UNITED NATIONS
ECONOMIC
AND
SOCIAL COUNCIL

54545

Distr.
LIMITED
E/CN.14/POP/3
E/CN.14/CAS.6/24
12 May 1969
Original : ENGLISH

ECONOMIC COMMISSION FOR AFRICA
Seminar on Application of Demographic
Data and Analysis to Development Planning
Addis Ababa, 2-9 June 1969

PRINCIPLES OF APPLICATION OF DEMOGRAPHIC DATA AND ANALYSIS TO DEVELOPMENT PLANNING IN REFERENCE TO AFRICA

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I. INTRODUCTION

1. Earlier this year, the Economic Commission for Africa observed its tenth anniversary. Introducing the ten-year progress report "A Venture in Self-Reliance - Ten Years of ECA", the Executive Secretary advised that the next phase of the Commission's work should be in the direction of synthesis and application of the results of its research. ECA had given special attention in the past to building of African institutional infrastructures for regional and sub-regional co-operation, and in the second Development Decade ECA could serve as a focal point to promote economic and social development in Africa. 1/

2. The ultimate goal of the development plans is to increase the material welfare and raise the level of living of the citizens, in a systematic time-chartered course, as articulated in the plan on consideration of the available resources, the policy, and the strategy. For measurement of performance and attainment of the ultimate objectives of the plan, quantitative target setting and reckoning are necessary. The plan articulation helps to identify deviations from the course chartered, the achievements and the short falls. 2/

3. The present levels and conditions are usually measured by some indicators, mostly in per capita terms, and population (or pertinent segments of it) thus forms the denominator of the measures. The respective commodities or services form the set of numerators, but population also enters the numerator as the manpower factor in production of the commodities and services. Population in pertinent segments thus forms the major single component of the measures of material welfare or level of living. The physical resources and the strategic links may be quite different from country to country, but the population factor remains essentially the same though it may vary in composition or in quality.

4. The process of planning is spread over a time span, and is thus laid on a dynamic frame; the population composition and changes in the composition over the time span, that is the dynamics of population, therefore, are of greater relevance to planning. Plans are by nature forward looking, and look ahead (often through perspective plans) to accelerated material progress in successive steps. The accelerated

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1/ Economic Commission for Africa, ninth session, Draft Report, E/CN.14/L.360; ECA, Addis Ababa, 1969.

2/ Roland Oliver, Planification en Afrique, Techniques modernes d'établissement des programmes de développement, Paris, 1963. Somali Republic, First Five-Year Plan 1963-67, Mogadiscio, 1963, mentions in the prefatory address that the plan is proposed to be used as a yardstick to measure performance.

progress in production of commodities and services has not only to be matched by the accelerated supply of technical manpower, but has to be viewed against the accelerated (or stable or decelerated) growth of population in pertinent segments.

5. Most plans have objectives and targets of increase of per capita gross domestic product (GDP), and accordingly take account of the prevailing population growth rates and possibilities of changes in them 3/. Some plans have targets to create expanded employment opportunities, more school positions, greater public health and specialized medical facilities, better housing, more food and the like; these targets for betterment concern different segments of the population in different degrees, for example, the cohorts entering school, labour force, marriage and new family formation ages, or cohorts requiring special attention in regard to nutrition or more specialized medical attention, and so on. A part, often a substatial part, of the planned increase in commodities and services is absorbed by the natural growth of the particular segments of the population; this feature has been dramatically described as the running needed to keep standing, because this part of the plan effort is needed just to maintain the status quo in per capita availability of commodities and services. 4/

6. Plans therefore are not content to deal with the numerator quantities of commodities and services alone and the skilled manpower required for their production, but in many countries extend to the denominator factor of population in its composition; and try to moderate population growth itself. This is only logical, and not to do so could be inefficient in certain situations of population density and growth. 5/ Most

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3/ Developing Countries in the Nineteen Seventies; Preliminary Estimates for Some Key Elements of a Framework for International Development Strategy, E/AC.54/L.29/Rev.1, Addis Ababa, 1968.
F.F. Clairmonte and A. Ben-Amor, 'Planning in Africa', The Journal of Modern African Studies, Vol. 3, No.4, 1965.

4/ The investments necessary in various sectors just to maintain the level of material welfare, sometimes receive a discreet mention in the plans. The reduction by the population growth rate, of the increase in GDP planned, to per capita GDP, implicitly demarcates the part necessary to maintain current levels; about 3 per cent per year of the GDP increase, which might be half or more of the total increase planned, is absorbed by population growth in some African countries.

5/ In Africa, the population density per km^2 of arable land, is high in UAR (697), Kenya (516) and Burundi (327) as compared to the African region average (114). Mention of population pressure and constraints imposed by it is made in the UAR, General Frame of the Five-Year Plan for Economic and Social Development, 1960-65, Cairo, 1960; Government of Kenya, Development Plan 1964-70, Nairobi 1964; Republique du Burundi, Plan quinquennal de développement économique et social du Burundi 1968-72. Also see "Recent Demographic Levels and Trends in Africa" ECA Economic Bulletin for Africa, Vol. 5, 1965.

plans extend to the improvement of the manpower factor which is relevant to the production of commodities and services, and thus to the improvement of the qualitative aspects of the population. But the pace of improvement of the quality of population is dependent on quantitative aspects of the population; and more development plans are now recognizing the feasibility of planning the population quantities, or at least making population policy declarations. 6/

7. Whether the country decides to have a population policy and family planning action programme or not, the population profiles will comprise the very basic dimensions of the plans. The population density of a country could impose asymptotic constraints in utilization of certain resources: density of population, however, is not a problem for Africa, though redistribution of population may be helpful for some countries. 7/ In the static sense, Africa is not under population pressure; but in the dynamic sense, from the high rate of growth of population, many of the African plans are under severe strain.

8. The current population growth rate of Africa estimated at 2.3 per cent per year is the second highest among the continents, and it is anticipated that the African growth rate will attain the highest rank in course of the coming decades. 8/ The births anddeaths inducing changes in natural population growth and structure, and in- and out-migration inducing urban growth and territorial redistribution of population, are of greater significance to planning in the African context.

9. The dominant role of population facts in administrative decision making was acknowledged from the beginning, in so far as census and other population statistics got precedence over statistics which provided material for planning the production of commodities and services. Censuses first brought in administrative intelligence and opened up procedures for recruitment for defence services and manpower levies, and for taxation. Later, the census helped informed decisions on administrative arrangements like demarcating executive jurisdictions;

6/ UAR, Kenya and Tunisia have official policies and programmes to moderate birth rate and population growth. Voluntary family planning organizations with official support or sympathy are in operation in a large number of countries of the region.

7/ République du Cameroun, Deuxiéme Plan quinquennal de développement économique et social, 1966-71, proposes better utilization of the population among other measures by their more efficient territorial redistribution.

8/ Demographic Handbook for Africa, ECA, Addis Ababa, 1968; World Population Prospects, United Nations Sales No. 66.XIII.2, New York, 1966.

development of transport and markets; location of schools, hospitals and other facilities. The census and other demographic information started supplying the spring-board for administrative programming and planning, as administrations started to look ahead. The censuses, and the birth, death and marriage registration statistics (which originated mainly from civic and legal demand), are all established sources of demographic information. Information on demographic and related topics is also available from a number of ancillary routine official sources (covering only a section of the population), like: immigration and emigration statistics; employment exchange and unemployment insurance files; old age pension files; school and hospital records; refugee records; and life insurance experience.

10. Demographic sample surveys have been used to gather demographic and related information when census or vital registration statistics are wanting or deficient; demographic sample surveys have also been used to supplement and enrich, and to secure collated information even when good census and vital registration statistics are available. Extensive use of demographic sample surveys has been made in Africa in recent times. 9/

11. A good deal more of value can be extracted from the censuses, vital registration system, and sample surveys, by adequate analysis of data. The census operation, in particular, involves a relatively high investment of the country's administrative resources; and by deeper analysis the investment can be made to yield more, and at the same time, the administrative programmes, plans and their evaluation afforded a wider scientific base. There is additional advantage in deeper analysis of data in that the source itself gets evaluated through critical internal consistency checks and external comparisons flowing from alternative channels of information; deeper analysis thus provides a starting point for improving the source itself. The reasons are compelling why countries should earmark a suitable portion of resources for adequate analysis of census and other sources.

12. Tabulation and analysis of population data for use in various types of planning are discussed in United Nations "National Programmes of Analysis of Population Census Data as an Aid to Planning and Policy Making" (1964), and the various projections useful for the purpose in "General Principles for National Programmes of Population Projections as Aids to

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9/ Pierre Cantrelle, République du Sénégal, Etude démographique dans la Région du sine Saloum état civil et observation démographique 1963-65, Dakar, 1966. Afrique noire, Madagascan Comores; Démographie comparée - Institut national de la statistique et des études économiques, Paris, 1967. Recent Sample Surveys in Africa, ECA document E/CN.14/SM.5, 1968.
C.Scott,'Vital Rate Surveys in Tropical Africa: Some New Data Relevant to Sample Design', The Population of Tropical Africa, London, 1968;
J.G.C. Blacker, "Some Unsolved Problems of Census and Demographic Survey Work in Africa", International Population Conference, London,1969.

Development Planning" (1965). 10/ The present document brings the tabulations, analysis and projections together, with particular reference to the African situation, both in regard to the availability of data, and priorities of usage.

13. Many lines of analysis have been mentioned in this document, and they have actually been used in various countries; yet the treatment could not be exhaustive. On the other hand, it does not imply that any one country will be expected, in practice, to do all the lines of analysis mentioned; as much analysis as needed for the administrative programming and planning in a country, will naturally be done. Some of the uses arising mainly from the demands of the private sector have also been included, since the public sector may as well plan or manage a section of these demands. References have been made in the text to various African country plans and documents; these are only illustrative, and do not necessarily imply that other African countries have not made similar observations or done similar analyses.

