pointing out the rural/urban and regional differentials. Literacy and educational levels, age distributions, sex differentials and broad working characteristics could be described. The housing situation could be reviewed and the issue of adequacy of both housing stock and essential facilities in existing housing could be brought forth. Such a publication will be very useful for national and regional administrators and other professionals because it contains tables relating to various basic characteristics with essential cross-classifications and presents an overview of the results of the census.

567. An atlas volume that presents information on population and housing in maps is very useful in conveying the implications of the census results, particularly of the population and housing situation, to the political and policy-making levels. Well-prepared maps that present information on the characteristics of population and housing and the regional differentials are more likely to receive the attention of the decision makers than innumerable tables and analytical notes. The subject-matter of the maps and the manner of presentation must be decided in advance so that the mapping division is ready to commence preparation of the maps as soon as data are available. The presentations in the atlas volume will also depend on the technical facilities for both production and printing of such maps.

568. An administrative report that includes a discussion of the methodology of enumeration is of invaluable assistance in planning a subsequent census. In addition, the material in such a volume is of great historical value, particularly when a series of such reports are available. The planning of later censuses will be vastly facilitated if the experiences of earlier ones are available in well-documented form. An administrative report is specially useful when it contains a description of how concepts were developed and why certain procedures were adopted, as well as discussions of staffing and organizational problems encountered and how they were solved, copies of the instructions and the questionnaire and descriptions of the data-processing system, publication procedures and other material. The form that such a report could take will vary. In some countries it is incorporated in one of the main publications while in others it is published in a separate volume. It is also recommended that, apart from the publication of such a report, multiple copies be retained of bound volumes of all important internal instructions, letters, memoranda, publicity material and the like.

569. The census data are of interest and use to professionals and to those in Government, but there is usually an intermediate category of persons who, while unable to digest highly technical material, should be kept informed on population issues. This category would include students, intellectuals and non-specialist educated groups. Population issues are becoming increasingly important in most countries and an understanding of general demographic characteristics of the country by as wide a segment of the public as possible will help in developing a perspective with regard to those issues and an awareness of the importance of the census as a national activity. The publication of an attractively produced and suitably illustrated non-technical descriptive report on the census results, aimed at this interest group, would seem desirable. The preparation of such a publication can be undertaken, if necessary, by a national expert not located in the census organization. Both costs and size will have to be controlled, if it is to have a very wide readership. The adoption of such a publication as additional reading material in schools and colleges will help in fostering a better and wider appreciation both of the importance of population as a dimension in national and human welfare development and of the need for a periodic census.

570. The preparation of the general report, the atlas volume, the administrative report and the popular version will necessarily depend on the availability of sufficient funds, professional skills, printing capacity and pace of production and release of the prescribed tabulations. Whether all or only some of these publications should be brought out could be decided on the basis of the following considerations:

(a) That the publication of the main tabulations as laid down in the tabulation plan will have first priority;

(b) That the administrative report must be considered essential for the purpose of preserving census experience, apart from its general utility, for the benefit of the organization itself;

(c) That in countries where research institutions concerned with population issues are well established and are part of the general consultative mechanisms within Government, they will normally provide the necessary input based on the census results that the policy maker or administrator needs. In fact, they should be actively encouraged to do so, in which event it may not be necessary for the census organization to produce the general report that has been suggested. If such expertise is not available, the census organization could consider the production of such a volume;

(d) That the possibility and desirability of bringing out the popular report on the census results will depend on many circumstances, including the availability of funds, time and professional skills for its preparation. However, such a publication is important because it will be an effective means of enlightening the public on the importance of the census, its vital role in ensuring the census's success and the great utility of the results for the public good. In countries where statistical publications are few or not easily available, such a popular version will serve as an important source of information not only to the public but also to professionals;

(e) That the production of the atlas volume must be regarded as being among the important instances of output by the organization. This volume will

supplement the analytical presentations and illustrate the utility of the census in a forceful manner.

571. In most countries population projections will be available and are, in fact, usually prepared by official agencies, including the statistical office of the country. The census results may differ from those projections. Where the variations are significant, it will be necessary to analyse and explain the reasons for the differences. It would be desirable to prepare a report on the basis of such an analysis for the benefit of governmental authorities or interested others that will help them appreciate the rationale for those variations and accept the validity of census procedures and results.

B. Format of the publications

572. The dissemination of census results is generally carried out through the publication of volumes in a series. These volumes will be the major source of census data to most users, will be used continuously till the results of the next census are available and will even be referred to thereafter. It is therefore necessary to design these series in such a manner as renders the volumes convenient to use and long-lasting.

