COURSE MANUAL

Demographic Data and Statistics of Educational Management

EME 104

University of Ibadan Distance Learning Centre
Open and Distance Learning Course Series Development

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Vice-Chancellor's Message

The Distance Learning Centre is building on a solid tradition of over two decades of service in the provision of External Studies Programme and now Distance Learning Education in Nigeria and beyond. The Distance Learning mode to which we are committed is providing access to many deserving Nigerians in having access to higher education especially those who by the nature of their engagement do not have the luxury of full time education. Recently, it is contributing in no small measure to providing places for teeming Nigerian youths who for one reason or the other could not get admission into the conventional universities.

These course materials have been written by writers specially trained in ODL course delivery. The writers have made great efforts to provide up to date information, knowledge and skills in the different disciplines and ensure that the materials are user-friendly.

In addition to provision of course materials in print and e-format, a lot of Information Technology input has also gone into the deployment of course materials. Most of them can be downloaded from the DLC website and are available in audio format which you can also download into your mobile phones, IPod, MP3 among other devices to allow you listen to the audio study sessions. Some of the study session materials have been scripted and are being broadcast on the university's Diamond Radio FM 101.1, while others have been delivered and captured in audio-visual format in a classroom environment for use by our students. Detailed information on availability and access is available on the website. We will continue in our efforts to provide and review course materials for our courses.

However, for you to take advantage of these formats, you will need to improve on your I.T. skills and develop requisite distance learning Culture. It is well known that, for efficient and effective provision of Distance learning education, availability of appropriate and relevant course materials is a *sine qua non*. So also, is the availability of multiple plat form for the convenience of our students. It is in fulfilment of this, that series of course materials are being written to enable our students study at their own pace and convenience.

It is our hope that you will put these course materials to the best use.

Prof. Abel Idowu Olayinka

Vice-Chancellor

Foreword

As part of its vision of providing education for "Liberty and Development" for Nigerians and the International Community, the University of Ibadan, Distance Learning Centre has recently embarked on a vigorous repositioning agenda which aimed at embracing a holistic and all encompassing approach to the delivery of its Open Distance Learning (ODL) programmes. Thus we are committed to global best practices in distance learning provision. Apart from providing an efficient administrative and academic support for our students, we are committed to providing educational resource materials for the use of our students. We are convinced that, without an up-to-date, learner-friendly and distance learning compliant course materials, there cannot be any basis to lay claim to being a provider of distance learning education. Indeed, availability of appropriate course materials in multiple formats is the hub of any distance learning provision worldwide.

In view of the above, we are vigorously pursuing as a matter of priority, the provision of credible, learner-friendly and interactive course materials for all our courses. We commissioned the authoring of, and review of course materials to teams of experts and their outputs were subjected to rigorous peer review to ensure standard. The approach not only emphasizes cognitive knowledge, but also skills and humane values which are at the core of education, even in an ICT age.

The development of the materials which is on-going also had input from experienced editors and illustrators who have ensured that they are accurate, current and learner-friendly. They are specially written with distance learners in mind. This is very important because, distance learning involves non-residential students who can often feel isolated from the community of learners.

It is important to note that, for a distance learner to excel there is the need to source and read relevant materials apart from this course material. Therefore, adequate supplementary reading materials as well as other information sources are suggested in the course materials.

Apart from the responsibility for you to read this course material with others, you are also advised to seek assistance from your course facilitators especially academic advisors during your study even before the interactive session which is by design for revision. Your academic advisors will assist you using convenient technology including Google Hang Out, You Tube, Talk Fusion, etc. but you have to take advantage of these. It is also going to be of immense advantage if you complete assignments as at when due so as to have necessary feedbacks as a guide.

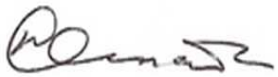
The implication of the above is that, a distance learner has a responsibility to develop requisite distance learning culture which includes diligent and disciplined self-study, seeking available administrative and academic support and acquisition of basic information technology skills. This is why you are encouraged to develop your computer

skills by availing yourself the opportunity of training that the Centre's provide and put these into use.

In conclusion, it is envisaged that the course materials would also be useful for the regular students of tertiary institutions in Nigeria who are faced with a dearth of high quality textbooks. We are therefore, delighted to present these titles to both our distance learning students and the university's regular students. We are confident that the materials will be an invaluable resource to all.

We would like to thank all our authors, reviewers and production staff for the high quality of work.

Best wishes.



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Study Session1: Introduction to Educational Management and Demographic Studies

1.1 Introduction

Education is a great idea. Imagine the world without education? Education is good for the society. Education has given you freedom to think and be creative. Education is an important tool for progress and should be planned. Therefore educational management means getting things done using people or attaining organizational resources, through efficient allocation of those resources to bring about optimization.

Education management also involves inter-planning, administration, coordination, staffing and budgeting. This study will introduce you to the concept of educational management, educational management and demography, demography and demographic study.

1.2 Learning Outcomes for Study Session 1

At the end of this study session, you should be able to:

1.1 Define Educational Management

1.2 Explain Educational Management and Demography

1.3 Discuss Demography and Demographic Study

1.3 The Meaning and Scope of Educational Management

Before you can consider discourse on educational management, you should familiarize yourself with the meaning of education. **Education** is concerned with the transmission of skills, knowledge, vocation and culture and this is usually done through teaching, learning, research and dissemination of the findings for ultimate utilization.

Figure 1.1: *Students in the classroom*

Therefore **educational management** means getting things done using people or attaining organizational resources, through efficient allocation of those resources to bring about optimization. Education management also involves inter-planning, administration, coordination, staffing and budgeting.

It is important to **note** that both the terms administration and management are used interchangeably, as the two words bear similar meanings. The process of administration is also the same as the process of management.

Figure 1.2: *Educational Management*

1.1.1 Traditional Concept of Management

It is important for you to know that the practice of management has been in existence since one thousand years ago. The Egyptians for instance, were known to have developed sophisticated managerial skills in order to manage their empire. The task of constructing

the pyramids was one of such complex enterprises that required effective and efficient management of human and material resources.

Figure 1.3: *The Egyptian pyramid (Building this pyramid required management of human and material resources)*

Scholars seem to hold a variety of opinions with regard to the use of the word ‘administration’ on the one hand and ‘management’ on the other. Some of these scholars use the word administration as indicating a specific function, which enters all tasks involving supervision of the work of others. It is not concerned with the status of those who exercise this function.

Lyndall Urwick also expressed concern at the possible division between management being seen to apply only to business organization and (public) administration as applying to the same functions in public service sector. A directional perception is that private sector organizations are managed and the use of the term “administration” is associated with public sector organization.

Figure 1.4: *Lyndall Urwick*

However, the term “management” is now used far more widely within the public sector. This can be seen for example, following the Plow then Report in 1961 into the control of public expenditure, which introduced the idea of management as a central activity and top administrators having responsibility for management efficiency.

In-Text Question

The word’ management’ is now widely used within the public sector. True or False

In-Text Answer

True

1.1.2 Scientific Management

Management in the eighteenth and nineteenth centuries was not properly mastered by the then managers who thus resorted to the use of force to get things done. It is important to note that although they were vested with manufacturing techniques and skills, the aspect of management, which required a judicious use, and control of human and material resources to achieve organizational goals was lacking.

Management functions were usually improved to meet needs resulting in various losses being incurred by businesses, but the complexities of these factories called for more. Based on this, some people took up the task venturing into more organized forms of management. This gave rise to the scientific management thought, which is adequately represented in the following selected works:

- The classical organizational thought (Efficiency movement 1920 –30) whose major exponents were Frederick Wilson Taylor, Henri Fayol, H., T. Emerson, Lyridall Urwick and Luther Gulick, Max Weber, to mention a few.
- The Human Relations School of thought (1930 – 50) whose chief exponent was Mary Parker Follet, and Elton Mayo.
- The Behaviourist/contemporaries (1960 – present) whose exponents were Chester Barnard and Herbert Simon.

Figure 1.5: *Max Weber (1864-1920)*

1.1.3 Classical Organizational Thought

i) Scientific and Administrative Management Approach

Frederick Taylor (1856 –1915), the father of the scientific management movement, sought ways to effectively use men in industrial organizations. Taylor's background and experience as labourer, clerk, mechanist, foreman, chief craftsman, and finally Chief engineer reinforced his belief that men could be programmed to be efficient machines.

Figure 1.6 *Frederick Taylor (1856 –1915*

The key to the scientific management approach is the concept of man-as-machine. Taylor and his associates thought that workers motivated by economics and limited by physiology, needed constant direction.

In 1911 Taylor formalized his ideas in the principles of scientific management as follows:

1. A large Daily Task – Each man in the establishment, high or low, should be a clearly defined duty task laid out before him. The carefully circumscribed task should require a full day's effort to complete.
2. Standard conditions – The workman should be given standardized conditions and appliances to accomplish the task with certainty.
3. High pay for success – High pay should be tied to successful completion.
4. Loss in case of failure – Failure should be penalized.
5. Expertise in large organizations – As organizations become increasingly sophisticated, tasks should be made so difficult as to be accomplished only by a first rate man. Taylor and his associates.

Although scientific management theory has formed the basis of modern management, it has been criticized for the following reasons;

- ❖ Over-emphasis on efficiency and productivity to the detriment of workers
- ❖ Man is equated to be machines and thereby encouraging mechanical behavior
- ❖ It utilized a carrot and stick model of motivation to motivate workers ie. more work more pay.
- ❖ It has neglected the psychological and motivational factors that are inherent to man at work.

ii) Administrative Management Approach or Universal Principle Movement

Traditional classical organization thought often called administrative management theory or universal principle movement was initiated by a French Gentlemen Henri Fayol (1841 – 1925). He was a French mining engineer and successful executive who later taught administration.