14. The academic research uses of census, registration and survey data, which carry considerable value, are not discussed here. The cumulative body of information that the census and other sources supply, enriches the discipline of demography, and provides the material for study of economic and sociological interrelations. Not only are the data evaluated and methods improved in the process, but research opens up new lines of utilization; the research use of demographic data is therefore not to be overlooked or minimized.

10/ United Nations, New York, Sales No. 64.XIII.4 (1964) and Sales No. 65.XIII.2 (1965), respectively.

II. TABULATION AND USES OF CENSUS DATA

15. Application starts from available data, and the discussions in the section centre mainly around the data available in African censuses or national demographic sample surveys. The ECA document, 'African Recommendations for the Population Censuses' 11/ accordingly provides the reference base for this section. 12/

16. The 'African Recommendations for the 1970 Population Census' 11/ strikes a judicious balance between complete enumeration and sample surveys in the following terms: 'A population census in minimal form would consist of a complete enumeration of the population where found at the time of census, and of certain other topics on which information is required down to localities or small civil divisions. Data on topics which present special difficulties and/or which are not required down to small civil divisions, could be investigated in a sample of the population. The complete enumeration and sampl' would together yield the basic data regarded as of interest to all c untries of the region'. Though sampling is relatively less expensive / d likely to yield more accurate estimates in less time, particularly on complex or involved topics, small civil division data are usually demanded for many administrative decision-making and regional planning purposes.

17. The list of recommended minimal and other useful topics classified under three groups 'Geographic', 'Personal and Household', and 'Economic', is reproduced in Table 1 from the 'African Recommendations for the 1970 Population Censuses'; the topics which lend themselves to sampling approach are marked by the top prefix's':

11/ ECA, E/CN.14/CAS.6/1, Addis Ababa 1968. The document is an adoption to African conditions of the Principles and Recommendations for the 1970 Population Censuses, United Nations Sales No. 67.XVIII.3, as modified and endorsed by the fifth Conference of African Statisticians.

12/ References are made in this section also to new topics, further classifications or other sources of data aside from census, and some of the countries will be doing even more extended enquires.

Table 1 : Recommended and other useful topics

Recommended	Other useful topics
Geographic characteristics	
Place where found at time of census	[S] Place of usual residence
Derived: Total population Locality Urban and rural	Derived: Total population Major civil division Urban and rural
Place of birth	[S] Duration of residence
	[S] Place of previous residence
Personal and household characteristics	
Name	
Relationship to head of household	
Derived:	
Household composition	
Sex	
Age	
Ethnic group (or citizenship)	[S] Citizenship (or [S] Ethnic group)
Literacy	
Educational attainment	[S] Religion
School attendance	[S] Number of wives
Marital status	[S] Number of years since first marriage
Children born alive	[S] Live births in past 12 months
Children living	[S] Deaths in past 12 months by sex and age
	[S] Children below school age
Economic characteristics	
[S] Type of activity	[S] Worked any time in the past 12 months
[S] Occupation	
[S] Industry	
[S] Status (in the past week) as employer, employee, etc.	

18. The 'African Recommendations for the 1970 Population Censuses' 11/ also contains a list of 21 recommended and 13 additional tabulations. While the recommended tabulations use only the recommended topics and are considered the minimum that the countries will deem essential, more cross-tabulations according to the needs and available resources of the countries will naturally be done. The recommended list is kept to the minimal, as an extended elaborate set might delay even the essential minimum tabulations and thus detract from their value. The tabulations and characteristic classifications 13/ visualized are indicative, and could of course be elaborated to answer to a particular country's needs. The tabulations will naturally go down to required geographical (minor or major civil divisions) and agglomeration levels (individual large cities, towns above 20,000 population).

19. The tabulations mentioned in the 'African Recommendations for the 1970 Population Censuses', distinguishing the recommended by the pre ix (R) and the additional by prefix (A) before the table number are discussed below in functional groupings in accordance with their major uses.

20. Population base, sex-age composition and territorial distribution

Tabulation R.1.	Total population and population of major and minor civil divisions, by sex.
Tabulation R.2.	Population in localities by size-class of locality, and sex.
Tabulation R.3.	Population of principal localities and their urban agglomerations, by sex.
Tabulation R.5.	Population by single years of age and sex.
Tabulation R.6.	Population by five-year age groups and sex.

These tabulations giving the population base, sex-age composition and the territorial concentration and dispersion of population, are the very fundamental outputs of the census effort. They provide the essential intelligence system for current administrative decisions and actions, for example: proportionate representation on legislative bodies; allocation of central finances and other contributions; equitable distribution and rationing of commodities and services in short supply; lay-out of housing schemes and transport networks; formation of new administrative units and assignment of cadre; location of schools, hospitals, post offices and other utilities.

13/ The detailed specifications recommended are given at pages 49-52 of the African Recommendations 11/; the specifications are illustrated in the subsequent section of the document in the set of notional tables.

21. The population growth rate ranks as of predominant importance among the population parameters in development plans. Two census counts can directly render the intercensal population growth, as also estimates of population at various international points of time. Evaluation of the successive censuses and adjustment to make them comparable in regard to coverage and quality, are important before estimates of growth are made from them. Valid estimates of growth presuppose a fair level of accuracy of the census counts. 14/ Where a series of censuses have been taken, it may be possible to estimate the current rate of population growth and even to project it mathematically for the plan period. 14/

22. Tabulation 2 and 3 similarly enable study of the formation and relative growth of localities, sub-regionally and between size classes of localities, over the time period for which census tabulations are available, often after adjustment for changing boundaries and completeness of enumerations.

14/ For a few decades, after the first census of a country, the census operations may go on improving in coverage and quality; and there are instances of temporary lapses in quality. As a rule, therefore, the successive counts should be tested and made comparable as far as possible. Many of the African countries are in the initial phases of census taking, and valid estimates of growth or mortality may be difficult.

Nigeria provides a very special case, where census 1952-53 giving an aggregate count of 31.5 million, was associated in minds of many citizens with tax assessment or superstition, and evasion of counts could have ran as high as 20 per cent in some areas. Census 1962 on the other hand got strongly associated with sub-regional political economic competitive claims, and resulted in a count of 55.7 million. C. Okonjo, 'Estimate of the 1962 Mid-year Population of Nigeria'; and R.K. Udo, 'Population and Politics in Nigeria'; in the Population of Tropical Africa, London, 1968.

Also see, Robert Blanc, Manuel de recherche démographique en pays sous - développés, ECA, E/CN.14/ASPP/L.14 of 1962.

The migration component has to be allowed for before estimates of natural growth of population are made. This is important for many parts of Africa, particularly West Africa, where population movement across the artificial political borders is considerable.

23. The variation in growth of certain localities or size classes of them, in relation to others and the country as a whole, may help to identify the causes, and formulate policy and devise ways and means for better balanced growth, if desired. Study of the size of the urban sector and its growth, which these tabulations enable when more than one comparable enumerations or estimates exist, is of special significance to economic and social planning. 15/

24. Tabulation 5 is important for evaluation of the quality of age reporting, and adjusting for reporting errors and biases. Sometimes a clear undercount (or overcount) is noticeable in the population reported at age 0 or 1. The run of population reported at the young individual ages, enables adjustment for miscount of infants and young children. 16/

25. For estimating the requirement of school positions at different levels, the numbers of children and adolescents are required by sex and single ages along with school enrolment ratios. Similarly, the numbers of persons at ages 15-24 (say) by sex and single ages are used along with sex and age-specific participation ratios, and the age-specific marriage rates to estimate the new entrants to the employment markets, and marriages and new household formations, respectively.

26. Indeed, accuracy of enumeration of population by single ages up to say age 20, is relatively much more important for analytical purposes. Where the dates or years of birth are not exactly known, emphasis in field work may be placed on more accurate estimation of the earlier age range of life; spreading of emphasis over the whole of the life span generally results in most of the available time and attention being absorbed in the relatively much less significant but much more intriguing

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15/ A number of African plans give attention to urban growth. Urban development was assigned high priority in Congo (Leo.), urban pressure and development received special mention in N. Rhodesia, and urban growth and employment in Ivory Coast plans. République du Congo, Plan intérimaire de développement économique et social 1964-68; N. Rhodesia, Development Plan for the Period 1961-65, Lusaka, 1962; République de Cote d'Ivoire, Le plan de développement économique, social et culturel 1967-70, Abidjan, 1967. Also see, Size and Growth of Urban Population in Africa, E/CN.14/CAS.6/3; It has been calculated that contemporary urban growth in Africa is at least twice the overall population growth, and that much of the urban population, sometimes more than half, is concentrated in the primary city 12/.

16/ A methodology for adjustment was evolved and used in Ajit Das Gupta, Samruay Chotechanapibal, Thip Chalothorn, Wiwit Siripak 'Population Perspective of Thailand', Sankhya, Series B. Vol. 27, parts 1 and 2, 1965. An example of gross overcount of infants aged 0 is provided by 1957 census of Tanganyika, when 6.1 per cent of the population was shown below age 1, with compensating undercount at age 1.

old age range. 17/ Emphasis in field work in estimating the earliest ages accurately may even result in more complete enumeration of the infants and young children.

27. The young age range is the product of the behaviour of the fertility and mortality components in the recent past, and thus carries the impress of recent growth rate; and the single age distribution of the population at the young age range if ascertained within small margins of error at a single available census, can provide a rough estimate of recent population growth, which may be useful in absence of any other estimates. 17/

28. The youngest single age numbers taken with supplementary information can provide estimates or cross-check for growth, birth and infant mortality rates. Such internal cross-checks are always desired, particularly in inadequate data situations. Population aged 1-4 is required to estimate the denominator for early childhood mortality rate for that age group, when computed from vital registration data; the early childhood mortality rate has assumed a special significance as an indicator of socio-hygienic conditions and nutrition level of population. 18/

29. Tabulation 6 by five year age group can be built from tabulation 5 by single years of age. The sex-age structure of the population, which tabulation 5 and 6 render, are relevant to planning, particularly in comparisons and considerations for relative efficiency of the age structure, formation of population policies. The population by sex and age provides the base for population projections by the component method, which, after the population growth rate parameter, are perhaps the most widely used ingredients of development, segmental or sectoral planning. Basic projections of urban populations, and a number of other subsidiary ones, also require base population by sex and age groups.