573. Although the contents of each of the volumes of census data and of the reports will vary, some degree of standardization must be maintained. The maintenance of such consistency will be helpful to the users. For example, the elements that can be standardized will include: captions used to describe a subject, which should be the same in all the publications; table formats with regard to titling, footnotes, symbols, and notations; principles of rounding off percentages and other derived figures; structure of contents; and description of references.

574. It would also be desirable to maintain as uniform a style of reporting as possible. The clientele for census data is wide-ranging in its interests and professional capacity. The presentation of analytical material should therefore not be too technical. An important point is that objectivity with regard to the presentation of interpretations and conclusions should be maintained so as to retain public and professional confidence.

575. The attempt should be made to render each volume as self-contained as possible, even if this results in an element of duplication. For example, the definitions of concepts and relevant extracts from instructions to the enumerators should be included in each volume to the extent necessary even if such a step involves repetition. It will also be useful to include brief analytical notes if possible. These will enhance the utility of the volumes that present quantitative data. The method of presentation of data within each volume will depend on the type of information being included and will have to be decided in each case. However, it would be desirable to present the data by the broad categories of rural and urban distribution, with separate presentations for the large urban agglomerations and cities, and by sex for each of the topics included in a particular volume.

576. A small but unfortunately often neglected aspect is the need to absolutely avoid errors in presentation of data. If such errors are present but not indicated by the inclusion of a list of errata, the utility of the

data will be considerably eroded. The presentation of a list of errata under such circumstances will no doubt be helpful. However, nothing discourages a user so much as being confronted with pages of errata at the beginning of a volume that is already replete with statistics. The avoidance of errata and the maintaining of data accuracy will require vigilant scrutiny and proofreading of all publications before they are printed.

577. Where it is necessary to publish the census volumes in bilingual form, the publications have to be carefully designed so as to maintain convenience in reading. Sometimes, separate editions are issued in each of the languages. Where the language of a country may not be very widely known throughout the world, it will be helpful if translations of table headings and important concepts and definitions are provided in languages understood internationally. This will enhance the regional and global utility of the data.

578. It was mentioned earlier that census volumes are of interest and utility long after a census is over. In fact, census records have archival value. If they are to survive constant use or long storage in printed form, the volumes will have to be printed on good-quality paper that lasts. Furthermore, the bindings should be strong. These are obvious points that nevertheless bear emphasis.

579. Most census authorities are free to present census information in the manner they consider suitable. They are rarely constrained, in drafting their reports, by the need to conform to the conventional official idiom. There is therefore no reason why census reports cannot be presented in a manner that renders them both useful and attractive. Attractiveness can be achieved by good-quality printing; inclusion of maps, diagrams and charts; and, as suggested earlier, a style of writing suitable to the enlightened reader or policy maker as well as the professional. To establish such a tradition of high-quality, objective presentations of accurate and useful data should be a constant endeavour.

C. Distribution of publications

580. The principles of distribution of census publications must be determined in advance since those principles will influence the number of copies to be printed and the costs of printing and distribution. Census publications are distributed through either free supply or sales. The objective of the distribution system should be to ensure as wide a dissemination of the results as possible. This will require that the census publications be available to data users as easily as possible and at reasonable cost.

581. The free distribution of census publications must be carried out in such a manner as to avoid waste, while at the same time ensuring that genuine users receive copies. It will therefore be necessary to prepare a list of persons and organizations that should receive free copies. The list would include: (a) government ministries and departments and other official bodies most concerned with census data, (b) national and regional planning authorities, (c) depository libraries, (d) other libraries of national and regional importance and university libraries, (e) institutions of national or regional repute carrying out research in population or population-related subjects and

(f) libraries of international organizations, including those in the region. Copies could also be distributed free to some experts, who would have to be identified and included in the list.

582. Census publications that are sold should be priced so as not to discourage users who need to acquire copies. Usually, such publications are subsidized from the census budget so as to maintain the sale price at reasonable levels. The principles of subsidizing the publications must be determined in advance and the appropriate subsidy element included in the budget estimates so as to reflect the true costs of the census.

583. It is important to note that the demand for census publications is often low because users either are unaware of the procedures for obtaining those publications or find such procedures difficult. It would be desirable to make the procedures as simple as possible and to include information on such procedures and on the costs of the publications in the publicity measures that may be adopted for improving public knowledge of availability of census publications.