Figure 1.7: *Henri Fayol (1841-1825)*

Source: *https://upload.wikimedia.org/wikipedia/commons/9/90/Henri_Fayol,_1900.jpg*

The movement developed concurrently with the scientific management movement. The two movements essentially belong to the classical management theory. The scientific management movement concentrated on the operational level (worker) while the Administrative Management approach concentrated on the top management (managers).
Fayol developed some universal principles that characterized successful administration and management. These can be applied to any organization, industry, education or government.

These elements are:

Figure 1.8: *Management Element*

(1) Planning

This is the first step in any administrative function. It involves making arrangements for the future. It deals on how to use time, personnel and equipment in future. The future may begin with day, week, month or year. Plans are made after objectives or goals are set. Planning is usually regarded as a search for the best method of achieving these goals.

(2) Organizing

The manager decides what jobs would have to be filled and the duties and responsibilities attached to each one. Effective organization implies that the right people are assigned to do the correct jobs at the appropriate times. Activities should be assigned to individuals on the basis of their ascertained qualification, experience and interests. On the part of the manager, a lot of wisdom, maturity and objectivity are required.

(3) Directing

Directing involves giving staff details on how to go about their jobs. It is not once for-all-activity but an on-going one. Officers have to be continually put on the right path.

(4) Co-Ordinating

This relates to the activities of different units to one another to ensure that the different activities are met, to achieve the set objectives. Co-ordination occurs when the Organization's numerous activities are planned, organized, directed and controlled.

(5) Controlling

It is the measuring and correcting of activities of subordinates to ensure that these activities are contributing to the achievement of planned goals. Ukeje (1992) pointed out that appraisal, evaluating and supervision are the administrators' tools for controlling, directing and leading.

These elements of management could be seen as a cyclical event Fayol went further to identify a list of fourteen principles upon which the soundness and good working order of an organization depend (Koontz et al 1980:46).

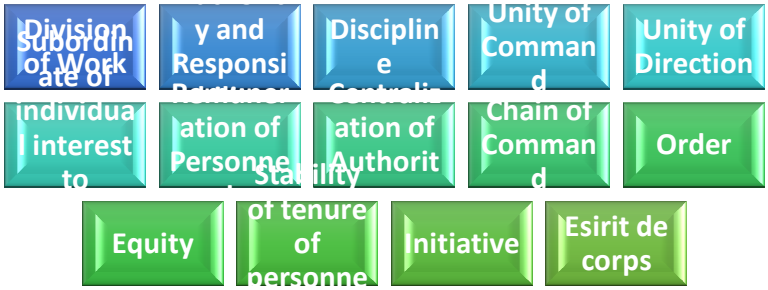

Figure 1.9: *Fourteen Principles of Management*

ii) Bureaucratic Approach

Bureaucracy can be defined as the process of creating a relationship between functional levels of an organizational hierarchy. It is a relationship between roles rather than between individuals. Organizational structure is a pyramid of relationship and authority.

At a period when the workers were being influenced to high degree by the whims and caprices of the authoritarian industrialist of the scientific management, Max Weber, a German sociologist saw hope in Bureaucratic Organization.

He hoped that well-run bureaucracy would become fairer, more impartial, more predictable and in general more rational. According to **Weber**, the bureaucracy apparatus would be very impersonal, minimizing irrational personal and emotional factors and leaving bureaucratic personal free work, with a minimum of friction or confusion. Arinze in Enaasatio et al (1998).

Weber developed some characteristics of a bureaucratic organization.

1. A division of labour based on functional specialization.
2. A well-defined hierarchy of authority.
3. Rules and regulations govern the official decisions and conduct of the employees.
4. Officials assume a kind of impersonal relationship or attitude towards their clients and other officials.
5. A system of procedures that guide the activities of people in that organization.
6. Selection and promotion of staff are based on technical competence.

In Text Question

The following are Scientific Management except

(a) Frederick Wilson Taylor

(b) Max Weber

(c) Elton Mayo

(d) Daniel Robert

In Text Answer

The answer is (d) Daniel Robert

1.4 Educational Management and Demography

The study of educational management has to do with planning and administration. Educational management is not only concerned with planning and administration as a course of instruction, it has to do with the provision, supervision and administration of educational institutions. In so doing, the elements of management come into operation.

In the process of planning education, there must be provision for education and this must involve planning. Educational planning involves data. Assuming you are to provide

schools at different levels for children in Ibadan metropolis of Oyo state, you cannot just go there and start because you have resources .

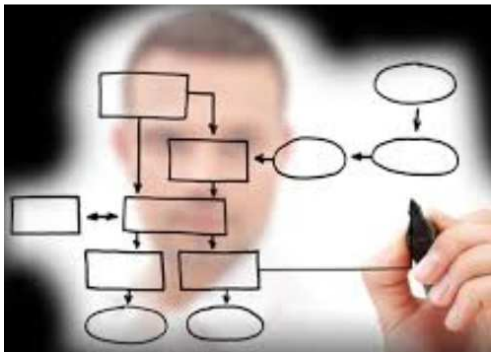

Figure 1.9: *Educational Planning*

If an educational manager does that, he has left educational management and has become a politician. An educational manager will source data on the number of schools each level of education will require and where it will be located. Such a venture in educational management is called **school mapping**. It is an area on its own in educational planning.

What will determine the school mapping venture?

Among the first things is to determine who and who needs each level of education. How do you get that? It is to look into the demographic structure of the population either in the state, Local Government or community. This is done most of the time statistically. The foregoing indicates that there is a relationship between educational management, demography and statistics.

1.5 Demography and Demographic Studies

These are foreign words with origin from Greek and Latin. '**Demo'** mean people while **'graphy'** means measurement. Demography therefore is the measurement of people. Demography is the statistical study of human populations in relation to their size, structure, composition, changes, ages and development.

The above description indicated that demography is a large area of study. It involves the carrying out of census in many communities and structuring the information acquired into

usable formats by deploring statistical tools. It is under such a situation that it becomes usable. It is further shown in the description of demography that it deals with population changes i.e. population dynamics.

Figure 1.10: *Demographics*

This means that the educational manager is ever at work including the demographer. They work hand in hand because as the educational planner is thinking of how to map schools, the information required to that must be obtained from the demographer and this is done statistically.

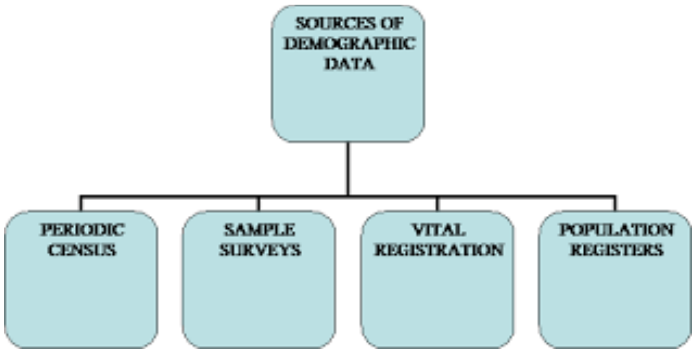

Figure 1.11: *Demographic Studies*

1.3.1 Educational Management and Demography

At this point in our introduction, there is a need to ask, why study educational management and demography? There are some simple reasons why you cannot but study educational management and demography.

The following may suffice;

1. Education is the provider of a chain reaction in any society hence education managers are often associated with changes. These changes bring other chain

reactions to health, economy, politics etc. and these are associated with demography. The possession of good health has the effect of enabling learners in a society have sharp cognitive skills that are useful to the society and education system.

2. It is meant to equip managers with simple techniques of interpolation, extrapolation and data manipulation (projections)

3. To be able to improvise data where correct data is not available for educational planning purposes.

1.6 Summary from Study Session 1

In this study session, you have learnt the following:

1. **Meaning of Educational Management**
   Educational Administration should logically involve, arranging and using human and material resources and performances available for education, for the transmission of skills, knowledge, vocation and culture through efficient teaching, learning, research, its dissemination and utilization for a better society.

2. **Educational Management and Demography**

   The study of educational management has to do with planning and administration. Educational management is not only concerned with planning and administration as a course of instruction, it has to do with the provision, supervision and administration of educational institutions. In so doing, the elements of management come into operation.

3. **Demography and Demographic Studies**
   It involves the carrying out of census in many communities and structuring the information acquired into usable formats by deploring statistical tools. It is under such a situation that it becomes usable. It is further shown in the description of demography that it deals with population changes i.e. population dynamics.

1.7 Self-Assessment Questions (SAQs) for study session 1

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 1.1 (Testing Learning Outcomes 1.1)

Define Educational Management

SAQ 1.2 (Testing Learning Outcomes 1.2)

Explain Educational Management and Demography

SAQ 1.3 (Testing Learning Outcomes 1.3)

Mention the reason for studying Educational Management

Notes on Study Session 1

SAQ 1.1.

Educational management means getting things done using people or attaining organizational resources, through efficient allocation of those resources to bring about optimization.

SAQ 1.2.

The study of educational management has to do with planning and administration. Demography is the statistical study of human populations in relation to their size, structure, composition, changes, ages and development

SAQ 1.3.

1. Education is the provider of a chain reaction in any society hence education managers are often associated with changes. These changes bring other chain reactions to health, economy, politics etc. and these are associated with demography. The possession of good health has the effect of enabling learners in a society have sharp cognitive skills that are useful to the society and education system.
2. It is meant to equip managers with simple techniques of interpolation, extrapolation and data manipulation (projections)

3. To be able to improvise data where correct data is not available for educational planning purposes.

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Study Session 2: Educational Demography and Statistics of Education

Introduction

In the preceding study session, you have learnt about the positive relation that appears to exist between educational management, demography and statistics. It was established that demography as a field of study dealt with human populations and looks at the dynamics of population changes whose results are often expressed statistically.

