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**REPORT OF THE WORKING GROUP ON
NATIONAL AND SUBNATIONAL POPULATION PROJECTIONS
CAIRO, EGYPT, 25-30 NOVEMBER 1974**

Introduction

1. The Working Group on National and Subnational Population Projections in Africa was organized by the Economic Commission for Africa in collaboration with the United Nations Population Division, the United Nations Fund for Population Activities and the Office of Technical Cooperation in Cairo and held from 25 to 30 November, 1974. The Government of Egypt provided host facilities for the Working Group, while the Cairo Demographic Centre and the office of the United Nations Development Programme in Cairo assisted with the arrangements for the meeting.

Opening Addresses

2. The Working Group was opened by Mr. Gamel Askar, President of the Central Agency for Public Mobilization and Statistics. Welcoming the participants, Mr. Askar said that the choice of Cairo as venue for the meeting was well grounded as Egypt faced a high rate of population growth which the Government was making every effort to counteract through efficient development planning with the proper statistical and demographic inputs.

3. The activities of the Egyptian Government in the population field included a national fertility survey, a vital statistics survey at present in progress and a population census planned for 1975. All those activities were being undertaken with assistance from UNFPA. He also mentioned the establishment of a research and training centre within the Central Agency for Public Mobilization and Statistics responsible for analysing demographic data and undertaking demographic surveys needed for national population policies and planning.

4. Egypt was willing to share its experience with other African countries whenever they could be of use. He promised that the services of the Central Agency could be made available to other African countries in all fields of demographic data processing. Lastly he wished the meeting well and expressed the hope that the work of the meeting would help in providing better life for Africans.

5. In the absence of the Executive Secretary of the Economic Commission for Africa, his opening statement was read on his behalf by Mr. D.K. Ghansah, Acting Chief of the ECA Population Programme Centre. In his statement he reminded the participants of the problems that planners in African countries faced in their work because of the lack of reliable bases for forecasting population, especially at the subnational and sectoral levels. One of the main obstacles was lack of data. In order to help remedy that situation, the United Nations was assisting a number of countries to undertake population censuses. He hoped that such assistance would help provide an impetus for future efforts in the countries concerned.
6. Proper planning, especially at the subregional level, could only be based on the requisite projections relating to the groups whose welfare was sought. In the years following the World Population Conference, that would be very important, and he hoped that the participants would gain an insight into some of the tools needed for such projections.
7. Referring to the co-operation the United Nations Family had already achieved in the field of sectoral projections, he stressed that assistance was needed from national experts to ensure that it provided the maximum benefit.
8. It was essential to remember the special problems of the region and provide guidelines which would benefit African countries. He hoped that the regional demographic training and research centres would undertake more work in the field, especially in view of the fact that many of the countries of the region did not have the requisite personnel to undertake such work alone.
9. Lastly, he expressed appreciation to the Government of Egypt for its hospitality, the Central Agency for Public Mobilization and Statistics, the Cairo Demographic Centre and the Office of the United Nations Development Programme for the assistance they had given in the organization of the meeting.
10. In a brief statement the Deputy Resident Representative of the United Nations Development Programme in Cairo, Mr. Azumi, also stressed the importance of the Working Group, especially in the follow-up to the World Population Conference. Efforts were already being made by the United Nations system in ensuring co-operation, especially in the field. He thanked the Economic Commission for Africa for organizing the Working Group and wished the meeting well in its deliberations.

Attendance

11. Representatives from the following member States of the Economic Commission for Africa participated in the Working Group: Algeria, Cameroon, Egypt, Ethiopia, Ghana, Madagascar, Mauritius, Nigeria, Togo, Tunisia and Zambia. Also represented were the following United Nations organizations: FAO, the ILO, UNESCO, and Headquarters Population Division. The Cairo Demographic Centre, the Institut de Formation et de Recherches Demographiques and the Regional Institute for Population Studies were also represented.

In addition, trainees from the Cairo Demographic Centre and the Institute de Formation et de Recherches Démographiques also participated. Mr. Ajit Das Gupta (India) served as consultant to the Working Group.