D. Data retrieval and release

584. It is important to encourage and support the maximum use of the data for the purposes for which they are intended. This would be possible through the establishment of a quick and efficient system for the dissemination of the data to users. The publications of the census organization meet a considerable part of the demand for data, including the normal requirements of agencies within Government. However, the clientele for census data is now no longer largely within Government and a few prominent research institutions. It has expanded to include a much wider network of research bodies, individual scholars, university departments, market research organizations, private enterprises and other organizations both within the country and beyond. There is now a continuous demand for such data. It would therefore be useful to consider the methods of preservation, retrieval and dissemination of census data that will have to be established to cater to this increasing demand.

585. The computerization of data processing has brought a new dimension to the system of preservation, retrieval and dissemination of census data. The census organization will be able to maintain and draw upon a data bank of great potential, in addition to the information released through its publications. Data can be recalled and processed for any level of aggregation and a variety of cross-classifications will be possible. In principle, it should be possible to satisfy most demands for census data.

586. The preparation of special tables for small areas is, in particular, facilitated by computerization. There is an increasing need for tabulations on population distribution and housing at the levels of civil divisions within the large urban areas and at the lowest administrative area level elsewhere. Because of their volume, it would be uneconomical to print and publish such tables for the whole country and would not seem useful to do so either. However, such tables would be extremely useful to the individual organizations responsible for local-area planning and administration. The maintenance of census data in computerized form enables the demands for those tables to be met.

587. The retrieval of data will have to be governed by firm rules relating to the procedures of clearance for release, the manner in which the data asked for will be made available, the recovery of costs and other aspects. The very potential for retrieval of data places a major responsibility on the census organization to ensure that the release of such data is well within the confines of the law relating to maintenance of confidentiality and preservation of individual anonymity.

588. Unpublished data can be released in various forms. Those forms include (a) allowing access to the manuscript copies of the final tabulation statements, (b) releasing the data tapes and (c) preparing the special tabulations required.

589. Permitting access to the manuscript copies of the final tabulations that have not been published may save computer time and costs, but it also results in the rapid deterioration of the records through excessive and often careless handling. Removal of the records from the office cannot be allowed, owing to risk of loss. Photocopying also results in too much handling. In most compilations, drafts are also retained, in which case there is the risk of releasing a statement of doubtful validity. This practice is best avoided.

590. Copies of the data tapes can also be made available to users for generating the compilations they desire. With the increasing availability of computers in universities and research institutions, the release of the final tapes to such bodies will reduce the burden on the census office of preparing special tabulations while at the same time maximizing the use of the data. However, the issue of maintenance of confidentiality and anonymity will be very important. It will determine the appropriate area level and aggregations below which data cannot be released. Usually, it will be possible to maintain confidentiality by eliminating information from the tapes that may permit identification of individuals. It will also be necessary to remove any information regarding exceptional characteristics that can lead to identification such as unusual occupations, very large incomes and extensive landholdings. In practice, the tapes that will be made available will comprise cleaned data, devoid of identification particulars and with aggregations at appropriate area levels.

591. Unpublished data can also be released through special tabulations generated at the request of the user. The preparation of such tables may require the preparation of fresh programmes and other organizational arrangements. Use of the various software packages that are available may be considered for processing such requests. The advantage of this method of dissemination of data is that the original data are always within the control of the census organization and the types of tabulations being produced will be known.

592. Subject to the stipulations of the census law, the general guiding principle should be to make data as freely available as possible. It must be noted that there could be possible misuse or misinterpretation of the data but, at the same time, it will be unrealistic to expect the census organization to monitor all the uses to which the data are put. The best that can be done would seem to be developing a sufficient liaison with users so that they accept technical guidance and suggestions. Users of data could also be requested to include disclaimers in their publications absolving the census

organization of any responsibility for the analysis or conclusions therein. In any case, in order for the census organization to have an idea of the variety of uses of the data, copies of the publications brought out by the recipients of those data could be obtained.

593. In view of the need to prevent unauthorized access to census data, whether the utilization by users of remote terminals to tap the data maintained in the computer system should be permitted merits serious consideration. Such direct-access facilities are generally restricted to agencies within the statistical system. In any case, such access, if permitted, should be available only to the data already in the published tables and to aggregated data maintained on tapes, not to unpublished data.

594. Irrespective of the method of release of data, the costs of making such data available must be charged to the recipient user. The costs may relate to the costs of the tapes or, when the tables are generated by the census organization, of such computer time and overheads as may be considered reasonable.

595. Meeting requests for additional data is highly desirable but should not be at the cost of the output of the organization itself. Satisfying such requests will require spare computer capacity and time, both of which may not always be available till most of the regular tabulations are completed. Also, catering to such demands while the planned tabulations are being processed will impose an additional burden on the census and data-processing staff that may result in a holding up of the normal work. Therefore, the appropriate stage at which such requests can be entertained will have to be determined after assessing the progress of the data-processing activity. It would be desirable for all the data-processing activity as specified in the census plan to be completed first before catering to requests for additional data is attempted. This will avoid having to delay, or even postpone, some part or other of the planned tables, since both delay and postponement would be undesirable.