It is not only statistics that planners need in terms of educational provision. You have also leant that managers require school mapping techniques that also applies demographic principles in its applications. In this study however you will learn demography, educational demography, statistics of education, educational statisticians

Learning Outcomes for Study Session 2

2.1 Define Demography
2.2 Explain Educational Demography
2.3 Discuss Statistics of Education
2.4 Discuss on Educational Statisticians

2.1 Definition of Demography

Demography is “the study of the size, territorial distribution, and composition of population, changes therein, and the components of such changes.” **Hauser** and **Duncan** (1959:2)

2.1.1 What is interesting about composition

It depends on who is asking:
a) Policy e.g., SS eligible, LFP at older ages, poverty, marital
Status/SPF, etc.
b) Local govt. e.g., school age, poverty, language, etc.

c) Demographerse.g., age, sex, race, family structure, marital status, etc.
d) Marketers e.g., profiles (multivariate)

2.1.2 Change in relationship between characteristics

Interest not only in change in composition with respect to characteristic x but also in change in composition with respect to intersection of x and y (and z and so on) e.g., race and marriage, gender and occupational status, gender and educational background, age and employment status.
Simple description or multivariate modeling.

2.1.3 Measures of composition

a) Simple descriptive
b) Indices a. e.g., dissimilarity, isolation, interaction, redistribution, concentration, diversity
c) Straightforward for past and present
d) What about the future?

2.1.4 Characteristic-specific projections

Projected population composition
1. What will the population look like with respect to things like school enrollment, labor force participation, housing tenure, etc.
2. Typically based on projected age and sex specific populations from cohort component method

2.1.5 Alternative methods

1. Participation ratio method
a. Apply prevailing participation rates (or other characteristics) to projected population by age, sex
b. Can also make assumptions about future trajectories of participation rates
2. Cohort progression method
a. Calculate observed net progression ratios between two points in time for a given age
b. Apply these progression ratios sequentially – assume temporal stability in
Progression ratios (or not)

Example – population in assisted living

1. Calculate age-specific proportions in assisted living facilities for most recently observed year(s)
2. Assume stability in proportions into future (or make assumptions about change)
3. Apply proportions to projected population by age (and perhaps sex, marital status, race, etc.)
4. Calculate projected numbers at points in future (can do at national/local levels)

Images

Figure 1.1: *Demography*

2.2 Educational Demography

Demography is the study of population changes which is of paramount interest to man. Education is also described as the source of life, light and education, if absent, it infers darkness and death. It is for these reasons that education and demography appear to be twin brothers in the business of progress.

Education is important to all nations; hence the nations invest scarce resources in education. It is observed that the provision of education impacts on health and society positively. Educational provision affects health in the sense that it promotes gender sensitivity and such impacts positively on the reduction of infant and maternal mortalities (Owolabi, 1984).

To provide these educational opportunities, demographers have rules, principles and methods of establishing population dynamics. Though the foregoing is important,

educational managers need the content of demography to be able to plan, especially where it has to do with projection of population over a period of time.

Beginners in the field of educational management might wonder why such emphasis is laid on managers to be equipped with demographic techniques.

An educational systems manager can hardly attain any positive achievement without demographic tools hence it is devised that instead of solely depending on the demographers' presence, the manager should be equipped with simple tools and techniques of demography hence this course and programme of educational demography.

In providing education, there is often a need to target age groups and split the age groups. In the planning of education, there are times when mortality and fertility rates are required especially where it has to do with long term projections. While the determination of fertility rates, mortality rates and growth rates are demographic, the needs are educational and elements of demography must be used to seek solutions to those educational problems.

In some studies, it is explained that a good demographic structure provides education and such education impacts on health especially where it emphasizes gender parity. It further explains that female gender education impacts on the health of children, increasing their cognitive abilities hence, knowledge of fertility rates will equip the education manager with expectations, especially in resources allocation for the period in view.

Images

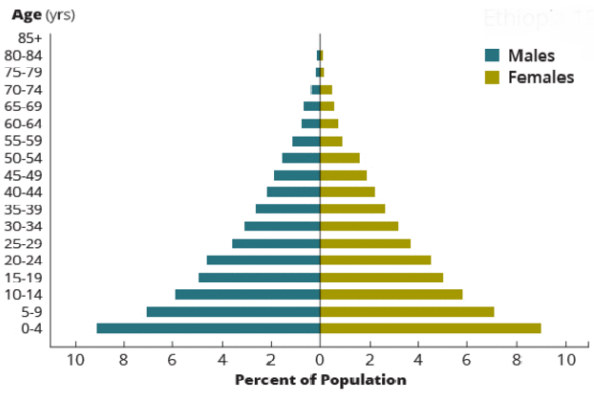

Figure 1.2: *Population Percentage*

2.3 Statistics of Education

Educational statistics involves the documentation of everything in the school system. Educational statistics assists in the planning and administration of education especially in the ability to evaluate the system.

It also involves the development of methods to gather, collect and collate data that are analyzed and interpreted for educational purposes. In this regards, there are statistician and there are educational statisticians.

The administration of an educational system depends, in a great measure, on the production of statistics. In Nigeria there is already a substantial flow of material, much of which is published.

While a number of important gaps still remain to be filled in this material, the immediate problem is less than that of a scarcity of statistics and more of improving their quality and of developing the skills of those who, from teachers to the senior officers are responsible for collecting and using them.

In Text Question

Educational statistics involves the development of methods to gather, collect and collate data that are analyzed and interpreted for educational purposes. **True/False**

In Text Answer

True

2.4 Educational Statisticians

These are officers in the Ministry of Education responsible for statistics. There are many others who are also concerned with educational statistics, either as producers or as consumers: officers of the Local Authorities or in the Local Education Offices; officers in the universities; those concerned with taking population or other censuses; the members of planning units or commissions; and officers in the central statistical offices.

Each has his own problems of which he gives emphasis. The key person for producing

the statistics required in educational planning, and for advising on their use, is nevertheless the educational statistician.

Although the term education statistician suggests a technically qualified person, and the appointment of such a person, is eventually necessary, it may happen that a state with very limited resources is not in a position to appoint an officer with high academic qualifications at the onset.

Since it is possible for a substantial amount of the basic work of the educational statistician to be carried out by someone without high academic qualifications in this field, the term educational statistician is taken to cover him as well.

2.4.1 Need for Educational Statistics

The need for educational statistics therefore arises for the following reasons;

1. Education as a large enterprise requires planning for its provision and success
2. The sector requires large personnel
3. Budgeting and allocation of resources requires statistics
4. School mapping is a statistical activity
5. Manpower planning
6. Educational investment purposes

As a large enterprise, education requires data for planning and administration. Statistics is a major ingredient for the production of quality plans and useful in administration.

In this regards, the educational sector needs not only those versed in the art of statistics as a discipline but those that are skilled to apply the needs of statistics to education. Statistics is required in the preparation of budgets, allocation of scarce resources and manpower planning.

Summary from Study Session 2

In this study session, you have learnt the following:

1. **Definition of Demography**
   Demography is "the study of the size, territorial distribution, and composition of population, changes therein, and the components of such changes.
2. **Educational Demography**
   Educational provision affects health in the sense that it promotes gender sensitivity and such impacts positively on the reduction of infant and maternal mortalities
3. **Statistics of Education**

   Educational statistics involves the documentation of everything in the school system. Educational statistics assists in the planning and administration of education especially in the ability to evaluate the system.
4. **Educational Statisticians**
   These are officers in the Ministry of Education responsible for statistics. There are many others who are also concerned with educational statistics, either as producers or as consumers: officers of the Local Authorities or in the Local Education Offices; officers in the universities; those concerned with taking population or other censuses; the members of planning units or commissions; and officers in the central statistical offices.

Self-Assessment Questions (SAQs) for study session 2

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 2.1 (Testing Learning Outcomes 2.1)

Definition of Demography

SAQ 2.2 (Testing Learning Outcomes 2.2)

Discuss Educational Demography

SAQ 2.3 (Testing Learning Outcomes 2.3)

Explain Statistics of Education

SAQ 2.4 (Testing Learning Outcomes 2.4)

Mention the Need for Educational Statistics

\Notes on Study Session 2

SAQ 2.1

Demography is “the study of the size, territorial distribution, and composition of population, changes therein, and the components of such changes.

SAQ 2.2

An educational systems manager can hardly attain any positive achievement without demographic tools hence it is devised that instead of solely depending on the demographers’ presence, the manager should be equipped with simple tools and techniques of demography hence this course and programme of educational demography.

In providing education, there is often a need to target age groups and split the age groups. In the planning of education, there are times when mortality and fertility rates are required especially where it has to do with long term projections. While the determination of fertility rates, mortality rates and growth rates are demographic, the needs are educational and elements of demography must be used to seek solutions to those educational problems

SAQ 2.3

Educational statistics involves the documentation of everything in the school system. Educational statistics assists in the planning and administration of education especially in the ability to evaluate the system.

SAQ 2.4

The need for educational statistics therefore arises for the following reasons;

1. Education as a large enterprise requires planning for its provision and success
2. The sector requires large personnel
3. Budgeting and allocation of resources requires statistics
4. School mapping is a statistical activity
5. Manpower planning
6. Educational investment purposes

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Study Session 3: Basic Concepts in Educational Demography and Statistics

Introduction

In the preceding study session, you have learnt that educational demography is the acquisition of demographic skills by intending education managers for use the educational system while educational statistics is the deployment of statistical skills for use in schools.

In this study session therefore you will be introduced to the basic concepts in demography and educational statistics, age distribution in your collection your data and the concept of management in education.