Election of officers

12. The Group elected Mr. Nadr Fergany of Egypt as Chairman and Mr. C. Tarifa of Tunisia as Vice-Chairman.

Adoption of the agenda

13. The Group adopted the following agenda:

1. Opening addresses
2. Election of officers
3. Adoption of the programme of work and the time table
4. Projection of the total population at national level: review of methodology and data requirements
5. Uses of subnational population projections in general: regional and urban planning
6. General review of methods of subnational population projections and data requirements
7. Households and families projections
8. School enrolment and educational projections
9. Visit to the Central Agency for Public Mobilization and Statistics, Cairo, for Computer demonstrations
10. Labour force and employment projections
11. National co-ordination and co-operation between agencies involved in projections
12. Other matters
13. Adoption of report.

Item 4: Projection of the Total Population at the National Level:

Review of Methodology and Data Requirements

14. Methods and data requirements for projections of total population at national level were generally known, and the discussion centred more around specific situations and operational experience. Both the mathematical or aggregate extrapolation method and the component method were discussed, but the component method received most attention.

15. The mathematical method required only a time series of population counts, and was still useful for countries with the very minimal population data. Usually an assumption as to the long-term law of growth would be involved, and logistic growth was normally appropriate for population projections. Projection of the time series trends and some other mathematical forms were also mentioned.

16. The component method of projection was one step ahead, and most countries had switched from the mathematical method to that method for their national-level projections. A starting sex-age population base was needed for projection in sex and age groups by the component method, besides the estimates of levels and trends of sex-age specific mortality and fertility components; assumptions as to the future course of those components of national growth were based on the prevailing trends at the starting point, and on changes likely to be induced during the projection period from socio-economic development envisaged.

17. In national-level projections, the migration component was often ignored. It was pointed out, however, that the migration component was significant for many African countries. Both a satisfactory methodology and data to incorporate the population changes from the migration component were lacking, and some approaches were suggested to remedy the situation.

18. Estimation of the sex ratio at birth was also necessary for projection by the component method, but the male/female percentage ratio varied within narrow limits a little above 100; the ratio was usually taken as invariant during the projection period.

19. There was general agreement that most of the work on projections by the component method had to be devoted to the adjustment to be made with caution, of the starting sex-age base, and estimating the levels and trends of the components. Some of the participants stated from their personal experience that the intermediate analysis leading to adjustment and estimation amounted to as much as four fifths of the total projection work. Preliminary evaluation and adjustment of the reported population counts were necessary even in the case of the mathematical method.

20. The role that base data played in projections was emphasized by a number of participants; that aspect, it was agreed, was of utmost importance in Africa. But the assumptions as to the future course of the components also gave rise to difficulties. It had become more or less a convention to assume a declining trend of mortality, but in some countries of Africa the declining mortality trend was not yet established; enough resources could not be set apart for health and nutrition programmes. The decline in mortality usually assumed in projections had therefore been occurring only in a few African countries. It was therefore necessary for demographers to examine conditions critically before deciding on mortality assumptions in projections for African countries. The future course was susceptible not only to the policy variables, but also to their implementation.

21. The matter of internal consistency between the base sex-age population structure, and the starting estimates of the components, was discussed. It was stressed that even the estimated sex ratio at birth needed to be tested against the base sex-age structure and the estimated initial level of the components.
22. It was pointed out that, in the projection of a national population, whereas the level of fertility would be sufficient and its age pattern would bring in only comparatively little variation in the estimation of births, the level and patterns of mortality were crucial because they affected all the age groups differently. It was therefore stressed that mortality patterns by age and sex would be important, and that efforts should be made to derive such patterns for the countries in the region. Experience had been that the two-parameters system of life table had not been successful due to the lack of detailed data on infant and early childhood mortality in some countries, and it was felt that efforts should be made to obtain accurate data on infant and early childhood mortality.
23. The use of stable models might not be suitable for countries experiencing a sharp decline in mortality and accelerated growth. It was suggested that use might be made of transitional and specific population models suited to such situations. Blind application of stable models would obliterate even recent major dents on population formations of countries, for example from civil wars and severe famines. Computer-simulation micro-population models were mentioned, as were also the probabilistic models as contrasted to the deterministic models.
24. A summary was made of the contents of document E/CN.14/POP/123 which, using statistical tests, compared different population projections for five African countries. The tests revealed significant differences between the projected populations arrived at by different individuals and agencies for the same countries; while the differences in the rates of population growth were generally less marked.
25. In most other cases, it was mentioned that the significant differences stemmed from the primary divergencies among the basic assumptions employed. It was pointed out that, in the case of the countries under study, the divergencies in the methods used for the population projections could not be considered as accounting for these significant differences. The tests also revealed that a good number of the projections differed significantly from the census results. It was, however, pointed out that some of those differences were sometimes due to factors, for example political ones, which demographers could not predict in their projections.