E. Management issues

596. The successful completion of the publication plan is very much dependent on the technology of printing and reproduction that is available. Conventionally, most census organizations are obliged to arrange for their publications to be printed by government presses. Where the reports or table volumes are brief, those presses will be able to complete the printing in reasonable time. However, when the publication programme is fairly extensive or the table volumes are many (which is generally the case in the larger countries), the official printing agencies may not - and this happens quite often - be able to adhere to the time schedules. Such delays, imposed by procedures, will tend to postpone the timely availability of census data. It would be desirable to explore the possibility of assigning some part of the printing of census publications to other agencies, including private presses, well before the first publications are ready for printing.

597. The installation of a printing press within the census organization itself could be considered. The availability of such in-house printing facilities will enable the smaller publications to be brought out quickly.

However, the difficulties of managing such a distinctive activity must not be underestimated. There will be issues relating to maintenance of equipment and recruitment of staff and problems of career management within a small set of staff. However, through secondment of professionals from the official printing offices, many of these problems can be solved. In any case, the establishment of minimum facilities such as a bank of electronic typewriters, word processors with printers, photocopiers and photo-offset printing equipment of reasonable capacity would be very desirable. The availability of these facilities will expedite the preparation of reports and the publication of tables.

598. The technology that will be adopted for printing the publications will also be important. The use of conventional technology involving typesetting is slow and could result in errors despite very careful proofreading. The possibility of generating print-ready copies of the computer tables should be explored. The production of tables in this form, combined with the use of photo-offset printing methods, will reduce the time for printing. The preparation and integration with the tables of the analytical sections of the publications, the explanations of concepts including the reproduction of definitions and extracts from the instructions to the enumerators will be possible by the use of modern equipment such as word processors. Such equipment is now available at reasonable cost. The installation of such equipment within the organization, as suggested earlier, will reduce the production time of many of the publications to a considerable extent.

599. The choice of the appropriate technology for preparation and printing of the publications will have to be based on expert advice and a realistic appraisal of the availability of equipment, skilled manpower to operate it, maintenance facilities and costs. If the planning of this stage is integrated into the total census plan from the start, it should be possible to improve the prospects for more rapid publication of all the volumes envisaged. However, if adequate printing facilities are not available, it will sometimes be more pragmatic to trim the publication plan or modify methods of presentation so as to ensure early dissemination of data.

600. The need for careful budgeting of the various components of the publication plan needs little emphasis. The initial exercise will consist of drawing up the desired publication plan and preparing the corresponding estimates. If there is no likelihood of obtaining the funds estimated on this basis, or if the necessary funds are likely to be available only over a longer period than was originally envisaged, the publication plan will have to be adjusted so as to maintain the production schedule of the priority tables, while spacing the sequence of the others over the appropriate period.

601. The sale of publications will doubtless yield some revenue that will partially meet the costs of production. The scale of such returns will be very small, however, compared with the costs of publication. The temptation to price the publications at a level that will yield a larger return must be resisted because such an approach is more likely to reduce sales than to augment revenue. The adoption of a policy of obtaining minor commercial gains (which, in any case, will be disproportionately small compared with the costs) will be self-defeating. On the other hand, the concern with ensuring the widest possible dissemination of census data must guide both free distribution and pricing policy.

602. The management of the activities relating to publication should be assigned to a unit that, for convenience, could be designated as the publications unit. It may not always be necessary to constitute a separate division for this purpose. By this stage of the operations, the administrative division should be able to take over the responsibility for publication activity, in which case a unit within that division may be sufficient. The actual structure most suitable to each country will have to be decided well in advance.

603. The census division could be made responsible for preparing the copies of all publications in print-ready form. Unlike the publications unit, which is more likely to be staffed by general administrative personnel and printing experts who may not be able to contribute much towards the technical content of the publications, the census division will have the necessary professional skills for ensuring consistency and uniformity among those publications. However, once the print-ready copy of a publication is received from the census division the publications unit will be responsible for all publication activities. It would be necessary for the publications unit to decide on the procedures and agencies for printing well in advance so that no time is lost in commencement of printing after a publication is ready. There will obviously have to be very close coordination among the census division, the research and analysis division, the data-processing division and the publications unit with a clear inter se assignment of functions and responsibility relating to publication activities to ensure that those activities receive the necessary attention.