1.8 Learning Outcomes for Study Session 3

At the end of this study session, you should be able to:

3.1 Explain Basic Concept in Demography and Educational Statistics
3.2 Discuss Age Distribution in demography
3.3 Discuss the Concept of Management in Education

1.9 3.1 Basic Concepts in Demography and Education Statistics

The following are some concepts in demography used in education and statistics. They will be examined here conceptually and operationally too. The concepts have been compiled from scholarly writings of Knowledge Project (2013), Uganda Bureau of Statistics (2003) and the works of **Sonkerley** and **Acol** (2009).

3.1.1 Population

This is the total unit of interest in an investigation at a given time and in a given territory. It must be noted that population has certain characteristics; it could grow or shrink, it could be dense or sparse. Again, population can be described as a group of individuals or

same species living and interbreeding within a given area. Population in its dynamic nature can be studied.

3.1: Population

However, demography is the study of the characteristics of populations. **Population density** refers to the amount of space that population occupies. Another characteristic of population especially of human, animals or living things is that they can **expand** or become **extinct**.

3.1.2 Age

The age structure of population is very important both to the demographer, statistician and educator. The demographers prepare pyramids of population which are at times biggest at the base and thin out towards the end. Populations however are not bound to be pyramidal, the importance of educational planning that has to do with age structure enables the educator to structure population using certain tools and projection techniques.

In Text Question

Population involve number of people. **True/False**

In Text Answer

True

3.1.2 Age & Sex Composition of the Population

The age and the sex structure of the population are the most important demographic characteristics that are captured by a census of a population. Age and sex are two attributes that largely influence an individual's role in society.

An attempt will be made in this chapter to examine the various aspects of age and sex composition of the population of Maldives at the national and sub-national levels using data collected from the quinquennial censuses. Regarding the collection of these data, the each individual was asked to give his/her current age as well as the date of birth, to aid the reporting of age accurately.

3.1.3 Age Structure

The age structure of a population, that is; the distribution of the population indifferent age groups, constitutes an important subject of demographic analysis and development planning. Age structural dynamics includes fertility, mortality and as well as related changes in family planning and social arrangements.

The use of age structure goes beyond demographic analysis to other important areas. Public polices aim to improve the welfare of a population; population welfare in turn is determined and shaped by the needs of present and future population; a population's needs and its potential are strongly shaped by its demographic composition- i.e. by age-structural transition.

In consideration of various uses of age data, information on age is routinely collected in every census and survey conducted in the country. As in most developing countries the quality of age reporting is a matter of contention in the Maldives.
Age misreporting remains a problem in the census. Certain segments of the population do not know their dates of birth so it ultimately leaves the enumerator to estimate the age to the likeliest age to be. In some cases the estimates could be several years off from their actual age.

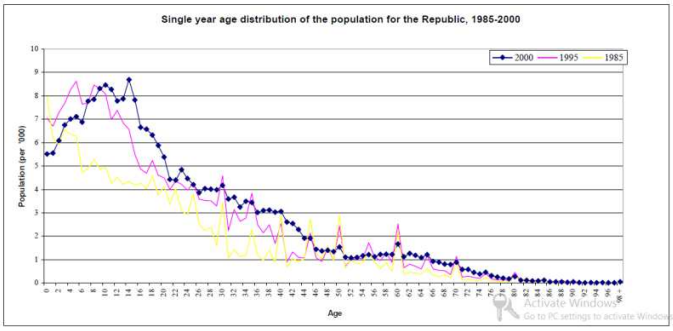

Figure 3.2: *Single year Age Structure of Population*

Heaping, i.e., digit preference, or the lack of heaping, i.e., digit avoidance, are the major forms of errors to be found in single year age data. The age distribution by single years, in the absence of dramatic decline in mortality and migration and assuming age is accurately reported, is expected to follow a descending pattern in which the population would decline with the increase in age.

There is no apparent preference of ages for the young population, thus gradually giving out a smooth curve. As the level of education increases among the younger population, it makes it easy for the respondents to report their ages accurately, judging from the grade they are attending. The level of education, particular among the younger generation has improved over the last two decades.

However, it can be noticed from the figure that preference for age 15, is more pronounced in the year 2000 than in the previous Censuses. This finding is confirmed by looking at the distribution of population in the year 1995.

This is acceptable as the cohort of 10-14 years of age in 1995 replaces those in the age group of 15-19 in year 2000, it would show the same trend as that of 1995 unless the population is exposed to severe migration and mortality changes.

This could also be in the view of the special significance the teenagers attach to this age as being at the best age of teenage. It could also be noted that in the atolls the standard of education has increased significantly providing secondary schooling opportunities leading to the ‘o’ level standard.

This attributes to the accuracy of age reporting between the ages 15-20. However, there maybe the possibility of misreporting of ages and errors associated with them. The figure 3.3 represents the age distribution of the population for male and the atolls.

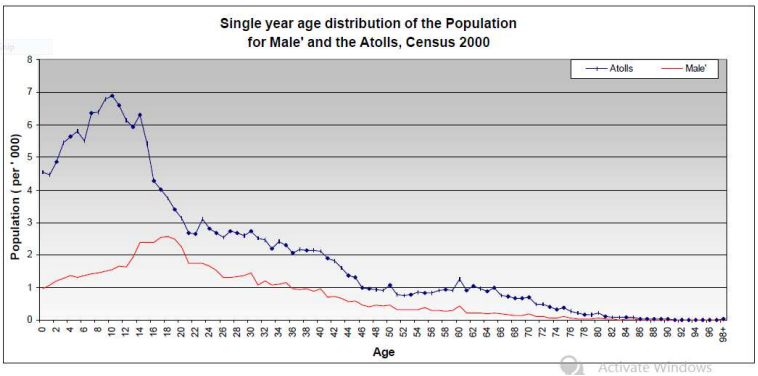

Figure 3.3: *Age Preference*

Figure 3.3 suggests that the same age preference is there for the Male' as well as for the Atoll. However it is more pronounced in the single year age distribution for the Atolls. This occurs from age 25 onwards where ages ending in 10 and 20 are obviously the preferred digits during the 2000 census.

The peak for age 15 is significant here also, showing a greater preference for the digit than the previous census. Compared to previous censuses, certain contradictions could also be revealed from the figure. It can also be noticed from the single year age distribution of the atolls that the peak for age 5 has gone down in 2000, as it moved to 9-10 years old cohort.

The preference for the ages 30, 36, 50 & 60 has gone down considerably showing an improvement in age reporting. On the other hand, the population distribution of Male' does not show such significant peaks. The extent of digit preference or age reporting can be measured by Whipple's Index, an index designed to reflect preference for the terminal digits of '0' and '5', usually in the age group 23-62.

Whipple's Index varies from 0 (when the digits 0 and 5 are not reported in the census data) to 100 (when there is no preference for 0 or 5 in the census data) to a maximum of 500 (when only the digits 0 and 5 are reported in the census data). If 100, there is tenderness towards no preference for certain digits.

The values of Whipple's Index obtained by sex for the census years are presented in Table 3.1: Value of Whipple's Index for the Census years 1985, 1995 & 2000.

Table 3.1: The values of Whipple's Index

SEX	VALUE OF WHIPPLE'S INDEX		
	1985	1995	2000
Male	175.3	149.3	109.5
Female	178.4	145.8	104.3
Total	176.8	143.1	106.9

The overall Whipple's index obtained for Maldives for the 2000 Census data was 106.9. We now try to examine this value using the standards for assessing the quality of age data given in Table 3.1

Table 3.2: Standard for Assessing Degree by Quality of Data using Whipple's Index.

	Quality of Data	Value of Whipple's Index
1-	Highly Accurate Data	Less than 105
2-	Fairly Accurate Data	105-109.9
3-	Approximate Data	110-124.9
4-	Rough Data	125-174.9
5-	Very Rough Data	175 and more

(Source: Methods and Materials of Demography, Shyrock and Siegel)

The decision of the Whipple's Index to focus on the age range of 23 to 62 is quite arbitrary. The ages of early childhood and old age are excluded since, frequently, they are more influenced by other types of errors and issues than digit preference; also 'the assumption of equal decrements from age to age is less applicable' at the older ages. According to this standard, the quality of age data can be considered fairly accurate.
This indicates minimal age heaping in the Maldives in digits ending in 0 and 5 in 2000. However, comparison of the data shows a greater improvement in the accuracy in collection of the data. Compared to the previous years, the quality of age reporting is far better in 2000 Census.

This can be acceptable with the efforts made toward improving the quality of the Census within the past five years. Census 2000 was made popular among the public through media and this increased the awareness among the people for the importance of such data collection. The data in the Table 3.1 also shows the changes in the pattern of sex difference in the quality of age reporting in the censuses.

In 2000 census, the quality of age reporting was better for the females than to the males like in the 1995 census. This can be true to some extent as the females are the ones who take the responsibility of looking after the family and judging from the age of their children, they are able to tell their ages at least.

And also females are the ones who tend to be the respondents at the time of census enumerations, and it is difficult for them to give the exact age of their husbands or spouses, in turn giving inaccurate data on them. The extent of digit preference for the whole of Maldives is compared with Male' and Atolls for the year 2000. Table 3.2 shows the results.

Tables 3.3: Value of Whipple's Index for Male' and Atolls for the 2000 Census

Sex	Value of Whipple's Index for the 2000 Census	
	Male'	Atolls
Male	111.8	108.3
Female	109.7	102.1
Both Sexes	110.9	105.1

It can be noted that the age reporting is more accurate for the Atolls than in the capital city, Male'. This is particularly due to the significant improvements in health care facilities, spread of schooling in rural areas, increased population awareness, wider spread of family planning programmes and the standardization of living conditions of the people in the islands of Maldives.

It can also be taken into consideration that in Male 'the age reporting of females is more accurate than males. This is expected especially in the Atolls' as most respondents were females who reported the age of their spouses. In Male', the value of Whipple's Index is high showing the quality of data collection is not accurate as in the islands.

In the islands it is easy to get hold of every ones ID cards while in Male' its quite difficult to get each and every persons, thus giving a rough estimate of their age.