26. All participants agreed that with population projections the basic assumptions played a more important part than the methods used. In that regard, international and national agencies were urged to continue with the assessment of available population projections in an attempt to test the validity of assumptions.

27. There was unanimous agreement on the need to take the aims of population policies into account in deciding on the future trends of the components of population growth. However, since there were differences between actual demographic changes and the aims of population policies, the latter should be used with some caution.

Item 5: Subnational Population Projections -

Uses in Regional and Urban Planning;

Item 6: General Review of Methods, Data Requirements and Problems

28. Subnational population projections, including sub-area projections and urban rural projections, were as indispensable as such sectoral projections as projections of school population, of labour force and so on, for development planning.

29. It was pointed out that the projection of the population of sub-areas had a number of features which made it much more difficult to carry out than the projection of total national population, although they had several similarities in terms of data requirements, problems of data evaluation, adjustment and vital parameters estimation and methodology of projection. In urban projections there was an additional need to account for accretion of new areas.

30. Firstly, in sub-area projections the base age-sex structure, if available, was difficult to adjust because the usual smoothing procedures might remove the genuine peculiarities in the data due to fertility and mortality differentials, migration, etc. Secondly, past trends in the evolution of the population growth of sub-areas should be critically examined keeping in view any changes over time.

31. Again, problems in the projection of sub-area populations stemmed not only from the possible variations introduced into the growth components due to the comparatively small size of the population, but also from the fact that in most cases the input parameters might not be available at such small area levels. In addition, the component of migration, which might not be significant in national population projections, could be substantial in sub-area projections; and, in contrast to the relatively small variation in the fertility and mortality variables as between areas within a country, migration could fluctuate violently and might make it very hazardous to project into the future.

32. As with any projection of population, first of all one should be very clear about the purpose for which the projection is made. The type and detail of the projection would depend upon the kind of projection needed. The methodology to be used would in turn determine the data requirements. In many cases, however, the availability of data more or less dictated the technique of projection.
33. It was felt that, while more and more detailed data on small area populations would be welcome, the available data in many countries would be sufficient to prepare sub-national projections. Even though the component method wherein the components of population change, viz, fertility, mortality and migration were accounted for might be best, it might not be easy of application in most cases due to the paucity of data.
34. It was recommended that, in the component method of projection, it would be advisable to project the population on the basis of fertility and mortality assumptions and then add on the assumed migration component showing the two operations separately.
35. Some of the mathematical functions, difference - differential equation type relationships or ratio - correlation techniques had been utilized fruitfully in projections of subnational populations, but it should be kept clearly in mind that such mathematical procedures, being mechanical, should not be used without appropriate caution. For example, supplementary information and anticipated changes should be tailored into the models.
36. The traditional technique for sub-area projections had been mathematical: the extrapolation of available sub-area population time series and then tallying and prorating with the national aggregative projection.
37. In small area projections the ratio method had been observed to be not only easy of application but also appropriate for use in the circumstances existing in developing countries today.
38. In city, town or urban projections, mathematical curves like the exponential or logistic had been observed to be more appropriate. Those techniques could be applied not only for projecting the total population of such areas but could also be used to derive the sex and age composition of the projected population, keeping in mind the pro-rating needed.
39. The group stressed the importance of basic data and assumptions in projections and pointed out that methods of projection were less crucial than the basic inputs.
40. It was agreed that the details of the manner in which the projection was carried out depended on the purpose for which the projections were being prepared. For example, in some cases there might be a need only for the

projection of a specific area or segment in a country, say the urban population. Here, the projection could be effected by using an appropriate curve, such as the logistic curve, and, after obtaining the expected urban proportion, deriving the urban population in conjunction with the projection of the total national population. However, if the need related to the urban population for manpower planning purposes, the sex and age structure of the projected urban population could be obtained by an appropriate method such as the ratio method in 5-year or 10-year age groups in the age group 10 years and over.

41. As in any projection exercise, there should not only be evaluation before a projection was attempted but also an evaluation and appraisal of the results and implications of the projections in terms of consistency and acceptability of the various parameters which emerged from the projection.