F. Planning data dissemination

604. The increasing interest in census data that has enormously enhanced demand and the technological developments that now permit this demand to be met in many forms of information transfer, will have to be matched by effective dissemination systems. However, in many countries, there is a considerable gap between availability and utilization of data. Census organizations have therefore to establish mechanisms, in some cases, for disseminating information on the availability of census data and, in others, for keeping pace with the accelerating demand. Increasing the demand for census results or devising strategies for their marketing, along with providing easy access to the data, must be priority tasks for the organization.

605. The organizational mechanisms for meeting the enhanced demands for census data have been discussed earlier. Most users will prefer to utilize the latest technology available for obtaining data from the census data bank and for carrying out analytical work. In most countries, it will be possible to meet such requests through tapes and disks and even by permitting access through terminals, subject to the safeguards indicated. To be able to cater to such demands for data, every effort will have to be made to upgrade the technology of data processing, preservation, retrieval and dissemination before the commencement of a new census.

606. The plans for dissemination of information on the census results must recognize that the user groups are varied. They will consist of (a) technical and professional users, (b) policy makers and private marketing and media agencies, (c) managers and general administrators at such functional levels as

those of local administration and departments of Government and (d) the general public. The strategies of dissemination will have to match the target groups.

607. Apart from the user's capacity to utilize the information, the demand for and utilization of census data are dependent on the knowledge of the availability of such data. It will therefore be necessary to devise methods for increasing awareness of the availability of such data. The range of census data that will be available, the sequence of release and other details could be indicated, inter alia, through advertisements, pamphlets, circular letters, summary reports and data sheets. These communication methods will have to be used selectively, depending on the user whose interest is being evoked. It will also be productive, soon after the basic census data are published, to hold seminars at which the main results could be discussed. Such professional gatherings will provide opportunities to hold exhibitions of census publications and furnish information on those still to be published. Catalogues of census publications, in which the procedures for obtaining the publications and additional data on tapes and disks could be indicated, should be published at the appropriate time and distributed widely.

XIII. POST-CENSUS TECHNICAL AND MANAGEMENT ACTIVITIES

608. The completion of the enumeration marks the end of the hectic phase of the census but it cannot be said that the tempo of census activity will lessen till the completion of data processing and publication of the results. However, soon after the enumeration and, later, after the tabulation and release of the results, there will be a period of reorganization. The nature of both the technical and management activities will undergo a change. In the post-census period the technical activities will relate to analysis and research while management activities will be concerned with records preservation, dissemination of data and promotion of their utilization, maintenance of the data system, and the like.

A. Analysis and research

609. The need to establish a unit for analysis and a research division has been referred to earlier during the discussion of the possible structure of the technical divisions in the census organization. The unit would be responsible for analysing and interpreting the census results and initiating methodological studies relevant to the subsequent census. The performance of these functions would optimize expenditure on the census in terms of use of the data, enhance the role of the organization in the national statistical system and maintain professional skills within the organization at a high level.

610. It will be necessary to define the terms analysis and research in the context under consideration. It is true that the activities relating to census tests and the post-enumeration survey involve a degree of analysis. However, analysis in this discussion is used in relation to operations on the results of the census that aim "at achieving increased substantive knowledge from the statistics produced". 59/ Research mainly refers to activity that yields new knowledge on methodological aspects of census operations.

611. Analytical activity can be regarded very broadly as consisting of two components, the first comprising the analysis of the census results on specific characteristics and the production of single-subject technical reports that may relate, for example, to age distribution, fertility, migration, the labour force and the like and the second relating to the production of reports seeking to integrate census data with data from other sources for an interpretation of the results within the larger development and socio-economic perspective. These distinctions are rather arbitrary and, admittedly, the two types of analysis are closely interrelated. However, the utility of this distinction will lie in determining priorities and sequencing the analytical output of the division.

612. The analysis of census results will be a normal responsibility of the organization. However, the utility of census data, and indeed the organization itself, will be considerably enhanced when the data are combined with relevant data from other sources in reports that bear on specific policy issues of which population is an important dimension. In this context, it is relevant to note that interpreting data and presenting it to policy makers and administrators in a readable and easily assimilable form is a difficult task

that has had to be faced by almost all statistical agencies. The scope of such interpretative analysis, the topics the reports should deal with, the manner of presentation and the extent of the technical analysis those reports should include will depend on the purpose of the reports and the clientele they are expected to serve. It will therefore be necessary to plan this activity after careful assessment both of the topics that, in the context of a country's needs, will be relevant and of the availability of reliable data from other sources that are required as an essential input. The utility of such reports is very much dependent on their timeliness.