30. Inter-censal mortality can be estimated from two comparable censuses by sex and age groups; a series of comparable censuses further enable estimation of trends in mortality, which is necessary for the population projections. This is however only possible if population changes from migration during the relevant period, can be allowed for. 14/

17/ Ajit Das Gupta, 'Estimation of Vital Rates for Developing Countries', Proceedings, International Population Conference, Ottawa, 1963.

18/ K. Miltenyi, 'Mortality Pattern in Ghana', International Population Conference, London, 1969. Research Needs in the Field of Mortality, South East Asia Region, WHO document, WHO/HS/WP/68.21 of 1968.

31. The population sex-age tabulations by sub-regions and urban classes furnish the denominator for calculation of aggregate and age-specific birth, death and marriage rates from vital and marriage registration statistics, for study of sub-regional and urban differentials. 19/ The age-specific death rates are processed further into life table mortality functions, and the age-specific birth rates refined further through cohort or couple (by duration of marriage) analysis, to provide the tools for various segmental population projections by the component method. The population sex-age tabulations by sub-regions and urban classes, similarly furnish the denominators for immigration and emigration rates, which enter into the population projections too and enable adjustment for prospective population changes from the migration component.

32. The sex-age structure is used to work out adult equivalent of the population in estimation of the total and special protective food requirements. 20/ The age structure of the population conditions many other commodity and service requirements. The number of births, infants and young children determine the demand for maternity child welfare clinics, for special baby food and clothes. Relative demand for toys, sports goods, books and other school provisions is tied up with the proportion of population at school age, which might vary widely among populations. Demand for employment is linked with the labour force age proportions. 20/ Marriages and the associated commodities and services, are related with the young adult marriage age population: housing plans in particular have to take account of marriages and the relevant sex-age group. Morbidity often has a typical sex-age pattern (tuberculosis, malignant neoplasms, diseases of heart and circulatory system), and provision of specialized medical facilities should therefore use population sex-age information. Location of consumer industries and services, and of their outlets, should take account of population sex-age distribution. The finances of old age pension schemes depend on the old age structure, apart from changing survival rates.

19/ Three urban size classes, urban, city and big city were distinguished in Size and Growth of Urban Population in Africa, ECA, E/CN.14/CAS.6/3, Addis Ababa, 1968. Such calculations cannot however be effected presently in most countries of Africa for want of satisfactory vital registration systems.

20/ The adult equivalent is a rough index: a number of other characteristics are needed to estimate nutritional and other protective food requirements. Emma Reh, Manual on Household Food Consumption Surveys, FAO., Rome, 1962. The significance of the population age structure is discussed by M. Seklani, 'Variations de la structure par âge et charges de la population active dans les pays sous - développés' International Population Conference, New York, 1961.

33. Households and housing

Tabulation R.4: Population in households and number of family nuclei, by size of households; and number of persons not living in households.

The household is a fundamental socio-economic nucleus in most societies. The household is an important consumption unit, some of the consumption items being linked with the corpus of the household rather than its membership. And in the subsistence sector, the household is an important production unit. The number, size, distribution and consumption of households, and trends in them, are therefore important in administrative programming and development planning.

34. Numbers of members per household and family nuclei in different sub-regions of the country, urban classes, and neighbourhoods of the city, indicate the extent of housing needs. Families often double up in the same household not from tradition alone but also from want of adequate housing. A substantial section of the population in some countries live in compounds. 21/ Persons not living in households will also include persons who do so for want of housing which they can afford. 22/

35. The 'African Recommendations for the 1970 Housing Censuses' 23/, have a number of tabulations bearing on composition of household and family nuclei, which furnish further information on households. Recommended tabulations 5, 6, 7, 10 and 11, giving age, sex, type of activity, industry, occupation and ethnic group of the head of the household or compound is particularly relevant to forecast of future housing needs. 23/

21/ In some cases, husbands may live in one compound and the wives with children in another, and here the concept of the family-based housing unit is inapplicable.

22/ A number of African countries have substantial proportions of nomads among their citizens. Somalia, for example, reported two-thirds of its population as nomadic, and Niger about 21 per cent. Somali Republic, First Five Year Plan, 1963-67, Mogadiscio, 1963; République du Niger, Plan de développement économique et social, 1961-63 (Interimaire).

23/ ECA document, E/CN.14/CAS.6/2, Addis Ababa, 1968. The tabulations are specified at pages 62-64, of the document. Also see, Demographic Statistics Required for Housing Programmes with Special Reference to the African Region, Working paper No. 6 at Seminar on Housing Statistics and Programmes for Africa, Copenhagen, 1966.

36. When information on the number and composition of the households, and characteristics of their heads are available from two censuses (or national sample surveys), past growth rates of households and changes in their composition are known. The past growth rate, modified by anticipated changes in growth of population, number of newly married couples, and socio-economic factors relevant to new household formation, enable projection of households, and estimation of future housing demands. The projections can be made to the degree of sophistication that the needs dictate and the data permit. Household size for example differs between rural and urban sectors, and between industry-occupation groups; progress of urbanization and changes in industry occupation structure are accordingly taken into account in the projections. 24/

37. Changes in household and family size could be relevant to small savings, though in Africa and most of the developing world the unsatisfied potentialdemand for essentials is so pressing that changes in this source are hardly significant. 25/

38. The tabulation provides the basic frame for allocation and probability selection of areal units in multi-stage socio-economic sample surveys, which usually have household as the ultimate sampling unit.

39. Marital status

Tabulation R.7: Population by marital status, age and sex.

Tabulation A.33: Married males by number of wives, by age.

The tabulations enable study of the marriage factor, which is normally the starter for family building and new household formation. 24/ In absence of adequate marriage registration, the sex-age distribution of population by marital status can provide estimates of age-specific marriage, divorce, widowhood rates. The age at first marriage is actually

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24/ Average size of urban households is found lower than rural in Africa, mainly from the large proportion of single member households in urban areas, 36 per cent for urban Zanzibar. 8/ See also Paul C. Glick, 'Family Statistics', The Study of Population, Chicago, 1959, and Frederick F. Stephan, 'Statistics Needed to Measure and Project Changes in Marriage and Family Life and Their Demographic Consequences', Proceedings, American Statistical Association, 1967.

25/ The theory of higher small savings from falling family size rests on the assumption that if family income held the same, the average margin of saving should increase, other things remaining the same. But the savings margin is tenuous, and more is spent on better food, or medicine or education. Small savings are hardly taken into account in African plans. There are recommendations for small investments in Le Plan de développement de Madagascar (Républika Malagasy), but that refers to investment of more work time and initiative.

given by tabulation 26, which is dealt with later under births and fertility sub-section. 26/

40. Marriages generate demand, immediately and in their wake, for a number of specific commodities and services. Distribution of population by marital status, and trends in them, are important in forecasts of births by marriage- and age-specific fertility rates, when the marriage ages and rates are changing. The age at marriage itself could be a determinant of fertility performance and there are examples of countries moderating or trying to moderate the national birth rate by deferring marriages to later ages. 26/

41. Marriage has also been found to be associated with mortality of the partners, but much of the improved mortality experience of the married perhaps comes from the selection of healthy lives at marriage, and stability of living. Communicable diseases are more likely to attack both partners (indeed the whole household cluster), and association in the field of morbidity and mortality is brought about in this manner.

42. The marriage factor is also associated with the type of activity of the female, and important for future estimates of supply of female labour force: tabulation 27, discussed later, is of direct relevance in this regard. A typical pattern (which may not hold for particular countries or cultures) is characterized by a high peak of labour force participation among young unmarried females, decline with marriage and family responsibilities, and rise to a minor peak again in early middle age when children grow up, or with widowhood or separation. 27/

26/ Early marriages are in vogue in many of the African countries. India has one of the lowest ages at marriage for the bride, and deferring the age at marriage of the bride by 3-5 years is under active consideration there. The national birth rate went down sharply by deferred marriages in Ireland in the 19th century. Estimates of the ages at marriage will be naturally subject to the bias in age statements. E. van de Walle, 'Marriage in African Censuses and Inquiries', The Demography of Tropical Africa, Princeton, 1967.

27/ Demographic Aspects of Manpower, Sex and Age Patterns of Participation in Economic Activities, United Nations, Sales No. 61.XII.4; and Population Growth and Manpower in the Sudan, United Nations, Sales No. 64.XIII.5.

43. Migration and population re-distribution

Tabulation R.8: Population by ethnic group, place of birth, age and sex.

Tabulation A.30: Population by duration of residence in locality and major civil division, age and sex.

Tabulation A.31: Population by place of usual residence, place of previous residence and sex.

Migration across boundaries is a component of population growth for the territory within the boundaries. The migration component is often highly variable, and forecasting of its future course (perhaps, with the exception of rural to urban migration) could be highly speculative.

44. Internal migration leads to re-distribution of population in relation to better opportunities or prospects, (when not compelling like refugee movements) 28/, and urban growth is part of such re-distribution. Estimates of past levels of migrations indicative of future trends, are thus important for population projections, for the whole country, by rural-urban 29/ and between sub-regions. In view of the high variation of the migration flows, only broad ratio adjustments on the basic projections are generally allowed for the migration component.

45. Tabulations by place of birth, age and sex, give measures of life-time migration limited by the age. 30/ The cumulated curve of life-time migration also gives indications of intensities of flows at various age ranges (assuming stability of past experience). Tabulation 31 by places of usual and previous residence will provide measures

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28/ There is a large refugee population in a number of countries in Africa: Uganda, Nigeria, Central African Republic, Burundi, Democratic Republic of Congo, Senegal, reported substantial numbers of refugees. See UNHCR publications.

29/ Projections of urban populations were done, for example, for Ivory Coast and Madagascar. République de Cote-d'Ivoire, Première esquisse du plan quinquennal de développement, 1971-75, Abidjan, 1968 - the urban population is estimated to rise 40 per cent by 1980. Madagascar, Plan de développement économique et social, Programme 1958-62, which took into consideration the internal migration factor.