3.1.4 Five-Year Age Distribution

The percentage distribution of the total male and female population of Maldives by five-year age group is given below in Table 3.4.

Table 3.4: Percentage Distribution of Population by Five-Year Age Groups and Sex for the Republic, Census 1985, 1995& 2000.

Age Group	1985		1995		2000	
	Male	Female	Male	Female	Male	Female
0-4	17.8	18.8	15.3	14.9	11.4	11.5
5-9	14.2	14.7	16.7	16.6	14.1	14.0
10-14	12.5	12.3	14.7	14.6	15.2	15.2
15-19	11.0	12.1	9.9	10.5	12.1	12.6
20-24	9.3	10.2	8.0	9.2	8.5	9.0
25-29	6.8	7.1	7.1	7.8	7.2	7.7
30-34	4.6	4.5	6.1	6.5	6.5	7.0
35-39	3.8	3.7	5.1	5.3	5.7	5.9
40-44	3.7	3.6	2.9	2.7	4.6	4.6
45-49	4.4	3.9	2.7	2.7	2.9	2.6
50-54	3.7	3.1	2.6	2.5	2.2	2.2
55-59	2.7	1.9	2.6	2.3	2.3	2.2
60-64	2.3	2.0	2.4	1.9	2.5	2.2
65-69	1.2	0.8	1.5	1.1	1.9	1.5
70-74	0.9	0.6	1.0	0.7	1.3	0.9
75+	1.0	0.5	1.1	0.7	1.1	0.8
Not Stated	0.1	0.0	0.3	0.1	0.6	0.4
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: Population and Housing Censuses, Ministry of Planning and National Development

It may be seen from the table that the erratic nature of age distribution as revealed in the single year age distribution is almost removed with the classification of age data by five-year age groups. The age distribution of the population in the absence of migratory movement or with drastic changes in births and deaths is expected to follow a smooth transition where there would be a decline from the preceding year to the next age cohort.

An examination from the 2000 five-year age group data shows, the pattern of the age grouping is similar to the above mentioned features. However there are certain ascertains

to this. It can be observed that between the age groups 10-19, the population is in excess to the previous age group. This can be explained from the table as we compared the 2000 data with the 1995 five age groups.

As the ages 0-14 from the 1995 data shift one cohort up, this trend is observed in the population by the year 2000. The trend is also observed in the age group 60-64. It is worthwhile noting that; it was the case in 1995 for the age group 59-60 with the excess of males. Apart from this, the population has followed a smooth declining trend as the population moves from one cohort to the next cohort.

1.10 3.2 Age Distribution

As can be seen in Figure 3.4 the age structure of the Nigeria population remains one that is young.

A population pyramid is a graphical way to show the age and sex composition of a population. Census results of 2000 further show that in the Nigeria 11 percentage of the population are under five years of age children while 51 or more percentage were aged 18 years or more.

As of 2000, less than half of the population is below the age of 15.(40.7 percent). This may have resulted from the low level of fertility that has prevailed in the country recently. It is interesting to note that the, size of the age 0-4 group has given the pyramid quite a narrow base when compared with the 1995 age cohort and the age group when compared with the age cohort 5-9 is smaller.

This picture suggests that the level of fertility has gone down considerably during the interdental period. A declining fertility trend could only be reflected in terms of smaller number of children born each year after a time lag from the start of the decline. This structure also predicts effects on population. At the same time, the number of new entrants to the labour force would increase.

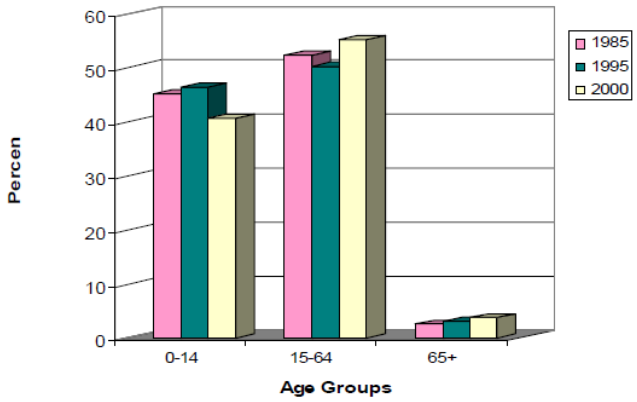

Figure 3.4: *Age Group*

3.2.1 Population Pyramid of Censuses 1985, 1990, 1995 & 2000

It may be seen from the table that the erratic nature of age distribution as revealed in the single year age distribution is almost removed with the classification of age data by five-year age groups. The age distribution of the population in the absence of migratory movement or with drastic changes in births and deaths is expected to follow a smooth transition where there would be a decline from the preceding year to the next age cohort.

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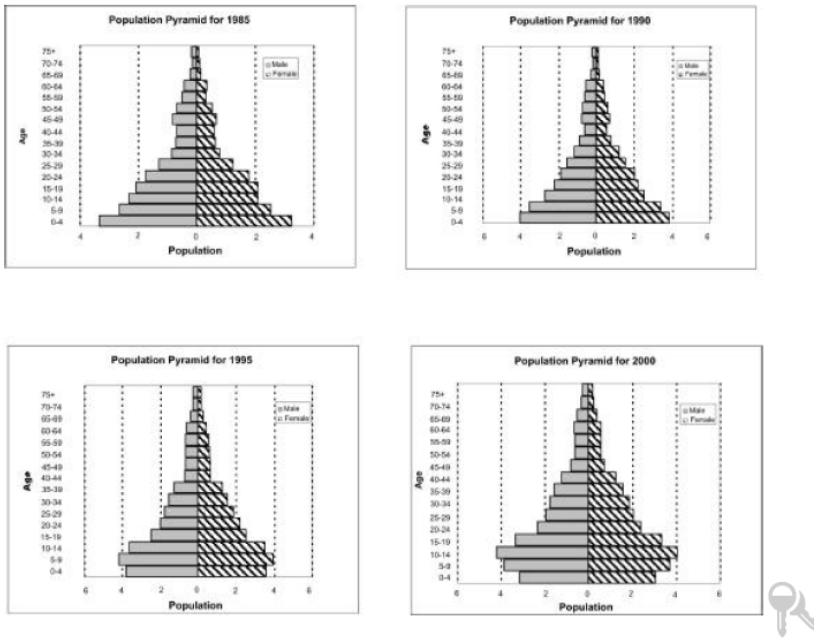

Figure 3.5: *Population by Broad Age Groups for the Republic for Census years-1985, 1995 & 2000*

The change in the age structure during the intercensal period is characterized by a gradual decline in relative size of the 'young' population. The percentage of the population aged 0-14 declined from 46.4 years to 40.7 years. The size of the working population increased to 55.1 percentage from 50.3 percentage between the two censuses. The elderly segment in the total population increased to 3.7 percentage in 2000.

In future, the rate of growth of the old population would present an important variable in determining the allocation of financial resources for pensions and social services in order to secure a decent and healthy living for this segment of the population. Population agings is generally considered when the median age of the population reaches 30 or above, while a median age of 20 or below is taken as a young population.

In fact, comparison of the median age of the population of Maldives in 2000 is 18.7 years to 16.7 years in 1995. This suggests that the population of Maldives has been 'young'. Another important aspect is the comparison of women in the broad age groups sub-divided into reproductive ages.

Table 3.5: Females by Broad Age Groups, Census years 1985-2000

Age groups	1985	1995	2000
0-14	45.84	46.06	40.63
15-49	45.18	44.63	49.37
50+	8.95	9.18	9.66
Total	**100.00**	**100.00**	**100.00**

It can be viewed from the table that the percentage of females in the age group15-49 has increased over the years. A large proportion of women in the childbearing ages will contribute to an increase in the number of births.

High birth rate during one period will produce a population in the age group 15-49 a generation later. Hence, even under the declines in fertility, the number of births might keep on increasing because of the rise in the number of women in the reproductive age in the future.

3.2.2 Dependency Ratio

The 'young' dependency ratio and the 'old' dependency ratio for the 1985, 1995 & 2000 censuses can be observed from Table 3.7

Table 3.6: Dependency Ratio for the Republic, Census year 1985, 1995 & 2000.

CENSUS YEARS	AGE GROUPS			NS	TOTAL	DEPENDENCY RATIO		
	0-14	15-64	65+			YOUNG	OLD	OVERALL
1985	45.1	52.3	2.5	0.1	100.0	86.2	4.8	90.9
1995	46.4	50.3	3.1	0.2	100.0	92.3	6.1	98.4
2000	40.7	55.1	3.7	0.5	100.0	73.8	6.7	80.6

The dependency ratio for the total population, defined as the ratio of the young and old population to the working age population, has declined marginally from 98.4 to 80.6. It can be seen from Table 3.9 the young population of about 40 percentage contributes to 73 percentage of the dependency ratio in 2000 of the overall dependency ratio.

It can also be observed that the proportion in the working age group has increased to 55 percentage leading to a decrease in the proportion of children under age.This has led to a decrease in the overall dependency ratio showing a better prospects for the development of the country as a whole.

The overall dependency ratio has decreased by about 18 percent. In other words, every 100 persons in the productive ages had to support 81 persons in terms of food, clothing, shelter, health, education, etc. This decrease can be explained by a drop of 5.7 percent in the young population dependency ratio that is larger than the observed increase in the old population dependency ratio of 0.02.

1.11

1.12 3.3 Concepts of management in education

Management can mean different things to different people at different times, and a variety of definitions have been offered. The term 'management' itself, derives from the verb 'to manage', which can mean:

Figure 3.5: *Management Meaning*

3.3.1 Management as an art

As an art, management is about carrying out organisational functions and tasks through people. This art involves the application of techniques in:

- Human and public relations
- The delegation of an authority: assigning and sharing responsibilities and duties
- Communication: including decision-making and problem-solving.
- Managing change.