613. The need for association with external expertise at the time the census is being planned has been mentioned earlier. Such expertise could also be involved in analytical work. Where institutions of excellence involved in population issues (including demographic training institutions) exist it would be desirable to consider the possibility of their being closely associated with the analytical programme. Activity could either be collaborative or performed exclusively by such institutions. Appropriate agreements could govern the arrangements for such collaboration or assignments, including, if necessary, the degree of responsibility for conclusions drawn or interpretations made. The induction of external expertise into, and its association with, analytical activity, if required, will expand the scope of analysis, reduce the load on the professionals within the organization and improve national professional skills.

614. After the major proportion of data-processing and publication activities of a census are over and before the planning of the next one begins, there will be some time available for planning and carrying out research studies relating to methodological issues relevant to census operations. Some of the aspects of the operations that could be studied include questionnaire design, the extent of precoding that could be adopted, enumeration procedures, field control problems and tabulation systems. The studies could also relate to concepts and definitions, of economic characteristics, for example; field problems of identification and enumeration of the disabled and the homeless; and the possibility of investigating new topics. The comparative advantages of different practices and staffing patterns that could influence the costs of census operations could also be studied. The subject-matter of such studies and the feasibility of carrying them out will vary. Each country will have to decide on the scope of, and the possibility of conducting, such activity, taking into consideration the availability of professional expertise, funds and time. If such studies are carried out, it will be essential that full details of their objectives, procedures and results be documented. Such a record of experiences will be an invaluable input in the planning of censuses not only in the particular country concerned but elsewhere as well.

B. Management issues

615. Post-enumeration management activities will relate mainly to completion of data processing and production of the publications. As these activities near completion, the focus of the organization will shift to intercensus activities. The major functions of management in the intercensus period will be: (a) printing and distribution of publications, (b) production of analytical reports, (c) dissemination of census data, (d) catering to demands for additional data, (e) organization and maintenance of the system of

preservation and retrieval of data and records and (f) carrying out of appropriate surveys and methodological studies. These functions will, among other things, also include management of the core staff, care of the equipment and preservation of maps and records.

616. As the post-enumeration stages near completion, the number of personnel will shrink considerably, with the disbanding of field staff after enumeration and reductions in data-processing staff, including editing and coding staff, after completion of the major proportion of tabulation. At this stage, it will be necessary to determine the strength of the professional staff needed for carrying out the analytical and research activities referred to above and for intercensus activities. In this context, the desirability of maintaining a permanent census organization has been noted. For that purpose it would be desirable to retain such technical divisions as the census division and those dealing with mapping, data processing, and analysis and research. The supporting offices relating to administration and accounts would also have to be retained, but on a reduced scale.

617. To provide the technical coordination for the intercensus activities, the character of the census planning group will have to change. There may be a need to set up in its place a technical group that will be responsible for appraising requests for additional data, overseeing technical and analytical reports and generally advising on other technical issues that may come up. Continuous monitoring of these activities by top management will be necessary to ensure that they are being effectively carried out.

618. The system that may be established for the preservation and retrieval of census information will include the setting up of a tape library. The library will include the tapes or disks containing raw data and those containing cleaned aggregate data. The preservation of those tapes and other media will be an important intercensus function that may involve the establishment of special facilities such as a dustproof, controlled environment and the maintenance of copies of the tapes at different locations to avoid total loss due to fire, mishandling and other causes. The necessary security measures will also have to be taken.

619. The preservation and care of the maps and records of the census are major responsibilities. Arrangements for storage of these documents will have to be made well in advance since the required space and special stacking equipment may not always be available at short notice. The maps that have to be preserved will include topographical sheets, which in some countries are classified documents. Census documents such as the questionnaires are also classified as confidential under the law. The arrangements for the preservation of these documents will therefore have to satisfy the prescribed security stipulations.

620. The period of retention of the field records in their original form will also need consideration. These records will include the filled-in questionnaires, manuals, control forms and other material. Beyond a certain point, their retention in original form will be difficult and a stage may be reached where their sheer volume may defeat the very purpose of retention. The storage and maintenance even of the printed publications are often difficult tasks; maintaining the original records in an orderly, retrievable form will be much more difficult. It will therefore be unrealistic to suggest

that these be retained indefinitely. The convention in some countries has been to retain original records till the time of the next census and to destroy them, under strict supervision, at the commencement of the subsequent operations. With raw data's being preserved on tape, particularly in cases where all the information is retained, there would seem to be no need to preserve the original records indefinitely. However, the period of retention of such records and the modalities of destruction will have to be determined keeping the requirements of the census or statistical laws in mind.