30/ Ajit Das Gupta, 'Types and Measures of Internal Migration', Proceedings, International Population Union Conference, Vienna, 1959.

relatively more proximate to migration flows, having the average time span of the previous change of residence. The tabulations provide directions and distances of migration streams.

46. Tabulation by ethnic groups will be of particular importance where settlement of some ethnic groups, or separate consideration for them in the national or regional plan, is contemplated. 31/

47. Tabulation by duration of residence in the locality, taken with other tabulations in the migration group, also enables improved estimates of net flow of migration under stable conditions. This will indicate what proportions of the movements have been short-range, medium-range, or long-range.

48. An other useful tabulation is 19 of the 'African Recommendations for the 1970 *Housing Census*' 23/, giving a distribution of the length of occupancy of the particular housing unit by the household, also indicates a facet of migration.

49. A number of related ancillary information may be needed in the field of migration, and specialized sample surveys will be called for in such cases, either with the census operations or independently. For example, an understanding of the reasons for migration, whether migrating and staying alone or followed soon after by other family members, association between migration and educational attainment and pre-migration income level, might be relevant. 30/

50. Sometimes, measures of short-range flow migration, which is likely to have characteristics different from longer range migration, may be required; so may be required, measures of day time commuting for work or marketing or attending educational and social centres, to plan efficiently the transport systems and suburban housing around principal cities. 30/

51. Type of activity

Tabulation R.9:	Population ... years of age and over by ethnic group, type of activity, age and sex.
Tabulation A.22:	Population not economically active by ethnic group, functional categories, age and sex.
Tabulation A.34:	Population unemployed in reference week by ethnic group, work status in the past 12 months, age and sex.

31/ South Africa, South West Africa and Algeria (before 1960) had above 10 per cent non-African populations. Morocco, Tunisia, Kenya, Zambia, Angola, Swaziland had high proportions of non-African populations too. Different African ethnic types are also found in the African countries.

Creation of more employment opportunities and better utilization of available manpower are included among the objectives of a number of African plans. 32/

52. These tabulations enable computing of labour force participation rates by sex-age (for different ethnic groups where desired), and the sex-age distribution of the unemployed (for the reference week) together with their work status during the past 12 months. Tabulation 22 also enables computation of the sex-age distribution of the two groups outside labour force - the students and the home-makers.

53. Labour force participation rates are essential for manpower estimates. When results in a time series from a number of censuses (or national sample surveys) are available, it may be possible to discern probable future trends; but often the future sex-age specific participation rates have to be borrowed from parallel precedents of countries in higher phases of development. Sometimes, rates of more

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32/ Most of the countries orient their plans with employment objective in view. Senegal emphasized the agricultural sector, about 85 per cent of the population being dependent on agriculture; République du Sénégal, Plan quadriennal de développement, 1961-64. Ghana had full employment among her long-term policies, Seven-Year Development Plan, 1963-70, Accra, 1964. In his introduction to the Government of Kenya, Development Plan, 1964-70, Prime Minister Jomo Kenyatta observed that all programmes to increase social welfare must begin with the problem of unemployment. République du Cameroun, Deuxième plan quinquennal de développement économique et social, 1966-71, contemplates to make better utilization of the work potential of the population through better territorial distribution, improving occupational qualification, and more efficient use of available time. Federation of Rhodesia and Nyasaland, Federal Government Development Plan, 1962-65, Salisbury, 1962, mentioned that the existing unemployment and under-employment were not merely serious social problems but reflected under-use of economic resources. In Republic of Zambia, First National Development Plan, 1966-70, Lusaka, 1966, increase of employment ranked as a top priority objective. Royaume du Maroc, Projet de plan quinquennal, 1968-72, works out the additional job requirements for the rural and urban sectors, and males and females, separately, in the next five years, in view of the high growth rate (3.3 per cent) of the active age group. United Arab Republic, General Frame of the 5-year Plan for Economic and Social Development, 1960-65, Cairo, 1960, affirmed that the most important social consideration is provision of fruitful work for those willing and able to work.

urbanized and industrial localities of the same country, available from static analysis of the latest census, can indicate the future profiles. Labour force participation rates are modified with development, generally falling at the younger (school) ages, the elderly (retiring) ages, and in some countries for the females where female participation was high at the pre-industrial phase. 33/

54. Tabulation 9 gives the sex-age distribution of the unemployed, broken into two categories of those unemployed for the first time and the repeaters. Tabulation 34 moreover identifies the hard core long-term unemployed who had not worked for the last 12 months; the hard core may require special remedial treatment. All this information is relevant to planning of employment opportunities. If expanding employment opportunities or utilization of manpower resources be an objective of the plan, a base line measure of employment level and utilization of manpower resources is needed; 34/ and the above tabulations provide broad indicators of employment.

55. Much more information at depth is really necessary for satisfactory formulation of a manpower utilization plan and its evaluation. Elements like hours or days worked over the seasons, income, intensity of work, additional hours available, attitude to work, as well as characteristics like educational attainment or skill level of the unemployed, underemployed and of the emerging labour force, and their distribution among sub-regions and rural-urban sectors, will be required; such information at depth is properly collected through specially designed sample enquiries. 34/

56. In subsistence or household sectors of economy, even identification of the unemployed is difficult as work is spread out among as many hands available in the household, some putting in only nominal hours of work. With development and transition to market economy, therefore, a section of the unpaid under-employed household labour comes out to the employment market and swells the number of the unemployed; some of those essentially required for home-making at the

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33/ High female economic participation rates are reported by a number of countries in Africa, for example, Lesotho, Portuguese Guinea, Dahomey, Madagascar, Ivory Coast, Dem. Rep. of Congo; Demographic Handbook for Africa, ECA, 1968; See also 27/. The female participation (adults, above 15 years of age) came down in Yugoslavia from 77 per cent in 1948, to 41 per cent by 1953.

34/ Ajit Das Gupta, An Empirical Approach to the Measurement of Underemployment, Proceedings, International Statistical Institute Session, Tokyo, 1960.

same time move out of the labour force. The distressing spectacle of shrinkage in labour force proportion but increase of unemployment, in this manner, sometimes emerges with development effort. 35/ Evaluation of the development effort to provide more employment, can only be done through comprehensive measurement of employment of the population through specialized sample surveys, and the limitations of the census medium should be understood. 34/

57. The age distribution of students from tabulation 22 can cross-check the school attendance ratios available from school records, and in absence of the latter, provide indicators of school attendance ratios by age. School attendance ratios are given directly by tabulation 19, discussed later. The student age population projections, along with the advances in school enrolment ratios planned, provide the perspective estimates of additional school positions needed to be created.

58. Expected future life time in labour force may be worked out from the data of these tabulations and labour force specific mortality tables (derived from incidence of reported deaths while in labour force).

59. Economic activity - industry, occupation and status

Tabulation R.10: Economically active population by ethnic group, industry, age and sex.

Tabulation R.11: Economically active population by ethnic group, occupation, age and sex.

Tabulation R.12: Economically active population by ethnic group, status, age and sex.

35/ A very striking example of the phenomenon was evidenced in Puerto Rico during the 1950's, when in spite of the accelerated high level of investment and brisk migration of a part of the labour force to the United States, the unemployment proportion went on increasing. T.J. Mboya, in 'Priorities in Planning', Education, Employment and Rural Development, Nairobi, 1967, placed sharp focus on the critical unemployment problem in Kenya; he observed that wage employment in Kenya in 1965 was not as gre t as it was 10 years ago despite sizable increase in coverage and an excess of 50 per cent in gross monetary domestic product. In the Kericho Conference conclusions, under-employment was estimated as 500,000 to 700,000 man-year equivalent, as against 2,300,000 to 2,500,000 existing employment, and hard-core unemployment of only about 200,000, in Kenya. Some of the lag in growth of employment arises from introduction of more capital-intensive projects; and the new projects in the organized sector sometimes push persons employed in the cottage and household sectors into unemployment or outside labour force.

Tabulation R.13: Economically active population by ethnic group, status, industry and sex.

Tabulation R.14: Economically active population by ethnic group, status, occupation and sex.

Tabulation R.15: Economically active population by ethnic group, industry, occupation and sex.

Tabulation A.23: Economically active population by ethnic group, occupation, educational attainment, age and sex.

Tabulation A.27: Economically active females by ethnic group, age, marital status, and by number of children below school age.

The above set of eight tabulations concerns more the production of commodities and services, that is the numerator quantities of the indicators of material welfare; they distribute the economically active (for each ethnic group), by sex and age, into the kind of work done by them (occupation), the activity of the establishment (industry), and the status of the economically active individual with respect to his employment (status), and provide a number of useful cross-classifications. For example, cross-classification of occupational distribution with educational attainment and age (tabulation 23), gives an indication of the level of education appropriate to particular occupation groups; and cross-classification of economically active females by marital status and children below school age (tabulation 27) gives the present pattern of economic participation of married females, which is liable to change with development and altered family composition. 33/

60. The numbers employed in various industries and occupations provide material for estimates of GDP in some approaches; 36/ and these tabulations produce the basic distributions.

61. The distributions of the economically active by industry, occupation and status are basic ingredients of economic development plans. The plans strive to alter the industry and status structure, shifting it more from agriculture and primary sector to manufacturing and secondary-tertiary sectors; and from the traditional sector of household enterprises and unpaid family workers, to the modern sector of organized establishments and employees. 36/ Where shortages of specific categories of manpower, like teachers, nurses, mechanics, scientists, doctors, engineers are felt, the classifications and tabula-

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36/ Yearbook of National Accounts Statistics, 1966, United Nations, Sales No. E.67.XVII.14. While the number of employees or number of own account and their average income are used to estimate certain sectors of national income, their use is obvious in showing income distributions. Some other uses of these tabulations will be found in Henri Leroux and Jean- Pierre Allier, Planification en Afrique: 6: Fonctions de production et modèles, Paris, 1963.

tions can be extended to cover those : the tabulations then provide the present stock of this scarce manpower, and successive censuses measure the progressive gains. 37/

62. Tabulation 15 furnishes the occupation distribution by industry; taken with tabulation 23, it can indicate the educational attainment required of the particular occupation in industry. These tabulations jointly suggest the nature of educational programmes necessary to provide the trained manpower for the industrial development envisaged in the plan. The pattern of training required to man various industries, depends not only on the very broad establishment classification that the status question provides, but on the level of mechanization of the plants to be set up. The present patterns of educational requirement may not accordingly hold for the planned projects of the future. Borrowing of coefficients from applicable precedents is usually resorted to; but static analysis of the educational attainments by age in various occupations within industry gives some indications of the plausible magnitude of shift in educational requirement with introduction of new technology.