3.3.2Management as a science

Management here is concerned with establishing a philosophy, laws, theories, principles, processes and practices which can be applied in various situations, including schools.

3.3.3 Management as an organization

As an organisation, management is about creating formal structures and an establishment based on a mission (or goals), objectives, targets, functions and tasks. For example, social and welfare organisations in government management can refer to education and health services, whilst public security management services could refer to the police and military.

In Text Question

Management is a science because it involve the following except _____

(a) Philosophy

(b) Theories

(c) Principles

(d) None of the above

In Text Answer

The answer is(d) None of the above

3.3.4 Management as a person

Managements may be seen as a person or a group of people. For example, a teacher could say 'The school management has changed the timetable in the middle of the term'. This could be referring to you, as the head alone, or to all the senior staff, or it could refer to the members of the board of governors or school committee. In schools with several promoted staff a 'senior management team' might be formed in much the same way as a government has a cabinet of ministers.

3.3.5 Management as a discipline

In this sense, management is a field of study with various subjects and topics. Knowledge, skills and attitudes in management can be acquired through learning, from experience and from certificated courses.

Management is a collection of processes, including such things as decision-making, problem-solving and action-planning. These processes involve the management of

resources including human, material, financial and time. These processes are also known as the functions of managers.

3.3.6 The functions of managers

We will briefly examine five main functions of managers, namely: planning, organising, directing, supervising and evaluating. These may be seen to form a management cycle as below

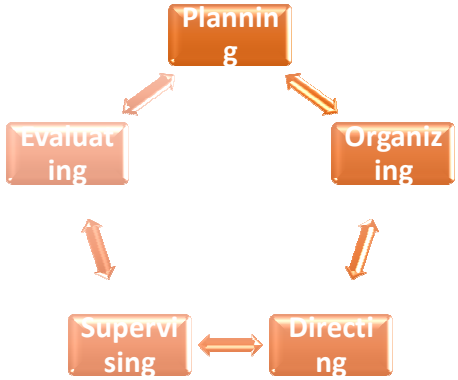

Figure 3.6: *Management Function*

(1) Planning

As discussed in study session 1, Self-Development for School Managers, you will have learned that the first action of a school manager is to identify the mission of the school and to set the objectives.

The head will then need to identify different strategies by which to achieve the agreed mission and objectives. Through the planning process the head aims to manage an efficient and an effective school. Efficient means using minimum resources to get maximum results on time. Effective means to achieve the set of objectives. The third part of the planning stage is thus to decide on an appropriate strategy.

(2) Organising

Organising involves putting in order of priority and preference the resources which are available. An Action Plan is needed in which actions and activities are scheduled. In order to give the plan 'teeth', targets are set. These targets should be quite easily attainable within a short period of time.

(3) Directing

The manager needs to direct the implementation of the plan. He or she should provide leadership by delegating duties and responsibilities to staff, and by motivating them. The directing process also involves co-ordinating and controlling the supply and use of resources

(4) Supervising

The manager will need to supervise the work which is being done, ensuring that activities are carried out in line with agreed standards, and taking steps to correct problems.

(5) Evaluating

The final part of the management cycle is to assess the results and compare them with the set targets and objectives. The performance of all the staff including the managers should be assessed. The feedback is needed in the adjustment of future plans.

These principles derive from industrial management in a Western context. Are they relevant in managing education in your country today? Look at current practices. Is there any evidence for the application of some of the above principles of management? Yes indeed, two principles popularly practised are:

(6) Span of control

This means the optimum number of subordinates reporting to the same supervisor. It is often suggested that this number should be between five to eight; one person cannot effectively supervise above this supposed limit, and some delegation may be appropriate.

(7) Co-ordination

This principle highlights that effective organisational performance is achieved when all persons and resources are synchronised, and given directions. This implies deliberate planned action towards the achievement of specific goals or policy objectives.

3.3.7 The role of the head

As a school head, you fulfil a number of important roles. Your role ultimately involves changing the behaviour and attitude of each pupil. It is recognised that you get this job done through other people. This is the management role, and the key focus of this unit so far has been to explore the nature of the management practices which make up this role.

The roles you noted might have included the following:

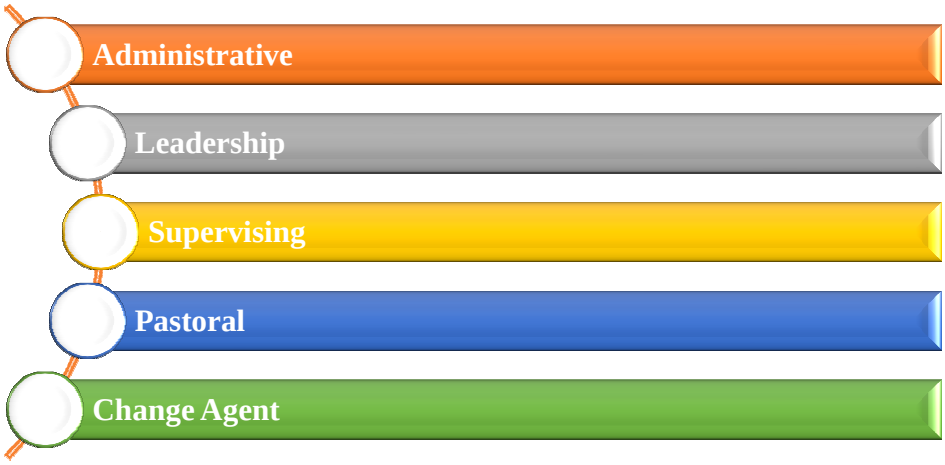

Figure 3.7: *Role of a Head*

We will be commenting on many of the functions associated with these various roles subsequently in this module. Here we attempt some clarifications of the administrative and leadership roles to conclude this introductory unit.

3.3.8 Administration and management

Pause for a moment and consider what you think to be the difference between administration and management.

Some people use management to mean administration. However, management in an organisation involves planning, designing, initiating actions, monitoring activities and demanding results on the basis of allocated resources. It is policy making, policy control and monitoring. Administration on the other hand involves implementation of the policies, procedures, rules and regulations as set up by the management.

A school head plays the role of an administrator in the implementation of policies on education within the country. You will need, for example, to be familiar with educational policy statements, such as:

- The language policy in education as stipulated in the constitution of the country
- Policy statements on promotion and provision of education services as stated in the education laws
- Policy statements on education by government officials especially those on code of conduct for pupils and for teachers; curriculum development, implementation and evaluation. In addition to the managerial and administrative role, the head teacher has a supervisory and a leadership role.

Summary from Study Session 3

In this study session, you have learnt the following:

1. **Basic Concepts in Demography and Education Statistics**
   They include the following:
   - **Population:** This is the total unit of interest in an investigation at a given time and in a given territory.
   - **Age:** The age structure of population is very important both to the demographer, statistician and educator
2. **Age Distribution**
   This is the distribution of age population to different location of a country.
3. **Concepts of Management in Education:**
   It involves the following:
   - To handle
   - To control
   - To make and keep submissive
   - To organise and to alter by manipulation and to carry out for a purpose.

Self-Assessment Questions (SAQs) for study session

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support

Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 3.1 (Testing Learning Outcomes 3.1)

Define Population

SAQ 3.2 (Testing Learning Outcomes 3.2)

Discuss Age distribution in demography

SAQ 3.3 (Testing Learning Outcomes 3.3)

Explain the concept of management in Education

Notes on Study Session 3

SAQ 3.1

Population can be described as a group of individuals or same species living and interbreeding within a given area. Population in its dynamic nature can be studied.

SAQ 3.2

A population pyramid is a graphical way to show the age and sex composition of a population. Census results of 2000 further show that in the Nigeria 11 percentage of the population are under five years of age children while 51 or more percentage were aged 18 years or more.

As of 2000, less than half of the population is below the age of 15.(40.7 percent). This may have resulted from the low level of fertility that has prevailed in the country recently. It is interesting to note that the, size of the age 0-4 group has given the pyramid quite a narrow base when compared with the 1995 age cohort and the age group when compared with the age cohort 5-9 is smaller.

SAQ 3.3

Management is a collection of processes, including such things as decision-making, problem-solving and action-planning. These processes involve the management of resources including human, material, financial and time. These processes are also known as the functions of managers.

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Study Session 4: Sources of Demographic Data and Statistics of Education

Introduction

In the last Study session, you studied the basic concepts in education, demography and statistics. The major reason why this was done was to acquaint the intending manager with some of the terms he might be coming across in the course of this course which may not be fully educational management terms but are borrowed from demography to keep the planning of education on course.

Prominent among the terms defined were; populations, age, fertility, sampling, enrollments etc. The theoretical and operational components of the terms in the light of this course were discussed. As may be well known, it is one thing to discuss and it is another thing to apply. After knowing these concepts, what must an educational manager do to be able to gather these data? What are their sources?