621. One of the valuable contributions of the census operations is the census frame. As suggested earlier, it would be desirable to devise mechanisms for updating this frame during the intercensus period. While it is recognized that this task may be beyond the capacity of the census organization, it would be desirable to consider whether the municipal administrations and local authorities could be induced to undertake responsibility for it. If continuous updating is found to be impractical, the possibility of these authorities' updating the frame once in a quinquennium could be suggested. Such an arrangement, even if progressively introduced, will reduce the enormous scale of the mapping operations that are currently carried out before each census and also spread the corresponding expenditure (which is now concentrated in a short period and is therefore a strain on resources) over a longer span of time. The possibility of establishing such a system of maintenance of the frame, evolved at considerable cost and effort at the time of the census, merits serious consideration.

XIV. GENERAL ISSUES

622. With the global expansion of census activity, the continuing enhancement of the content of the census and the increasing demands for data, census-taking has acquired high visibility in recent times. This, in turn, has evoked a much larger degree of interest in census activities in the public and among data users. Such developments, along with the availability of new technologies of data processing, preservation and retrieval, have given rise to certain issues relating to the broader aspects of the census. Many of these, such as the need to ensure public acceptability, maintenance of confidentiality and anonymity while retaining data in a computerized system, security considerations with such a system (and with the introduction of microcomputers), the changing role of statistical and data-processing professionals, have in fact been touched upon in the preceding chapters. Nevertheless, there are a few broader issues that census-takers may have to consider in the years ahead. Some of those issues are discussed in the present chapter. It must, however, be noted that the character of these issues or the issues themselves will change with the passage of time. There is therefore a need for constant re-examination of the census scenario on an international basis so that each country benefits from the experiences of others.

A. Costs of census operations

623. The scope of the census has increased significantly over the past decades as a result of two factors. The topics that a census covers have grown in number and complexity, resulting in heavier responsibilities of data collection, processing, analysis and dissemination. Secondly, the character of the demands for census data has altered. The focus has gone from generalized data and aggregates to detailed cross-tabulations of socio-economic information and data at small-area levels. There has also been increasing pressure for more rapid release of data and for access to the data sources. These factors, along with the general inflation in the price of the input required, have tended to increase the costs of a census. There have been occasions when, due to budgetary difficulties, timely and adequate funding of all stages of the operations has not always been available, often reducing the accuracy and utility of the results. Therefore, the balance that can be achieved between meeting data requirements and increasing costs will need consideration. In assessing the possibilities of achieving that balance, the impact of new technologies of data processing, preservation and retrieval and possible modifications in census procedures will have to be taken into account.

624. The outlay on a census may appear great because the largest costs are concentrated in a short period of time. In all probability, if spread over the conventional ten- or, as in some countries, five-year period during which the data are continuously used, the average annual cost of the census would compare very favorably with the cost of all the other statistical inquiries that together yield a wealth of data but that do not offer its unique contribution of information at the small-area level. Also, in some countries, traditional budgetary practices could contribute to the impression that census costs are relatively high, compared with other activities of Government, because the comparison is with annual outlays on government activities that are continuing and routine. This comparison appears, in principle,

unjustified. Another reason for unfavourable comparisons would seem to be the manner in which budget allocations are made in some countries. The census has gradually become multidimensional and meets innumerable data needs. It would therefore be reasonable to consider census-taking as part of the statistical component of the total development plan where a country has such a plan. The inclusion of the census in a five- or ten-year development plan will place the expenditure incurred on the operations in the appropriate perspective. In other words, the census will have to be viewed as a major component of the statistical and development activities of Government over a longer time span than just the two or three years of peak expenditure.

625. The largest element in the cost of a census relates to outlays on staff, of which the expenditure on the staff employed on fieldwork and in editing and coding will be a significant proportion. The costs of field operations are directly related to the size of the questionnaires, the period of enumeration and the extent of the supervision. It will be false economy to reduce the intensity of supervision or the provision of the logistic support that the field staff will need. Therefore, critical review of the questionnaire, of the extent of field coding, and of all procedures will be necessary to identify possible areas where costs could be controlled. For example, in some countries, the questionnaires contain information on some particulars obtained from population registers and other administrative records; therefore, the respondents have only to provide information on other characteristics and to indicate corrections in information already included. This system saves time and expenditure by avoiding repetitive collection and tabulation of data already available. The adoption of mail-out/mail-back procedures will also reduce staff costs. 60/

626. The procedures that are adopted for data processing and dissemination will also influence costs. In assessing the investment on computerization in relation to the total cost of the census it will be relevant to take into consideration the advantages that computerization provides in terms of reduction in the long run in personnel and of data storage, retrieval and dissemination. Assessments of the relative costs and advantages of adopting other technologies such as optical-character and optical-mark readers will also have to take into consideration the long-term benefits of such investment.