63. The information thrown up by these tabulations may even be relevant at the stage of strategy decisions in plan formulation; for example,

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37/ Shortage of technical manpower and emphasis on building-up cadres of key personnel is a nearly universal feature of African countries. Congo (Brazzaville), Plan triennal; Republic of Kenya, Development Plan, 1966-70, Nairobi, 1966; Republic of Ghana, Two-Year Development Plan, 1968-70, Accra, 1968; Federation of Nigeria, National Development Plan, 1962-68, Lagos; Ethiopia, Second Five-Year Development Plan, 1963-67 (GC), Addis Ababa, 1962; Sierra Leone Government, Ten-Year Plan of Economic and Social Development for Sierra Leone, 1962-72, Freetown, 1962; Republique du Niger, Plan quadriennal, 1965-68; to mention a few, all observe how shortage of trained and experienced manpower circumscribes development effort, and make provision for more training and universitypositions to remedy the situation. Malawi, Development Programme, 1967, Zomba, 1967, included an education programme to produce more trained secondary school teachers, administrators, agriculturists, engineers, craftsmen, technicians.

the existence of a large proportion of unskilled labour may prompt adoption of more labour-intensive and lower technology base. 38/

64. The proportion of manpower employed in agriculture is an indicator of the level of industrial development. The proportion in unpaid family worker status could function as similar indicator. The industry and occupation groups provide the denominators for calculation of differential fertility and mortality, where adequate vital registration statistics and facilities for their linkage with census data obtain. As productivity of agriculture rises through development, more of rural agricultural labour gets surplus; problems of unemployment, urban drift and utilization of this emerging surplus are therefore involved in development planning processes, 38/ and the above tabulations can provide indications of magnitudes involved.

65. The employee groups including the unemployed, are particularly important for social security benefits, health and unemployment insurance, whenever they are introduced. Casual workers alternating between short spells of employment and unemployment, who abound in many parts of Africa, will be counted among the employees if they happen to be employed at census time. They however do not normally qualify for all social security benefits; and it may be desired to identify the group separately anyway.

66. The industry distribution by sub-regions is relevant in decisions for planned locations of new industries, and maintenance of regional balance; the information may be useful in plans for settlement of ethnic groups. 39/

38/ Appropriate classifications are important for analysis. Many countries, for example, find it difficult to devise a set of combined industry-occupation-status classifications, meaningful to the phase of their development, and not too large as to be difficult of comprehension. The United Nations International Standard Classification of all Economic Activities (ISIC), and the International Labour Organisation International Standard Classification of Occupations (ISCO), provide the detailed standard classifications. Specific mention of urban drift and urban development is made in: République du Congo, Plan intérimaire de développement économique et social, 1964-68; République islamique de Mauritanie, Plan quadriennal de développement économique et social, 1963-66.

39/ Republic of Sudan, The Ten-Year Plan of Economic and Social Development, 1961-71, has a target of removing barriers which prevent population of backward areas from participating in the modern monetary sector. République du Sénégal, Deuxième plan quadriennal de développement économique et social 1965-69, has a full volume of sub-regional programmes within the country in which natural resources, development and population factors are taken into account separately for each sub-region. Plan intérimaire de développement économique et social 1964-68 of Congo (Brazzaville) gives discrete treatment to Niari valley for agricultural development.

67. The industry-occupation tabulations provide cross-checks for bench mark data on establishment reporting of employees; and supplement them, when as usual, establishment reporting does not extend all the way down to the cottage or household industry sectors. They thus furnish materials for design of sample survey of industries, and for sample survey of employees in various industries (for example, for productivity or average income studies).

68. Literacy and educational attainments

Tabulation R.16: Population 10 years of age and over by literacy, age and sex.

Tabulation R.17: Population 25 years of age and over by educational attainment, age and sex.

Tabulation R.18: Population ... to 24 years of age by school attendance, educational attainment, age and sex.

Tabulation R.19: Population ... to 24 years of age by school attendance, single years of age and sex.

Literacy and education form the end objectives of the plans as components of levels of living which the plans strive to raise, 40/ as well as intermediate objectives of the plans to provide skilled manpower for the industrial progress.

69. The distribution of illiteracy, by sex, age groups and localities, provides the information needed to remedy the high illiteracy situation, for siting of schools of various types, including arrangements

40/ Raising of literacy and education levels is also a universal feature of African plans. To quote a few: Le Plan de développement économique et social du Gabon, 1966-71, provided schools for 80 per cent of children aged 6-16; Plan septennal, 1964-71, République de Guinée, while making further provision for education, mentioned that the proportion of school age population attending school had improved from 8 per cent in 1958 to 50 per cent in 1964. Republic of Zambia, An Outline of Transitional Development Plan, 1965-66, places the next priority on education after defence and administration, and makes a suitably high allocation of resources for it. Republic of Botswana, Transitional Plan for Social and Economic Development, Gaberones, 1966, while assigning priority to education in comparison to health, mentioned that only 40 nationals had degree level education.

for adult education. 41/ Tabulation 17 in particular indicates the extent of availability of educated manpower resources, in relation to present and future requirements of such manpower for the development projects, constraints if any imposed by shortage of trained manpower of particular categories, 37/ and needs for providing training programmes in the plan to meet emerging manpower requirements.

70.- Countries might desire to record and tabulate the number which attained the scarce educational levels, like qualified teachers and scientists, nurses and doctors, mechanics and engineers, in which case additional classifications will be introduced in the census. Such tabulations will then provide scope for mutual check with higher level manpower registers, where maintained.

71. Cross-classification by age helps to indicate the progress of literacy and education over time; or if relevant education statistics be available, to cross-check them.

72. Tabulations 18 and 19 distribute persons up to age 24 by school attendance, and furnish direct measures of the effectiveness and reach of the schooling systems, by various localities. The cross-tabulation of school attendance by educational attainment was important to understand the flows - who are still going ahead, and who left off at what stage. They indicate the successive step-ratios between school levels and the university. Tabulation by single ages is important for projecting of school and university positions that are likely to be demanded from year to year in future.

73. Projections of school and university positions are derived from the basic population projections, by application of perspective admission

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41/ Adult education projects found special mention in: Government of Kenya, Development Plan, 1964-70, Nairobi, 1964; Protectorate of Bechuanaland, Development Plan, 1963-68; Republic of Ghana, Two-Year Development Plan, 1968-70; among others. Bias and errors in reporting literacy status are believed to be widespread in some censuses in Africa; in view of the importance assigned to raising of literacy level, a sample verification of the response through a supporting written test may be appropriate in concerned countries.

and attendance ratios decided from current trends and future plans. 42/

74. Births and fertility

Tabulation R.20: Female population aged ... years and over, by age, and number of children born alive.

Tabulation R.21: Female population aged ... years and over, by age, and number of children now living.

Tabulation A.24: Female population aged ... years and over, by age, number of children born alive, and educational attainment.

Tabulation A.26: Female population aged ... and over, by age, number of years since first marriage, and number of children born alive.

Tabulation A.28: Female population aged ... years and over, by age, and number of live births in last 12 months.

Tabulations 20, 24 and 26 give the cumulated fertility performance of women by age, in respect of live births; the latter two provide cross-classifications to examine differentials in fertility by educational attainment, and by duration of marriage, that is, by ages at marriage.

75. Cumulated fertility or total number of children born, and trends in the number by age of the mother, can be used to estimate current age-specific fertility rates and total births in the population, when-

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42/ Projections of school age population were done in République tunisienne, Plan quadriennal, 1965-68, République malagasy, Plan quinquennal, 1964-68, Tananarive, also estimated student population till 1973. Kyale Mwendwa, in 'Constraint and Strategy in Planning Education', Education, Employment and Rural Development, Nairobi, 1967, pointed out that contemporary secondary: primary school enrolment was 47:1000 in Kenya - a 100 per cent gain in the ratio in 20 years, and gave projections for school age population of Kenya. The ratio of secondary to primary enrolment was of the same level in Ghana (39:1000 in 1960), but there was sub-regional variation of the order of 1:5 in school attendance: W. Birmingham, I. Neustadt, E.N. Omaboe, A Study of Contemporary Ghana, London, 1967.

ever the vital registration data is not adequate. 43/ Even where vital registration data are believed to be good, these tabulations provide a means of cross-check, and supplement the vital registration statistics, in regard to the inter-relation of cumulated fertility with educational attainment or duration since marriage. Tabulation 24 helps to indicate how much the progress of female education may affect fertility performance. The tabulations also provide the base for calculation of parity-specific fertility. If information be available over successive censuses, direct comparison and shifts in cohort fertility will be available.

76. The data collection for tabulation 28 is recommended on sample basis. Recall lapse is involved in such retrospective enquiries, and subsidiary battery of questions are necessary for proper analysis. 43/ Tabulation 28 renders the current fertility level, and estimates of current births; compared with the estimates from the other tabulations under this sub-section, trends in fertility performance and birth rates may be discernable. Unless the data for tabulation 28 be collected by sex of the birth, the sex-ratio at birth, necessary for population projections, will not be available from these tabulations.