In this study session, you will learn about the sources of demography data, survey sampling, tax returns and sources of educational data

Learning Outcomes for Study Session 4

At the end of this study session, you should be able to:

4.1 Highlight the Sources of Demography Data
4.2 Discuss Survey Sampling
4.3 Explain Tax Returns
4.4 Outline the Sources of Educational Data

4.1 Sources of Demography Data

For good data collection the following source of data must be available which include the following:

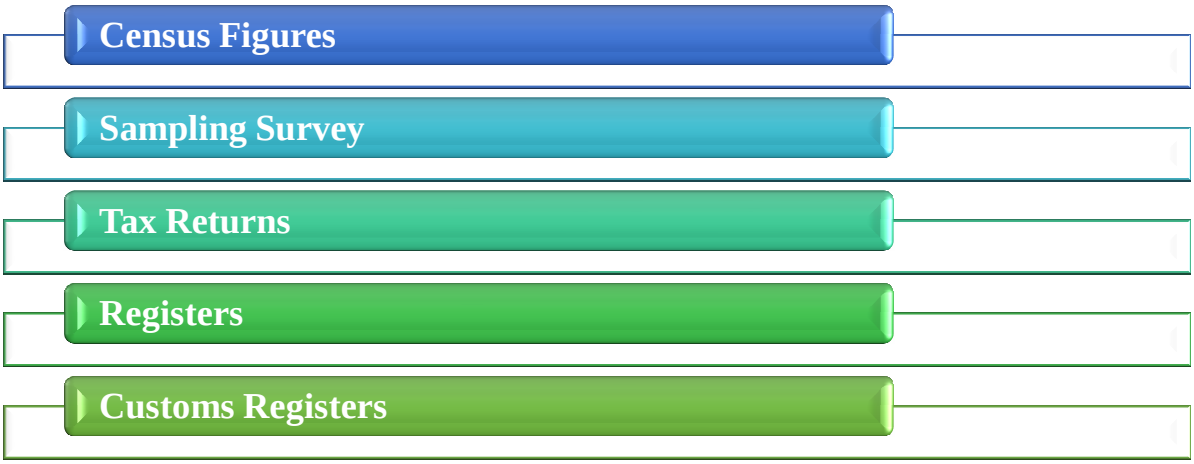

Figure 4.1: *Sources of Demographic Data*

4.1.1Basic census Definitions

The most basic census definitions appear hereunder. Compared to previous censuses, certain changes have been implemented to clarify the relationship between different units and concepts. Despite these formal differences, there are only two main variations compared to 1991:

The elimination of the concept non-resident, and consequently, of the de facto population; and, as an estimate of the genuine population load in each municipality, the concept linked population has been included as an innovation to the 2001 operation.

The concept household becomes household-dwelling, and no longer requires inhabitants to share common expenses, as this did not adapt appropriately to the close relationship between register and census data foreseen for these Censuses.

4.1.2 Population census

Series of operations that compile, summarize, assess, analyze and publish demographic, cultural, economic and social data on all the inhabitants of the country and its political-administrative divisions, referred to a specific moment or period. This operation considers all persons that live in dwellings, be they family dwellings or group dwellings.

The basic unit used in the Population census is the resident person, but the identification is not individual, as it is necessary to consider the relationships of coexistence; therefore, the family, the household and the family nucleus also appear as additional basic units.

4.1.3 Housing Census

Series of operations that compile, summarize, assess, analyze and publish data on all the places used for human habitation that have been conceived as such, and list those that were not conceived for that use but are employed for this purpose.

(1) Resident

The ensemble of residents in a specific political-administrative division is designated the resident population (concept totally equivalent to the former de jure population) or, simply, population.

The census no longer considers Non-residents .Consequently, the concept de facto population disappears, alongside the removal of the term non-resident from the Register of inhabitants.

Nevertheless, a new concept has been introduced in this census in order to calculate a better estimate of the real population load in each municipality.

(2) Dwelling

A venue is considered separate if it is surrounded by walls, fences, gates..., it is covered by a roof and allows a person, or group of persons, to be isolated from others, in order to prepare and eat food, to sleep and to find shelter from the weather and the environment.

Figure 4.2: *Venue (dwelling)*

The venue will be considered independent if it can be accessed directly from the street or public or private area, either common or individual, or from a staircase, corridor..., that is to say, when the persons in the dwelling can enter and exit it without having to go through a venue occupied by other persons.

In any case, the survey considers the current situation of the venue-dwelling and not the primitive state of the construction. Therefore, the groupings or subdivisions of the dwellings consider as many units as resulted from the transformation processes, as long as they fulfil the aforementioned conditions, and regardless, therefore, of the initial state of the construction.

There are two types of dwellings: group dwellings (also known as group establishments) and family dwellings. Inside the group of family dwellings, there is a subtype called accommodation. The definitions for each of these concepts appear below.

(3) Group dwelling

Dwelling designed to be inhabited by a group of persons subjected to a common authority or scheme that is not based on family ties or specific coexistence schemes. The group dwelling may occupy only part of the building or, most frequently, the whole of the construction.

For census purposes, this includes both actual group dwellings (convents, barracks, institution, student halls, workers residences, hospitals, prisons, etc.), and hotels, guest houses and similar establishments.

Figure 4.3: *Hotel*

When there are family dwellings (see next definition) in a group dwelling, which are normally used for the establishment's managerial, administrative or cleaning personnel, these will be considered family dwellings and be included in a different part of the census.

(4) Family dwelling

Dwelling designed to be inhabited by one or several persons, who are generally but not necessarily members of the same family, and do not compose a group, according to the previous definition.

Family dwellings1 are included in the Housing Census, regardless of whether they are inhabited or not when the census is performed. Conversely, this does not include venues constructed initially to be used as dwellings which are currently used exclusively for other purposes (dwellings that have been transformed to accommodate offices, workshops, warehouses..., which appear in the census as commercial premises).

Although they do not strictly comply with the definition, accommodations are also considered family dwellings, and are defined below. In order to distinguish between family dwelling and accommodation, the former will appear alongside the adjective conventional, in line with international regulations.

Figure 4.4: *A Family*

(5) Accommodation

A family dwelling that presents the particular feature of being mobile, semi-permanent or improvised, or a space that was not designed with a residential purpose, although it is used as the residence of one or more persons when the census is performed (therefore, empty accommodations are not included in the census).

Accommodations can be permanent, or:

- Semi-permanent dwellings which, are similar to family dwellings in certain aspects, but are only used during a limited period of time (usually under 10 years).

- Certain premises conceived as dwellings that are constructed without pillars and using waste material (tins, boxes...): huts or shacks...
- Others premises, that were not conceived as dwellings, and that have not been refurbished or reformed to be used as such, but that are used as a residence by the people living within; for example, areas located in stables, barns, windmills, garages, warehouses, commercial premises, as well as caves and other natural shelters that have been fitted out to live in them.

1 The adjective family does not imply that the inhabitants of the dwelling have to relate. It would be more precise to use an adjective related to the household, instead of to the family, but the census maintains the traditional denomination so that respondents will not think this concept has been changed, as this is not the case or mobile.
In other words, those constructed to be transported or that composes a mobile venue, and is used as a residence for one or several persons, such as tents, boats, yachts, trailers... Sections reserved for passengers in group means of transport (boats, trains...) are not mobile accommodations.

4.1.4 Family

Group of persons resident in the same family dwelling (therefore composing a household) that are related, by blood ties or by law, regardless of the degree2.
The differences between household and family are:

a The household can be composed by a single person, whilst the family has to have at least, two members.

b The members of a multi-person household do not have to be related, whilst the members of a family do.

(1) Family nucleus

Intermediate hierarchical unit between the resident and the family. The notion of the family nucleus corresponds to a restricted conception of the family that is limited to the closest degrees of kinship. There are four types of family nuclei:
a) Married couple or couple without children.
b) Married couple or couple with one or more children.
c) Father with one or more children.

d) Mother with one or more children.

Figure 4.5: *Nucleus Family*

Source: *http://www.bellanaija.com/wp-content/uploads/2015/11/dreamstime_l_28082536.jpg*

1.13 4.2 Survey Sample

Survey sampling is the process of selecting a probability-based sample from a finite population according to a sample design. You then collect data from these selected units and use them to estimate characteristics of the entire population. A sample design encompasses the rules and operations by which you select sampling units from the population and the computation of sample statistics, which are estimates of the population values of interest.

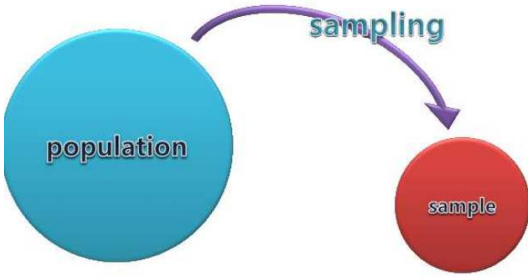

Figure 4.6: *Survey sampling*

Source

The objective of your survey often determines appropriate sample designs and valid data collection methodology. A complex sample design can include stratification, clustering, multiple stages of selection, and unequal weighting. The survey procedures can be used for single stage designs or for multistage designs, with or without stratification, and with or without unequal weighting.

To analyse your survey data with the Survey means, Surveyfreq, Surveyed, and Survey logistic procedures, you need to specify sample design information for the procedures. This information can include design strata, clusters, and sampling weights. All the survey analysis procedures use the same syntax for specifying sample design information.

You provide sample design information with the Strata, Cluster, and Weight statements, and with the RATE= or TOTAL= option in the PROC statement. If you provide replicate weights for BRR or jack-knife variance estimation, you do not need to specific strata or cluster statement. Otherwise, you should specify STRATA and CLUSTER statements whenever your design includes stratification and clustering.

A complex sample design can include the following:

- Population
- Stratification
- Clustering
- Multistage sampling
- Sampling Weights

(1) Population

Population refers to the target population or group of individuals of interest for study. Often, the primary objective is to estimate certain characteristics of this population, called population values. A sampling unit is an element or an individual in the target population. A sample is a subset of the population that is selected for the study.

Before you use the survey procedures, you should have a well-defined target population, sampling units, and an appropriate sample design. In order to select a sample according to your sample design, you need to have a list of sampling units in the population. This is called a sampling frame. Proc Survey select selects a sample by using this sampling frame.

(2) Stratification

Stratified sampling involves selecting samples independently within strata, which are non-overlapping subgroups of the survey population. Stratification controls the distribution of the sample size in the strata.

It is widely used to meet a variety of survey objectives. For example, with stratification you can ensure adequate sample sizes for subgroups of interest, including small subgroups, or you can use stratification to improve the precision of overall estimates. To improve precision, units within strata should be as homogeneous as possible for the characteristics of interest.