42. There was also the question regarding the time span of subnational projections. On the one hand, since such projections could be wide of the mark due to uncertainties in the input parameters, it was advisable not to project the population for too long a period into the future; on the other hand, since such projections were utilized in planning for educational facilities, housing, water supply, etc. it was necessary to have long-term projections. While a long-term projection was indeed necessary, it was advisable to revise and update it as and when more recent data became available.

43. Finally, the question of the number of sets to be prepared in subnational projections was not an easy one to answer. One projection wherein reasonable assumptions about future prospects were made was advantageous for non-ambiguity in planning, as it was often found that the various users of such projections were confused by a plethora of projections.

44. From the knowledge so far gained, it looked as if the literature on subnational projections in the countries of the region was meagre. Possibly that was due to the fact that several of the available projections were not published and remained only in some offices or departments. There was a need for compilation of an annotated bibliography on such projections in the region. The experience of various countries in such projections could be invaluable to others attempting similar projections. ECA, in collaboration with the Regional Demographic Centres and interested national authorities, initiate a study available projections in the region and perhaps the demographic centres could, on the basis of information so collected not only prepare projections but also disseminate the methodology and problems encountered.

Item 7: Projections of Households and Families

45. The need for projections of the future number and composition of households had been growing since the end of the Second World War. Traditionally, the bigger users of the projections have been Government agencies concerned with the planning of housing and building. But, recently, demands had come from government agencies and private industry planning the development of public utilities and the production and distribution of consumer durables such as electrical appliances and automobiles. That new trend was partly due to the fact that in most of the world the rate of growth of households and families had been more rapid than that of population and, therefore, that future trends would be different from those of the total population.
46. In Africa, with increasing government efforts towards economic and social development, the need for projections of the number and structure of households and families had been strongly felt. With the increasing number of Governments taking full-scale population and housing censuses, it had now become possible to prepare national projections of households and families.
47. The preparation of reasonable household and family projections assumed the availability of adequate data on the demographic characteristics of households and families and the availability of population projections. The data on households and families depended to a large extent on census definitions and national uses. The United Nations had recommended the "house-keeping unit" approach for households but that approach must of course be adjusted to each country's specific demographic and organizational requirements.
48. The United Nations had recommended in its Manual on Methods of Projecting Households and Families the component method, particularly using the headship rates by sex and age in combination with the available population projections by sex and age. That method was especially meaningful since the population structure by sex and age was the main determinant of the size and structure of households and families under normal circumstances. The headship rate denoted the ratio of the number of households or family heads to the number of persons in each class of sex and age. The projected number of households and families in the entire population was obtained by adding up all classes, the product of the population projections by sex and age and the corresponding sex-age specific headship rates.
49. Projections could also be made by more sophisticated methods, using more detailed characteristics of households and families such as the headship rates by sex, age and marital status, but because of the paucity of data available for such headship rates and the practical difficulty of preparing population projections by sex, age and marital status, that kind of projection was of only theoretical importance.
50. According to United Nations studies, in practically all countries, including the developing countries, with more than two continuous censuses covering sex and age characteristics of heads of households, the headship rates by sex

and age had increased except for female age group 35-44. At the same time, a study of international comparability shows that generally the more industrialized countries tended to have higher headship rates than the less developed ones except for the middle age groups of females. Those findings had been used as a framework for extrapolating the sex-age specific headship rates in national and regional projections of the number of households and families.

51. The discussion centred particularly on the applicability of the headship rate method to the African situation, where detailed data on heads of households and families are lacking, and on whether the theoretical framework developed mostly from the experience of the developed countries was suitable for the African countries. Although difficulties appeared formidable and development in the field had only just started, some useful experience had been accumulated not only in North America and Europe but also in a good number of Asian and Latin American countries. Such experience could undoubtedly provide useful methodological guidelines for projections of households and families in African countries. Even if detailed data on the sex-age breakdown of heads of households and families was lacking, the use of headship rates by broad age groups or the ratio of the total number of heads to the population 20-65, could provide a fair approximation of household and family projections. Inasmuch as the age structure of population rather than age-specific headship rates overwhelmingly determined the number of households and families under usual circumstances, even borrowing some Asian schedules of sex-age specific headship rates would be useful for African countries if adjustments were made to the total number of heads of households and families.

52. The difficulty of making household and family projections except for a very short period was also discussed. In the age groups consisting of the core of heads of households and families, headship rates have normally been quite stable for a long period of time, except for the very young and old age groups, particularly of females, which were more sensitive to current economic conditions. In addition, the dominant factor which determined the number of households and families was the sex-age structure of population rather than sex-age specific headship rates. Thus, long-range projections were not necessarily difficult.