77. Tabul tion 21 for the number of children now living, besides providing a check on tabulation 20 and possibly improving the completeness of the response on total children born alive, gives an indication of mortality, particularly in the early years of life. 44/ Additional information is thus provided to supplement or cross-check the vital

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43/ Ajit Das Gupta, 'Determination of Fertility Level and Trend in Defective Registration Areas', Bulletin of the International Statistical Institute, 30th Session, Stockholm, 1958. R.K. Som, 'On Recall Lapse in Demographic Studies', Proceedings, International Population Conference, Vienna, 1959. R.K. Som, Recall Lapse in Demographic Enquiries (under publication). M.A. El-Badry, 'Errors in Parity Data', Proceedings, International Population Conference, Ottawa, 1963, Liege, 1964.

44/ C.A.L. Myburgh, 'Estimating the Fertility and Mortality of African Populations from the Total Number of Children Ever Born, and the Number Still Living', Population Studies, Vol. 10, No.2. W. Brass, 'The Construction of Life Tables from Child Survivorship Ratios', Proceedings, International Population Conference, New York, 1961. W. Brass, A.J. Coale, P. Demney, D. Heisel, F. Lorimer, A. Romaniuk, E. van de Walle. The Demography of Tropical Africa, Princeton, 1967. Methods of Estimating Basic Demographic Measures from Incomplete Data, United Nations, Sales No. 67.XIII.2, New York, 1967.

registration statistics. The tabulation also helps directly to study bio-family compositions, which is not possible from other census questions.

78. The importance of the levels and trends of births, birth rates, and fertility rates to planning, has been discussed earlier. A given population ages with flux of time, is augmented by births, depleted by deaths, and changed by migration flows, to become the population at the next point of time. Forecasts of the specific fertility trends and estimation of future births, are thus essential ingredients of population projections.

79. Deaths and mortality

Tabulation 29: Number of deaths in last 12 months, by sex and age of decedent.

The tabulation will provide an estimate of deaths, death rates and age-group specific mortality. Like fertility, mortality is an essential ingredient of population projections, and its close estimation is therefore imperative for all analysis of population dynamics. The tabulation can provide valuable cross-check on methods and rates, if the vital registration statistics are considered reliable.

80. Even where the tabulation results from sample data turn out to be highly variant or deficient in some respect, the tabulation may indicate the broad distinctive sex-age pattern of mortality appropriate for the country. A set of model life tables like the one prepared by the United Nations 45/, could then be suitably adjusted to conform to the sex-age pattern of mortality of the country, indicated by the tabulation, and used for projections.

81. There are a number of other ways in which deficient data on deaths could be put to use: some of them are discussed in the later sub-section of estimation on adjusted data and intermediate analysis. The tabulations will indicate if there are any significant rural-urban differentials in mortality. Deaths by broad causes of death (like communicable diseases, other causes characterizing infancy or early childhood deaths, degenerative causes) are useful in estimating the future course of mortality, but it is difficult to secure valid

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45/ Age and Sex Patterns of Mortality: Model Life Tables for Under-Developed Countries, United Nations, Sales No.55.XIII.9. Also see, S. Ledermann and J. Breas, 'Les dimensions de la mortalité', Population, 14, 1959; The Situation and Recent Trends of Mortality in the World, United Nations, Sales No. 62.XIII.2; and E. Adams and P.S. Menon, 'Types of Data and Studies Needed to Improve the Basis for Population, Projections in Tropical Africa', Proceedings, World Population Conference, Belgrade, 1965, United Nations.

information on causes in sample surveys in developing countries for want of proper medical certification of deaths. 48/ The causes of death statistics are even more important to public health programme formulation. 46/

82. Like data on current births, collection of data on current (last 12 months') deaths is recommended on sample basis. Reporting of deaths extending through the period of a year may be liable to high recall lapse, 43/ and the questionnaire and tabulation design should provide for recall analysis. There is an additional complication for events of death, in so far as households may be extinguished or coalesced on death of the single member or the head of the household, and further suitable adjustment will be needed for this omission.

46/ Research in Public Health Aspects of Mortality Trends and Levels: Recent Experience and Future Trends, WHO/HS/WP/68.3 of 1968. G.Z. Johnson, 'Public Health Activities as Factors in Levels and Trends of Mortality and Morbidity in Developing Countries', Proceedings, World Population Conference, United Nations, Sales No. 66.XIII.6.

III. OTHER SOURCES, ANALYSIS AND APPLICATIONS

83. Only brief mention is made in this section of other routine sources of demographic information, as these are not well-developed yet in Africa. Sample surveys have found relatively greater application; they have been discussed in earlier parts of the text, and also will be discussed briefly in this section. Techniques of evaluation and adjustment, estimations and intermediate analysis, and population projections, are also briefly discussed, leaving out details of methodology, which are available in the references quoted and other standard works.

Vital Registration and Other Routine Sources

84. Of the routine sources of population data aside from the census, the vital registration system is the most important. Indeed, in developed countries where vital registration is complete, the system is used as a check on census enumeration, particularly at the infant and young childhood age range where under-enumeration is common. With the census population sex-age base, vital registration data give the age-specific fertility and mortality rates, in addition to the natural growth rate of the population segments. Births are registered by sex, and the sex-ratio at birth needed for population projections, is also given by vital registration data. Vital registration data moreover give the seasonality of births and deaths found in most countries, which has relevance to planning of related services and commodities. 47/

85. The "cause of death" analysis possible from complete vital registration systems with good medical certification of death, is helpful in forecasting the future course of age-specific mortality, considering the contribution from the more easily preventable causes, and the public health and medical care programmes of the countries. 48/ Similarly, changes in

47/ Even a grossly defective vital registration system may reflect the seasonality pattern correctly, if there be no seasonality bias in the system, like periodic excess time lags or under-reporting from transport and communication difficulties or prejudices.

48/ The situation is that very few developing countries have complete vital registration, and hardly any complete and good medical certification. Prognosis about the future course of mortality is often based on recent trends and on parallel precedents; choice of precedents contains a margin of arbitrariness. Estimation of the significant broad classes of causes for the population itself by surveys or other techniques therefore becomes very much desirable: Y. Biraud, in A Method for Recording Crude Causes of Death by Laymen in Under-developed Countries, document WHO/HS/60 at African Conference on Vital and Health Statistics, 1956, advocated such course. S. Swaroop and K. Uemura, in "Proportional Mortality of 50 Years and Above", Bulletin of the World Health Organization, Vol. 17, an efficient indicator of mortality and health.

age-and parity-specific fertility disclosed by the birth registration series, indicate the probable future course of fertility during the plan period.

86. Complete vital registration currently covers only an insignificant section (less than 3 per cent) of the population of Africa, and alternative sources and devices, therefore, have to be resorted to. Defective registration data can however be put to good analytical use in certain circumstances. One example is the possibility of estimations of the growth rate from defective birth registration data when the birth rate is still invariant. 17/ Estimates of death rate may similarly be made from defective registration data, from the analysis of the age distribution of deaths; estimates of birth rates could next be derived by differencing, from the above estimates of growth and death rates. The estimates of death and birth rates, so obtained, indicate in turn the levels of under-registration of the vital registration system. 17/ Under-registration could be selective of the sex of child and marital status of mother, in the case of birth registration, and of sex and age of the decedent, in the case of death; by successive adjustments, improved sets of estimates of the vital rates can sometimes be achieved. 16/

87. Even good vital registration systems on the other hand, are not found adequate for all planning purposes. Specialized sample surveys, particularly in regard to family planning practice and desire for children by characteristics of the couple, and in regard to causes of death (infant, childhood, and general mortality) by social class, are conducted in many countries to supplement the vital registration information. 49/

88. Other specialized sectional sources of demographic data, apart from housing censuses, as already mentioned, include: marriage registration; migration and emigration statistics; employment exchange and unemployment insurance files; higher level manpower registers; industrial establishment returns; refugee records; old age pension files; school and hospital records; and life insurance experience.

89. Marriage registration statistics can give the marriage rates, their seasonal distribution and the ages of the partners, by ethnic groups and other differentials if registration is complete. This information is relevant, but more related information than is available from the

49/ D.V. Glass and E. Grebnik, The Trend and Pattern of Fertility in Great Britain: A Report on Family Census of 1946, London, 1954; Charles F. Westoff, Robert Potter, Phillip Sagi, and Elliot Mishlev, Family Growth in Metropolitan America, Princeton, 1962. Ruth R. Puffer and G. Wyhne Griffith, Patterns of Urban Mortality, WHO, Washington, 1967.

registration system, like the various forms of union 50/, level of education of the partners, association of these characteristics and the age at marriage with subsequent fertility performance, may be needed; a specialized sample survey is then called for. Similarly, even in countries with good census and employment registration systems labour force or employment sample surveys are found necessary to supplement census and employment exchange information on labour force, in order to meet the requirements of detailed manpower or employment planning. Routine migration statistics do not give the reasons for migration and many other related facts. The routine education statistics and censuses do not indicate the reasons for not being in school or for dropping out.

90. While analysis of information from all available sources is advised, cross-checking the results from alternate sources, possibilities of deficiencies and selective bias in the sources should be borne in mind. For example, marriages may not be registered by particular segments of the population, the employment exchange and hospital records will cover only persons who come to these institutions, and are thus likely to be unrepresentative of the general population and industrial establishment reporting will omit the cottage industry and household sectors.

Sample Surveys

91. Sample surveys, with their manageable size, flexibility, and ability to furnish relatively more accurate and integrated information, are particularly important for the developing countries with inadequate data situations. Their role has been well recognized and established in Africa. It may take some time and experience with local media before quality information is produced by them, 51/ but sample surveys have become an essential part of the information system involving population and planning. Where probing and studies at depth, or studies with specialized personnel are called for, the sample survey is the only plausible medium.

50/ Collection of Statistics of Marital Status in Africa, ECA document, E/CN.14/CAS.4/CPH/5. R. Blanc, "Le mariage en Afrique. Concepts et Aspects démographiques"; J.C. Mitchell, "Marriage, Stability and Social Structure in Bantu Africa", L. Braithwaite and G.W. Roberts, "Mating Patterns and Prospects in Trinidad", Proceedings International Population Conference, New York, 1961. Also refer 26/.