627. The costs of data dissemination, including those relating to the publication of the large series of volumes in printed form, will merit consideration. The publication plan should be carefully reviewed to limit the printed volumes to essential and priority data sets. It may be possible to make other data available to particular users on demand, reducing the printing and publication outlays. If the capacity and equipment are available, the dissemination of data through copies of tapes or disks, with the safeguards mentioned earlier, will reduce costs considerably. The various options with regard to dissemination of data that computerization provides must be explored to identify possibilities of cost reduction. 61/

628. The need to control the costs of a census is an important responsibility of the census organization. All possible measures for achieving maximum economy in the conduct of the operations must be taken. However, care will have to be exercised lest false economies (saving small amounts at the expense of disproportionate losses in terms of coverage or quality of the results) be

introduced. If the results are of doubtful utility, the expenditure on the census, even if apparently economical, may in fact have been wasteful. Therefore, a balance will have to be struck between the information that is required and its utility, and the costs of collecting, processing and using that information. The careful determination of this balance is particularly important in a census because, unlike surveys, it will be too expensive an exercise to repeat.

B. Public perceptions of the census

629. Two issues relating to the public's changing perceptions of the census have been referred to earlier. The first is connected with the inquiry's sometimes being considered an invasion of privacy; the second involves the growing concern over confidentiality. The use of computers has introduced a new dimension into the entire process of tabulation, preservation and retrieval of data in relation to the need to maintain confidentiality. In some countries in the last few years these concerns have tended to evoke public hostility to the census and suspicions regarding the use of the information, resulting in erosion of public involvement in the operations.

630. It has been noticed (while considering the content of census publicity) that in some countries where there have been strong public movements against a census, the objections have been based on general suspicion concerning the use to which personal data will be put, rather than on hostility directed against the census activity itself. In other words, in such countries, a census that seeks to obtain information on only the very basic characteristics is likely to be acceptable. Any additional inquiries, however, may be viewed as an intrusion on one's privacy. The right to privacy has, in some cases, become a prominent issue because of the high visibility of the census and the intensive use of its results (in combination with information from other sources) in administration. This, in turn, has given rise to the view that the assurance that census information will be used exclusively for statistical purposes and in aggregated form is no longer credible. Since this issue, in essence, involves the conflict between the individual's personal privacy interests and society's information needs, it largely revolves around the content of the census and the topics the census seeks to cover. Since the perceptions of census confidentiality have important implications both for the cooperation the public extends and the quality of the data, concern will largely be with achieving the proper balance between the two competing points of view.

Notes

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- 6/ Forrest E. Linder, "World demographic data", in The Study of Population, P. Hauser and O. D. Duncan, eds. (Chicago, University of Chicago Press, 1959), p. 331.
- 7/ "Preparations for the World Population And Housing Census Programme, 1985-1994: report of the Secretary-General" (E/CN.3/1987/15), presented to the Statistical Commission at its twenty-fourth session, 23 February - 4 March 1987, para. 1.
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- 9/ Statistical Office of the United Nations Secretariat, "National household survey capability programme, sampling frames and sampling designs for integrated household survey programmes", preliminary version (DP/UN/INT-84-014/5E, 1986), pp. 16-17.
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- 11/ Methodology And Evaluation Of Population Registers And Similar Systems (United Nations publication, Sales No. E.69.XVII.15), p. 1.
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19/ For notes on the definition of urban, see Handbook of Population and Housing Census Methods, Part III: Topics and Tabulations for Housing Censuses (United Nations publication, Sales No. E.70.XVII.6), paras. 215-216; and Demographic Yearbook, 1987 (United Nations publication, Sales No. E/F.88.XIII.1), notes to table 6.

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22/ Handbook of Statistical Organization, Vol. I, p. 30.

23/ Switzerland, Federal Statistical Office, "Use and users of population census results in Switzerland" (CES/SEM.25/R.2), Statistical Commission and Economic Commission for Europe, Conference of European Statisticians, Seminar on the Relevance and Importance of Population and Housing Census Data, April 1989, Wiesbaden, Germany. A reverse situation is cited: when plans for a reduced questionnaire were announced for the 1990 census, a "save the census" campaign was organized by some groups.

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43/ Najib Assifi, "Pre-census communication campaigns: guidelines for census planners", United Nations Development Programme Asia and Pacific Programme for Development Training And Communication Planning (RB.402, UNDP/DTCP, Bangkok, January 1988).

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45/ Handbook of Statistical Organization, Vol. I, p. 51.

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49/ Principles and Recommendations for Population and Housing Censuses, pp. 102-104 and pp. 254-255.

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