53. The importance of the nuptiality factor in household and family projections was also discussed. Although it was a very significant factor in explaining the household and family formation, it was pointed out that with present knowledge and data availability it was difficult to make projections using the sex-age-marital status specific headship rate method because of the lack of proper base population projections by sex and age and at the same time by marital status. That type of specialized projections had yet to be developed.

54. The Group agreed that household and family projections were important tools for economic and social development planning in African countries, and the efforts should be made for the preparation of that type of specialized projections by the countries themselves, possibly with assistance from the United Nations at the initial stages.

55. In order to prepare household and family projections, data on the heads of households and families classified by sex and age groups, at least by broad age groups, was important. Governmental efforts should be made to include the cross-tabulation of heads of households by sex and age in the processing of census data. Often in the African countries, such characteristics of population had been regarded as a second priority. It was recommended that the cross-tabulation of heads of households and families by sex and age should be given higher priority in census tabulation plans.

56. The method of evaluating sex-age data on household and family heads should be developed along with the development of methods of evaluating the sex-age structure of population.

57. The headship rate method using sex and age- or at least broad age groups - was the best method at the present stage of methodological development. Use of the headship rate method by sex and age was therefore recommended in conjunction with careful analysis of trends and patterns in each country.

Item 8: School Enrolment and Educational Projections

58. As a basis for the discussion on school enrolment projections, the UNESCO Office of Statistics had prepared a paper entitled: "Projecting School Enrolment: A Selective Review of Models and Data Requirements" (E/CN.14/PCP/125). The efforts of the UNESCO Statistical Office in that area had started about two years previously, when the UNESCO Programme on Statistical Country Education Projections had been launched. The first stage of the programme had consisted of preparing a set of projections of enrolment by age groups and sex for the 24 United Nations regions presented at the 1974 World Population Conference. The work plan for the next two years had two main objectives: firstly, to prepare projections of enrolment by level of education, age groups and sex for all developing countries and, secondly, to arrange training seminars on projection techniques for government officials and other persons involved in national projection exercises in developing countries.

59. As regards the data base for those projections, the UNESCO Office of Statistics had for a number of years been collecting data on school enrolments from its member states. Thus, for the large majority of countries data on enrolment were available, year by year, from 1960 or earlier. Thus from the point of view of data availability, there was a difference between population projections which had to rely on census data and enrolment projections which could usually be based on time series of considerable length. On the other hand, educational projections presented a number of special problems due to the complexity of the educational system and of the outputs to be projected. Thus, future school enrolment was a function of the development of the school age population, new entrants to the educational system and the internal efficiency of the system. Furthermore, governments might influence radically the future development of school enrolment by a single administrative decision, for example, by lowering the age of entry to, or reducing the duration of, primary education. All those factors made long range projections of school enrolment very uncertain.

60. The discussion paper presented to the Working Group reviewed a number of models currently used for projecting school enrolment. The models most commonly used were flow models describing the flow of pupils through the educational system. A major problem experienced by the UNESCO Statistical Office in applying such models to developing countries was that of determining the future number of new entrants to the educational system. While the number of new entrants in countries with universal primary education would equal the number of children in the admission age-groups, in developing countries the number of new entrants might during a certain stage of development of primary education considerably exceed the number of children in the admission age-group. That was due to the enrolment of a large number of children older than the normal age of admission. A proper solution of that problem required data on new entrants by single years of age. Such data would make it possible to register the new admission of a given cohort, year by year.

61. The need for developing simple projection models adapted to the problems and data availability in developing countries was emphasized.

62. During the discussion several participants underlined the need for detailed subnational population projections for administrative units within countries to serve as a basis for school enrolment projections. Those projections of the school-age population had to be made by single years of age which, in turn, required correct estimation of the age structure of the population for the base year. It was also pointed out that the future development of the population in the school-going ages was very sensitive to changes in fertility.

63. The importance of taking properly into account repetition and drop-out when projecting school enrolment was emphasized by several speakers. The differences observed in repetition and drop-out rates between grades

within a given educational system as well as between urban and rural areas within a given country was underlined. It was pointed out that the relatively low enrolment ratios in rural areas as compared to urban areas in many countries, as well as the higher drop-out rates observed in rural areas, were often due to lack of educational facilities in rural areas. In particular, many primary schools in rural areas did not provide all grades of primary education. A child who wished to complete its primary education was thus forced to move to another school, which might be relatively distant from the child's home - and that might lead to drop-out.