51/ Final Report of the African Seminar on Vital Statistics, Addis Ababa, 1964. United Nations Sales No. 65, XVII.6. Georges Sabagh and C. Scott "An Evaluation of the Use of Retrospective Questionnaires for obtaining Vital Data; the Experience of the Moroccan Multi-purpose Sample Survey of 1961-63", Proceedings, World Population Conference, Belgrade, 1965, United Nations Sales No. 56, XIII.7. A Romaniuk, "La fécondité et stérilité des femmes congolaises", Proceedings, International Population Conference, New York, 1961. Notes on Variance and Co-variance Estimators in Demographic Sample Surveys's ECA Statistical Newsletter, No. 29, 1969.

92. Because of their flexibility, the additional expert attention and control arrangements that go into their design, and better training and interview situations under which they operate, sample surveys are in a very advantageous position for locating, and assessing response errors and biases; in demographic and many socio-economic surveys, the response errors could be of much higher magnitude than sampling errors. The response errors and biases, when located, enable a better understanding of the reported census and vital registration data, which are also subject to similar errors.

93. Sample surveys enable collection of data on demographic variables on the one hand and socio-economic variables on the other. Sample surveys can be designed to render specific information required to answer particular sets of questions. Because of these advantages, sample surveys are common even in countries and fields where good routine official data are available. Common examples of specialized sample surveys in developed countries are labour force sample surveys to estimate periodically the employed and the unemployed, their attitude and characteristics, fertility and family planning surveys to find out the number of children desired, spread of family planning practice as indication of the future course of fertility and sample surveys of morbidity and mortality. A word of caution, however, has been very properly sounded in the "African Recommendations for the 1970 Population Censuses" 11/, against the tendency to break down sample data into too many cells; this limitation of sampling should be respected.

94. Even a complete enumeration is often checked by a sample verification in many countries as is the extent of completeness and quality of the vital registration system.

95. Mention can be made here of the technique of estimation through sample registration tracts, in which complete registration by an alternate or re-inforced agency is done in small tracts of a country selected as a probability sample. Improved operation and control is exercised, and often annual counting of the population in these sample tracts is done, to secure for the country as a whole, improved estimates of vital rates, internal migration and growth. 52/ Sample registration uses the principles of sampling, but is essentially different from sample surveys. One feature of sample registration is that by progressive cluster building, a sample registration system can gradually grow into a complete registration system, say in 15-20 years time.

52/ Use of sample registration tracts was suggested some time ago; see Philip M. Hauser, Bulletin of the World Health Organization, Vol. 11 (1954); and 43/. They were tried in Pakistan in estimation of growth in the PGE project; see, Population Growth Estimation Procedure, Special Studies Series, PGE 1, Pakistan Central Statistical Office, Karachi, 1962. They are currently being tried in India on a wide scale. The Rural Demographic Sample Survey, 1965-66 of Nigeria, Federal Office of Statistics, Lagos, had some elements of the sample registration tract approach in it.

Evaluation and Adjustment

96. It is obvious that the analyst should test and evaluate the data, and adjust it in the light of the results of evaluation, whenever there is scope for such adjustment, before proceeding with further analysis. Evaluation and adjustment are indeed part of the analysis process; and such intermediate analysis is exceedingly important in the inadequate data situation of most developing countries, including those in Africa. Inferences, estimates or projections based on data, before evaluation and possible scientific adjustments of faults discovered in them, are to be taken with a great deal of reservation.

97. Examination of age-reporting errors and biases in censuses, and steps taken to mitigate them by grouping and smoothing provide a traditional instance of evaluation and adjustment of population data. 53/ Age is a fundamental variable in demography, and evaluation of age reporting is most important. Age of the mother in birth registration, and age of the decedent in death registration, are liable to high degrees of error, and examination and adjustment of errors of age-reporting in the vital registration system are equally important.

98. Evaluation of census under-count of certain sex-age segments in some cultures is another common example; the total census count is often adjusted on the basis of a sample verification, though the verification itself could carry some of the biases of the census medium. 54/

99. To estimate population growth from successive censuses, it is usual and important to ensure that the successive censuses are comparable in coverage and quality of count; the census counts are evaluated, and the counts considered defective are suitably adjusted before further analysis. It is obvious that unadjusted series of censuses could lead to large errors in the growth rate. Omissions of infants, young children and females, and sometimes overcount at age 0, have been found in a number of censuses. Omissions could be located and adjusted from vital registration

53/ The single age distributions of many censuses have been examined and the unusual concentrations observed at certain digits of age have been smoothed by appropriate grouping and graduation. Ansley J. Coale, in "The Population of the United States in 1950 classified by Age, Sex and Colour - A Revision of Census Figures", Journal of the American Statistical Association, Vol. 50, 1954, was able to spot patterns of age-reporting faults and adjust the U.S. census count of 1950 from his analysis of these faults. A searching examination into age-reporting errors and biases for a developing country was done in "A Technical Note on Age Grouping" National Sample Survey No.11, New Delhi, 1959. The grave biases of African age reporting, along with other evaluation and reliability check techniques, have been discussed in "Age Data in African Censuses and Surveys" Report of the Seminar on the Organization and Conduct of Censuses of Population and Housing, E/CN.14/CPH.13, 1968.

54/ H.V. Muhsam, "Population Estimates Based on Census Enumeration and Coverage Check", Population Studies, Vo. XIII, No. 3, 1960.

statistics, if adequate; there are techniques for adjustment through static analysis and use of age-structure models, when vital registration statistics are inadequate.

100. An adjusted population base by sex-age groups is the first pre-requisite of population projections, which will otherwise carry on errors from the base. Consistency between the sex-age group population base, and the current starting of points of the emerging fertility and mortality assumptions, can hardly be effected without adjustment.

101. When, for example, the total children born, or the numbers of births, deaths, or spells of sickness, are forgotten due to passage of time since the event, which is a very common experience, the recall lapse could be located and adjusted by suitable analysis. 43/ Unless the adjustment is made, the serious underestimate of the variables may result, nullifying most of the value of the survey effort.

Estimations on Adjusted Data and Intermediate Analysis

102. The estimation of the population growth rate has been referred to earlier, as that is the most commonly used population parameter in planning. The inter-censal growth rate is estimated from two consecutive censuses, after adjustment for coverage and quality. The important thing in planning is however, estimation of current and future plan period population growth rates. This could be done by fitting the suitable exponential or logistic curves, when a census series exists; in the absence of such a series, other devices or assumptions are applied to estimate the current and perspective growth rates. 55/

103. A set of independent or quasi-independent estimates of the population variables are sometimes possible, even in some inadequate data situations; and approaching the variables from different information sources is generally advisable. Population growth rates for example, could be estimated independently from the vital registration source and the census source and sometimes also from the sources jointly; these could be compared and an improved estimate chosen from the set of alternative estimates. 17/

55/ Examples of estimation of the levels of recent growth when only one census with age distribution is available, and the current and perspective rates when series of censuses are available, by fitting quadratic exponentials are given in 16/. Fitting of logistic curves has been the traditional technique. If the trend of decline in mortality can be estimated and fertility remains invariant (as it will in most such situations), the trend of increase in growth rate is known. Current growth rate can also be estimated in similar situations from defective birth registration data, provided the coverage and quality of such registration is not changing 16/.

104. Separate estimates of birth rates may be made from the census questions on cumulative fertility and current (past 12 months) numbers of births, as also from adjusted vital registration statistics. Similarly, separate estimates of death rates could possibly be made from longitudinal comparison of age cohorts between two successive censuses, analysis of age distribution of deaths, and from the census question on current numbers of deaths. Such a battery of estimates, along with the adjusted young age distribution, provides a framework for progressive improvement of the estimates 17/

105. Estimates of the future courses of fertility and mortality are necessary for population projections. They are inter-related with socio-economic variables, and the inter-relations are not well understood or established yet. Significant variations in these inter-relations between cultures, and within cultures between socio-economic groups not only in extent but also in direction, have been observed. Further, the plans change the socio-economic structure itself, even where they do not propose to modify the population factor directly; and these structural changes in turn impinge on the population variables. But estimates of the future courses of the fertility and mortality components required for population projections are made from a study of past trends, improvements in the socio-economic field planned (e.g. in education, public health, housing, real incomes), and parallel precedents. 56/

106. If for simplicity the migration component be ignored, the vital variables of births and deaths produce changes in population, and passing time ages it. Given the age-distribution, therefore, and one of the two vital variables (births or deaths), the other variable can be estimated. On the other hand, the future population by age distribution could be estimated, given the present of age-distribution and the progression of birth and death variables, which furnishes the theoretical basis of population projections by the component method. In fact, projections by the component method are themselves a class of estimates, using other intermediate estimates as ingredients.

Population Projections

107. Various types of population projections required for development planning and sectorial programming, have been referred to earlier. The

56/ A. Romaniuk, "Projection Basis for Populations of Tropical Africa: a General Discussion", Proceeding World Population Conference, Belgrade, 1965, United Nations Sales No. 66. XIII.7. Reference may be made to African Development Plans, for example, Final Draft of the Seven Year Agricultural Plan 1963-69 of Ghana, République Centrafricaine Plan Intérimaire Biennal, 1965-66, République Malgache Plan Quinquennal 1964-68, République Tunisienne Plan Quadriennal 1965-68, which gave population projections for the respective countries.

detailed procedure of the component method of projection is not dealt with here. 57/

108. Usually, the basic projection is of population by sex in five year age groups till old age, and then a terminal old age group. Standard classifications for age suggested are: under 1 year, 1-4 years, then by 5 year groups to 84 years, and a terminal group of 85 years and over. The basic projection is usually made for a time-span of 20-25 years, but the span depends on the purpose for which the projection is reduced. Though a somewhat longer span may be required for the purpose of perspective planning, it should be remembered that the projections get more and more speculative with increasing length of time. The basic projection is often done in 3 or more variants, one "high", the other "low", around the "medium" which the operator considers most likely; there is sometimes also a variant depicting the course of current levels of fertility and mortality.