64. The use and interpretation of enrolment ratios was brought up by several participants. It was pointed out that there were several types of such ratios, and that they should be interpreted with caution. With regard to the data used for calculating such ratios, it was underlined that school attendance data, as collected in population censuses, often gave results different from those obtained when using enrolment data collected annually from the school system.

Item 10: Labour Force Projections

65. The activities of ILO in the field of estimates and projections of the labour force for regions and countries had started in 1964.

66. The ILO programme aimed at giving a complete and consistent picture of the data concerning countries and territories in the different regions of the world on the basis of uniform concepts and methods.

67. For the purposes of such projections, the labour force was defined as comprising the employed and the unemployed (including persons seeking employment for the first time). The definition covered employers, the self-employed, the employed, family workers, members of production co-operatives and members of the armed forces.

68. ILO had issued in 1971 estimates and projections of the labour force by country in a six-volume publication entitled Labour Force Projections. The first five volumes contained projections, while the sixth described the principles adopted and the methodology employed to carry out the projections.

69. The projections had been based on the United Nations population estimates and projections as assessed in 1968 and the estimates and projections of participation rates as assessed in 1971.

70. The methodology employed to make the projections was summarized as follows:

(a) Estimation of the basic data

An effort had been made to collect all available relevant data on the size of the labour force, its distribution by age and sex, its distribution by economic sector, and its other characteristics for 1950 and 1960, if possible, or for the years around 1960. The data had been derived primarily from population censuses. The data collected had then, as necessary, been adjusted according to the basic criteria. Whenever necessary adjustments had been made to the definitions of certain categories of persons - in particular unpaid family workers, members of the armed forces, persons seeking work for the first time, etc. For countries or territories for which data were partially or totally lacking, the relevant data had been estimated by means of models.

(b) Projections for 1965-1985

The projections had been prepared on the basis of a uniform methodology used for all countries and territories. The methodology, consisting of projecting labour force participation rates by sex and age, was based essentially on the close relationship between the level and trends of those rates and the level and growth of economic development. The percentage of the male labour force in agriculture had been taken as indicator of development. The difference between the 1950 and 1960 percentage had been used as a measure of the economic development trend. Finally, the trend of the labour force participation rates had been measured by variation index of these rates (base 1950) between 1950 and 1960.

(c) Remarks on the pattern of male and female participation rates with particular reference to Africa

For males, the derived models of projections assumed a decrease for all age groups of the labour force participation rates. The decrease was slight for the age group 25-44, and increased gradually for younger or older age groups. In general the decrease would be accentuated when the economic rate of growth of the country concerned was high. For the younger and older age groups, the decrease was related, on the one hand, to the increase in school enrolment and, on the other hand, to the proportion of the aged benefiting from pension schemes. For females, two projection models had been used: the first for countries with a high female participation rate, and the other for countries with a low female participation rate. The first model for African countries assumed a continuous decrease in the participation rates for all age groups, which would slow down with development progress. The second model assumed a general increase of all age-specific participation rates, although for more developed countries that increase affected only the age group 20-44 (or 20-54) years.

71. In the discussion that followed, the difficulties encountered in defining categories of the labour force were stressed.

72. The participants noted that ILO's selection of the ratio of male labour employed in agriculture to the total male labour force had been made on the basis of the following considerations:

- (a) Firstly, research and experiments in ILO had shown that there was a close correlation between that ratio and its evolution, on the one hand, and the levels of labour force participation rates and their evolution on the other; and, secondly, that the ratio was very closely related to certain indices of development such as life expectancy at birth, the percentage of urban population, the per capita gross national product and the crude mortality and birth rates;
- (b) In the second place, the ratio had the advantage of being readily available and was reasonably comparable overtime within a given country and between countries.

73. The projection models developed by ILO were therefore essentially based on the close relationship between the labour force participation rates by sex and age and their evolution on the one hand and, on the other, the percentage of male labour force in agriculture and its variation over two periods.

74. The results of the 1970 round of population censuses, carried out in various countries of the world, which ILO was collecting, should enable it to evaluate the quality of its projections, especially those relative to 1970, and, if need be, to develop new projection models. In that connection ILO is currently making pilot studies in selected countries with a view to analysing the factors which determined labour force participation rates, notably definitions, data processing methods, fertility, nuptiality, unemployment, income, etc.