109. The different variants provide the planners with plausible alternative models of population growth and structure, and their implications; the "high" and "low" variants however do not correspond to any confidence intervals in the statistical sense.

110. The projections start from a factual basis, often the most recent census or adjusted census population by sex in five-year age groups, and provide estimates of the same groups usually at five-year intervals of time from the base year. The successive age groups in such a case are advanced five years by multiplication by survival factors derived from underlying mortality assumptions, and the initial 0-4 age group is generated by births produced by the fertility assumptions and then advanced from births to age 0-4 by appropriate survival factors. An assumption as to the sex-ratio at birth is also necessary; it usually varies between narrow limits, and is kept invariant during the projection period. For developing countries, unless a vigorous national fertility moderation programme has been effective, fertility is often kept invariant for a short or medium time-span. Projections incorporating fertility reductions

57/ Methods for Population Projections by Sex and Age, United Nations, Sales No. 56. XIII.3, New York, 1956, or some standard text-book on demography may be referred to. The essential ingredients are: (i) a current sex-age distributed population base; (ii) current estimates of age-specific mortality and fertility (with the sex-ratio at birth) consistent with the population base, and realistic well-reasoned assumptions as to their future course during the projection period; (iii) also estimates of the migration factor, where this is significant.

are also sometimes prepared for illustrative purposes, to demonstrate the various advantages of reducing fertility. 58/ In most developing countries, mortality is assumed to fall at a pace in line with the actual mortality experience, and the likelihood of programmes in the public health and medical fields in operation being accomplished. Contemporary experience is that public health measures and modern medicine rather than nutritional improvement, are bringing sharp declines in mortality. 59/ In practice, a projection of age-specific mortality, or corresponding survival factors is first made, with different variants, for the projection perio.. For countries lacking well-determined patterns of specific mortality, it is usual to adapt, in the light of the indications provided by its own experience, a set of model mortality tables, like the United Nations family of model mortality tables 45/, and use the adapted set for future patterns and improvements of mortality.

111. Apart from model building and research, in the vast majority of cases, the population projections are produced in answer to some operational questions or needs. The types of projection therefore depend on these questions and needs, and are as numerous. The basic projections could be split into sub-regional, urban or city projections, according to need, and to the availability of subsidiary information to permit valid assumptions involved in such splitting (like relative growths of sub-regions, urban sector or cities, or the size of migration flows between them).

112. Projections by ethnic groups are preferably based on the deviant fertility and mortality of the groups. In most cases, however, only the direction and broad dimension of the deviation may be known, and the ratio method of estimation from the basic national population projections will be used.

58/ The recent African Regional Meeting on the Role of Women in National Development, Addis Ababa, 1969, organized jointly by the ECA and the German Foundation for Developing Countries, with the collaboration of United Nations and Specialized Agencies, recommended, among other things, that "family planning should be included as part of the normal and routine maternal and child care work of the basic health services as well as educational and community and social welfare..... in order to enable mothers to have children by choice rather than by chance" (Provisional Report of the Meeting). This is a step towards fertility moderation in African countries, but it usually takes many years before substantive impact on fertility performance is achieved.

59/ George J. Stolnitz, "Recent Mortality Declines in Latin America, Asia and Africa: Review and Some Perspectives, Proceeding, World Population Conference, Belgrade 1965, United Nations, Sales No. 66.XIII.6. Research Needs in the Field of Mortality South West Asia Region, WHO/HS/WP/68.21 of 1968, for example, points out that the public health and other environmental improvements which perhaps brought down infant and general mortality, have not had the same impact on early childhood mortality of the region.

113. The basic projections could also be split into single ages in sensitive ranges.

114. It will be clear that whatever current population profiles are required for the present time, similar profiles for future dates will be required for the logistics of planning. One of the very common requirements is : projections of the school population with reference to the school admission, attendance and drop-out ratios, which are usually done by single years of age; similarly, projections by educational attainment, may be required by single ages for the young adult range; projections of key personnel like teachers and scientists, nurses and doctors, mechanics and engineers, are sometimes called for; labour force projections are desirable by single years of age for the young entry ages, to visualize the changing pattern of new entrants by age.

115. These subsidiary projections are usually derived from the sex and five-year age group basic projections, by application of relevant sets of ratios, such as territorial distribution ratios, single age distribution coefficients 60/, which belong to the domain of demography, or school enrolment, 61/ educational attainment, labour force participation and unemployment ratios, which belong more to the domain of sociology or economics. Sometimes targets of improvement of these ratios will be a part of the plan effort, and induced changes in them should be taken into account. Some of the projections, on the other hand, may not require sex-age breakdowns; projections for housing and households, projections of population dependent on agriculture, projections for provision of some protective items of food or public health services, furnish examples of such aggregate interests. It is obviously desirable to have one single basic population projection, and derive from that a consistent set of subsidiary and segmental projections; and to organize or co-ordinate the various projections at one place.

60/ With sophistication in analysis, greater refinements and more detailed breakdown of data and projections, are usually demanded. Unless the basic data are good enough. These subsequent refinements and detailed breakdowns are clearly out of place.

The usual practice is to split the five-year age groups of the basic sex-age projection into individual age populations, rather than to make individual age projections. The underlying technique is one of interpolation, examples of which may be found in 17/. The individual age projections so obtained are smoothed ones, not affected by chance variations in births and infant and early age mortality.

61/ Estimating Future School Enrolment in Developing Countries, United Nations/UNESCO, Sales No. 66.XIII.3, New York, 1966.

116. Population projections are required from the very preparatory stages of planning, like realistic policy formation and target setting, which cannot be effectively done without knowing the future populations for which targets are being set. 62/ They are required at the detailed plan formulation stage; and then for evaluation, and through the circular process of feed back, to the preparatory stages of the next plan. The plan may not purport to modify directly the population quantities, which have major weight in the denominator, but every plan has objectives of improving population quality - and quality, in any given situation is not independent of quantity. In planning greater availability of commodities, and educational and health services, improvement in the quality of populations is planned; changes in quality will affect the components of population quantity through the inter-relations between socio-economic and population factors. Unless consequential population quantity changes are kept in view, serious imbalances might result. The population factor is thus more involved in the development plans than is often realised.

117. Population projections should be revised as soon as new information or analysis leading to changes in the population base or the fertility-mortality assumptions is accepted. As with the original set of basic assumptions, the internal consistency of the revised set should be checked at the start.

62/ This aspect is presented aptly in République Tunisienne, Plan Quadriennal 1965-68, in the following terms: "La démographie constitue un secteur d'études fondamental qui conditionne toutes les prévisions dans les autres secteurs. Ainsi, c'est à partir de l'évolution de la population que sont déterminés les programmes de scolarisation, d'habitat, la structure quantitative et qualitative de l'emploi, la structure de la sécurite sociale etc."

IV. SUMMARY

118. The ultimate goal of the development plans is to increase the material welfare of the people of the country, by the people of the country. The population factor not only enters the denominator as consumers and beneficiaries of the increased flow of material welfare, but also enters the numerator as producers of the commodities and services that provide the increased flow of material welfare. The population factor is thus more involved in development planning than is often realised, right from the policy formation, through detailed plan formulation and evaluation stages..

119. Most plans in Africa do not purport to change the flux of population quantities; but all of them naturally strive to change the level of population qualities. And in any given situation, population quantity and quality are dependent on each other. The plans change the socio-economic structure, and these structural changes in turn impinge on the components of population growth. Unless consequential population quantity changes are kept in view, serious imbalances might result. Though Africa does not exhibit population pressure in the static sense, the high growth rate of population is a serious strain on development effort in the dynamic sense.

120. Taking account of the population factor is thus compulsory in development planning, and most African countries have made some use of demographic data and analysis in their plans. The present document sums up the various applications of demographic data and analysis, either actually done in African countries, or possible and desirable.

121. A good deal more value can be extracted from the census operations or the vital registration source by adequate analysis of data; by deeper analysis, the productivity of the investment is enhanced. Another additional advantage of deeper analysis is that the source itself gets evaluated in the process, and means of improvement are suggested. It is therefore imperative that the countries should ear-mark a suitable portion of available resources for analysis of census and other data systems.

122. The role of sample surveys, with their manageable size, flexibility, and ability to furnish relatively more accurate and integrated information, is already well recognized and established in Africa. Sample surveys, either linked with the census operation or independent, may be used further to improve estimates of the current fertility and mortality components, and to gather integrated information covering marriage, education, employment, migration and health characteristics. Because of additional expert attention and control arrangements that go into their design, and the better training and interview situations under which they operate, sample surveys are in a very advantageous to locating and assessing response errors and biases. In demographic and [illegible] economic surveys, the response errors could be of much higher order of

magnitude than sampling errors. The response errors and biases, when located, also enable a better understanding of the reported census and vital registration data, which are subject to similar errors and biases. This, of course, assumes deep analysis of the survey material.

123. Data should be tested and evaluated, and then adjusted if necessary in the light of the evaluation, before further analysis is done; evaluation and adjustment are indeed part of the analysis process, and are exceedingly important in the inadequate data situation of the developing countries, including those of Africa.

124. A set of independent or quasi-independent estimates of the population variable is sometimes possible, and in inadequate data situations, approaching the variables from different information sources is generally advisable. The population growth rate, the most commonly used population parameter in planning, can often be estimated in different ways by use of different sources. A set of alternative approaches may improve the estimate, and in any case promotes better understanding.

125. Whatever current population profiles are required for the present time, similar profiles for future dates will be required for the logistics of planning. Usually three is a basic projection by sex and five-year age-groups up to old age (and a single terminal old age group after that), for a time-span of about 20 years, possibly in three variants, "high" "low", and "medium", on different plausible assumptions of future courses of fertility and mortality components. In some African countries, international migration is of sufficient importance to be taken into consideration as a separate component, in the basic projection. Subsidiary projections of school age population, and of population by educational attainment of key personnel, or of emerging labour force, often required by single years of age in the pre-adult and young adult range, and projections of sub-regional or urban or primary city populations, are normally derived from the basic projection. The various projections are best done or at least co-ordinated in the same technical unit.

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