75. Regarding the basic data used in calculating the 1950 and 1960 labour force participation rates of African countries, attention was given to all relevant information available at the beginning of 1971.

76. Mention was made of a method for projecting labour force participation rates on a within-country basis which, although similar to the ILO method, focussed on the different regions within a country and not on divergences between countries (as in the ILO method). The advantage of the within-country method would seem to be that it more faithfully reflected the situation characteristic of the country than the averaged heterogeneous between-country methods. It was, however, noted that ILO had already used the method described above, particularly in estimating the labour force participation rates by sex and age for India in 1950. That method had, however, one difficulty in that it required a prior estimate of the time period involved. With the ILO method the period was of 10 years and was obtained automatically.

Projections of the Agricultural Population and Labour Force

77. The Working Group had before it a paper prepared by FAO (E/CN.14/POP/133). The Working Group was informed of the work of FAO in the field of estimates and projections of the agricultural population and labour force. The need for projections of those sections of the population for planning, in particular agricultural planning, was stressed.

78. It was recognized that, while data existed on the agricultural labour force from either population censuses or labour force surveys, those were often subject to various measurement errors due to the seasonality of agricultural work and the phenomena of multi-job-holding and part-time employment, particularly of unpaid female family workers and children. The definitions used often varied from country to country as well as from one census to another within the same country. That had to be taken into account when evaluating the basic labour from data and assessing current trends.

79. However, statistics on the agricultural population, which was the sum of the members of the agricultural labour force and their non-working dependants, were not available for most African countries. The collection of such dependency statistics using the family member's main source of livelihood as the criterion was complex, and that may account for the lack of data on the agricultural population and also the omission of appropriate recommendations in the United Nations Programme for the 1970 population censuses. However, in view of the need to assess the size of that important segment of the population, research into concepts and definitions should be undertaken so that the population could be measured, even approximately if necessary. In the meantime, certain suggestions were made on how to obtain approximate data on the agricultural population from on-going censuses in Africa. It was necessary to take all the non-working dependants and agricultural workers in households where heads were reported as engaged in agriculture as the agricultural population. That might provide a satisfactory estimate in most African countries.

80. In view of the present lack of data on the agricultural population, the Working Group was informed of the method of estimation used by FAO to derive estimates and projections of that segment of the population. It was assumed that the proportion of labour force in the agricultural sector was equal to the proportion of agricultural population in the total population. The relationship between the agricultural and non-agricultural population on the one hand, and the urban and rural population on the other hand, was also dealt with.

81. The Group was also informed of the methodology of projections of the agricultural population and labour force recently developed in FAO. The total population was taken to consist of the agricultural sector and the non-agricultural sector. The proportion of population in the non-agricultural sector was projected in the future and, by applying the proportions to the separately prepared projections of the total population and labour force, the corresponding agricultural and non-agricultural population could be obtained.

The future level of the proportion was obtained from a model representing the absolute increase in the proportion of non-agricultural population in the total population as a function of the proportion itself. The following fundamental assumptions were made:

- (i) Starting from a point near zero when nearly all the population depend on agriculture, the proportion in the non-agricultural sector will grow continuously until it nears unity.
- (ii) The absolute change in the proportion of the non-agricultural population from time t to $(t+1)$ will accelerate on a defined curve as the proportion in non-agriculture rises from nearly zero to some value around 0.5 and will decelerate along the defined path as the proportion approaches unit. The curve is assumed to follow the incomplete Beta distribution.

82. The aim was to estimate the parameters of the curve (of the Beta family) for a given country. The detailed procedure for so doing was given in the document presented to the meeting. Once the curve had been determined for a particular country, the expected absolute increase in the proportion in non-agriculture at different levels of the proportion could be estimated from the curve.

83. During the discussion following the presentation, the problems of errors in the data on the agricultural labour force due to the seasonal nature of agricultural work and the phenomena of multi-job-holding and part-time employment were stressed. The advantage of undertaking surveys at different times during the year in order to obtain a better assessment of the agricultural labour force was noted.

84. In connexion with the methodology suggested for projections, the question of whether it was an improvement over certain other methods used previously in one or two developing countries was raised. It was noted that the previous methods assumed the availability of other related variables, e.g., rural population or certain economic variables. The new method was an attempt to do away with that constraint, and also to derive a procedure which was applicable to all countries.

Item 11: National Co-ordination and Co-operation
Between Agencies Involved in Projections

85. The attention of the Group was drawn to the need for operation among the different agencies which made projections for the use of Government in planning. It was stressed that Governments needed guidance and that it was necessary to avoid a situation in which various departments gave advice based on projections which were not consistent. Though it was recognized that it

was difficult to establish one centralized body for projections, it was felt that some sort of co-ordination and co-operation should be aimed at. Representatives of two countries described the situation in their countries, where co-ordinating bodies had been established made up of persons both in Government service and in universities.

86. The Group was informed of the arrangements for inter-agency collaboration in the field of projections established since 1967. Under this arrangement the Inter-agency Working Group on demographic projections consisting of representatives of the United Nations Population Division, the regional economic commissions, ILO, FAO, UNESCO, WHO, UNICEF and IBRD met regularly to co-ordinate their activities in the field of projections.

87. As a result of the efforts of that group, the United Nations Population Division, with the assistance of the regional economic commissions, undertook projections of the total population, rural and urban populations as well as projections of households and families for all countries, while ILO undertook the projections of the labour force, UNESCO the school projections, FAO agricultural projections and WHO projections for health needs. Studies concerning the projects of those different segments of the population were also undertaken by the specific agencies concerned.

88. The Group stressed the need for better dissemination of available information at the country level in order to help achieve better co-ordination among the different agencies concerned with projections.

89. It was stressed that it was necessary to strengthen and co-ordinate the activities of statistical units in various Government departments.

Other matters

90. No matters were raised under this item.

Adoption of the report

91. The Working Group adopted this report on its meeting on 29 November 1974.

ANNEX I

POPULATION PROJECTIONS BY COMPUTERS

1. A visit to the Egyptian Central Agency for Public Mobilization and Statistics was organized in order to demonstrate to the participants the procedure used to carry out population projections of Egypt by computer. The procedure is described below.
2. The programme is divided into segments, and the function of each segment is explained.

MASTER DEMG:

3. In this routine a control card is read where 2 values are punched: KK and LL. KK is the number of 5-year age groups in the given population at the base year. LL takes a value ≥ 0 ; if LL = 0, this indicates, that the printout of the base population after being interpolated by Sprague Multipliers is not required. The programme reads the male population at base year given in age groups and do the splitting, then print the population in single years or read the female population depending on the value of LL. The programme will do the splitting for the female population in the same fashion.
4. The programme afterwards reads another control card where 2 values are punched: L and K. L is the number of single years in the population (5. KK). The other value, K, is a control which may be the base year (1970 say) if a complete printout of the life table is wanted, other-wise it is left blank to suppress life table printout. Then the routine calls for projection. This routine calls three subroutines SING, ALTAB AND PROJECT.

SUBROUTINE SING:

5. This routine takes K, 5 years, age groups to derive from them 5.K single years using Sprague Multipliers. Then the routine gives a printout of the result of the derived single ages, if required bending upon the value of LL by calling subroutine PERI.

SUBROUTINE ALTAB

6. This routine takes in life table death rates $1000 q_x$ to form and printout a complete life table. It should be known that one can use age specific death rates m_x and derive from them q_x to construct an abridged life table from which can form a detailed or complete life table.

SUBROUTINE PROJECT:

7. This routine computes projected population year by year successively using the information fed to the computer and acted upon by the previous Subroutines. The routine starts reading a control card containing the following parameters:
 - LM = 0 if projected population in age groups only is required, other-wise LM ≠ 0.
 - M = 0 if constant fertility rate is assumed.
 - N = Number of years in projection (20 years say).
 - IY = Value of the base year (1960 say).
 - BR = Birth rate in year IY + 1, assumed constant if M = 0.
 - SR = Sex Ratio at birth.
8. Then the routine will start calculations and printing the projected population year after year in the mode required. If variable fertility is assumed, (N-1) cards, each containing the fertility rate for a given year, should be added to the data.
9. The routine calls either the subroutine PERI or PRINT depending on the form of the layout of the results needed.
10. Experience with this programme indicates that using a computer is really time-saving. Using Egyptian data, 1960 population census and NIT IV, the 1904 computer finalized the projection for 25 years in about 3 minutes. This time was reduced to 30 seconds using the 1906 S Computer.
11. Although this programme does not answer the many problems in population projections, it may develop interest in some demographers to use the computer in detailed analysis.