(3) Clustering

Cluster sampling involves selecting clusters, which are groups of sampling units. For example, clusters might be schools, hospitals, or geographical areas, and sampling units might be students, patients, or citizens. Cluster sampling can provide efficiency in frame construction and other survey operations.

However, it can also result in a loss in precision of your estimates, compared to a non-clustered sample of the same size. To minimize this effect, units within clusters should be as heterogeneous as possible for the characteristics of interest.

(4) Multistage Sampling

In multistage sampling, you select an initial or first-stage sample based on groups of elements in the population, called primary sampling units or PSUs. Then you create a second-stage sample by drawing a subsample from each selected PSU in the first-stage sample. By repeating this operation, you can select a higher-stage sample. If you include all the elements from the selected primary sampling units, then the two-stage sample is a cluster sample.

(5) Sampling Weights

Sampling weights, or survey weights, are positive values associated with the units in your sample. Ideally, the weight of a sampling unit should be the “frequency” that the sampling unit represents in the target population. Often, sampling weights are the reciprocals of the selection probabilities for the sampling units.

When you use Proc Survey select, the procedure generates the sampling weight component for each stage of the design, and you can multiply these sampling weight components to obtain the final sampling weights.

Sometimes, sampling weights also include non response adjustments, post sampling stratification, or regression adjustments by using supplemental information. When the

sampling units have unequal weights, you must provide the weights to the survey analysis procedures. If you do not specify sampling weights, the procedures use equal weights in the analyses.

In Text Question

Sampling Weights involves selecting clusters, which are groups of sampling units. **True/False**

In Text Answer

False (Cluster sampling)

1.14 4.3 Tax Returns

The tax form or forms used to file income taxes with the Internal Revenue Service (IRS). Tax returns often are set up in a worksheet format, where the income figures used to calculate the tax liability are written into the documents themselves. Tax returns must be filed every year for an individual or business that received income during the year, whether through regular income (wages), interest, dividends, capital gains, or other profits.

A return of excess taxes paid during a given tax year; this is more accurately known as a "tax refund".

Figure 4.7: *Tax returns*

4.3.1 Breaking down 'Tax Return'

Individuals use Form 1040, corporations use Form 1120 and partnerships use Form 1065. Investment income is recorded on Form 1099. Most large corporations and sole proprietors file tax returns quarterly, rather than just once per year. This keeps the tax

balance running as close to $0 as possible and avoids oversized tax bills at the end of the year.

4.3.2 Registers

The registers referred to here are quite many. There is the school enrollment register, Local Government Council, birth registration, Businesses, Religions, Hospitals, Clinics, etc.

The registers referred to above include school enrollment register that has to do with the enrollment of all pupils and students in the school section. Among them are enrollment of pupils in primary schools, secondary and universities.

Again, it is possible to access population through birth attendant registers in villages and council areas. These registers are also available in hospitals, courts etc. In the modern 21st century Nigeria, with the return to political democracy, there is the constant update of political voters' registers, party registers etc from which population can be projected or extrapolated.

A major disadvantage of these registers is that they are not total. To do them, the manager has to combine almost all to get at each segment of the population and arrive at a reasonable conclusion which will be laborious, expensive, painful, and at the end, will not be error-proof.

4.3.3 Customs Registers

This register is meant to take advantage of emigration and immigration. The availability of such records will enable adequate enumeration of entry and exit. Also, it will enable the enumeration of cars and other related property enumerations.

4.4 Sources of Educational Data

The data mentioned above have to do with demographic data and it also treats demographic characteristics of populations. However, the following could be sources of school data.

4.4.1 School Statistics

These concern school data on resource input often classified among series of booklets in school records called ‘school statistics’. It is often produced by the statistics division of Ministries of Education either at the Local Government, State or National levels in Nigeria.

The books consist of schools, enrollments (male, female, teacher and non-academic), etc. Educational data can be extrapolated from these books. In Oyo state for example, such documents on school facilities and manpower is often produced in the Ministry. Again, the State Universal Basic Education Board (SUBEB) also produces them for research uses. The documents show number of teachers, calculates pupil-teacher ratio, average class size etc.

4.4.2 School Enrolments Statistics

Enrollment is a very powerful indicator in educational planning to measure school growth. There is absolute increase that can be computed that has to do with the total number of additions irrespective of levels while we have the growth rate that has to do with other issues as age, level, crude, general etc.

Figure 4.7: *School Classroom*

Source: *https://upload.wikimedia.org/wikipedia/commons/2/25/Bundesarchiv_Bild_105-DOA0184,_Deutsch-Ostafrika,_Wuga,_Schule.jpg*

Summary from Study Session 4

In this study session, you have learnt the following:

1. **Sources of Demography Data**

   The following are sources of demography data:

   2. Census
   3. Sampling
   4. Tax Returns
   5. Registers
   6. Customs Registers

2. **Survey Sample**

   Survey sampling is the process of selecting a probability-based sample from a finite population according to a sample design. You then collect data from these selected units and use them to estimate characteristics of the entire population.

3. **Tax Return**s

   The tax form or forms used to file income taxes with the Internal Revenue Service (IRS). Tax returns often are set up in a worksheet format, where the income figures used to calculate the tax liability are written into the documents themselves.

4. **Sources of Educational Data**

The following sources of Educational Data:

- School Statistics
- School Enrolment Statistics

Self-Assessment Questions (SAQs) for study session 4

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 4.1 (Testing Learning Outcomes 4.1)

Explain Sources of Demography Data

SAQ 4.2 (Testing Learning Outcomes 4.2)

Define sampling Survey

SAQ 4.3 (Testing Learning Outcomes 4.3)

Enumerate on Tax Return

SAQ 4.4 (Testing Learning Outcomes 4.4)

Discuss on the following:

- School Statistics
- School Enrolment

Notes on Study Session 4

SAQ 4.1

- **Census Figures**
- **Sampling Survey**
- **Tax Returns**
- **Registers**
- **Customs Registers**

SAQ 4.2

Survey sampling is the process of selecting a probability-based sample from a finite population according to a sample design.

SAQ 4.3

The tax form or forms used to file income taxes with the Internal Revenue Service (IRS). Tax returns often are set up in a worksheet format, where the income figures used to calculate the tax liability are written into the documents themselves. Tax returns must be filed every year for an individual or business that received income during the year, whether through regular income (wages), interest, dividends, capital gains, or other profits.

SAQ 4.4.

These concern school data on resource input often classified among series of booklets in school records called ‘school statistics’.

Enrollment is a very powerful indicator in educational planning to measure school growth. There is absolute increase that can be computed that has to do with the total

number of additions irrespective of levels while we have the growth rate that has to do with other issues as age, level, crude, general etc.

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Study Session 5: Methods of Measuring Natality

Introduction

A change in population means an increase or decrease in the population of an area over a period of time and this is determined by two main factors: *natality* and *mortality*. However, there is a third factor which may be important in the domestic front, internal migration that could lead to a change in the population at the micro-level.

These factors can occur in several combinations to determine the change in the size of a population. You will learn about the 'methods and techniques of measuring natality and the factors which affect fertility.

Learning Outcomes for 5

At the end of this study session, you should be able to:

5.1 Explain Estimated Natality

5.2 Discuss Fertility Rate

Estimated Natality

Two main rates are used to estimate natality. These are:

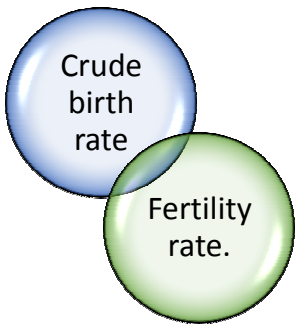

Figure 5.1: *Estimated Natality*

5.1.1 Crude Birth Rate

Crude Birth Rate is the number of resident live births for a specified geographic area (nation, state, county, etc.) during a specified period (usually a calendar year) divided by the total population (usually mid-year) for that area and multiplied by 1,000.

Calculation:

(Number of resident live births / Number of total population) x 1,000

Total Resident Live Births X 1,000

Total Population

Examples:

180,000 live births in calendar year 2005 among state residents12,300,000 estimated population in calendar year 2005 for state residents(180,000/12,300,000) x 1,000 = **14.6** live births per 1,000 state residents in 2005

Technical Notes:

- While the Crude Birth Rate (CBR) is a basic measure of fertility, it is only occasionally used as a public health measure in the US. There are other fertility measures that are more population-at-risk specific and more comparable across time and geography, such as the general fertility rate and the total fertility rate.

- The reason the CBR is “crude” is because the total population is represented in the denominator, similar to the crude death rate for example.
- Obviously, the “population at risk” of giving birth to a live neonate is poorly represented by the total population. As a result, the CBR is affected by the demographic distribution of the population in the denominator, especially by sex and age, but also by race or ethnicity category and other demographic characteristics.

- Reporting of live births may differ by birthing facility or attendant at time of birth. For example, a live birth can be interpreted and subsequently registered as a fatal death or stillbirth when the neonate very briefly shows signs of life and

subsequently dies. In some countries, “live birth” may be defined differently than in the U.S.

In Text Question

“Population at risk” of giving birth to a live neonate is poorly represented by the sample survey. **True/False**

In Text Answer

False (Total Population)

5.1.2 World Health Organization (WHO)

Sometimes live births do not become part of the official count of a state’s resident live birth total because:

a) The birth to a state resident occurred in an area (often another country) for which the state does not have a vital records exchange agreement.

b) The birth to a state resident occurred in an area for which the state does have an exchange agreement but it arrived at the state’s vital registration office too late for inclusion in the state’s official count.

c) The live birth occurred in the state but simply was not registered in time (e.g., an at-home birth) for inclusion in the state’s official count. Also note that a state’s official count of resident live births may vary somewhat from that determined by NCHS for that state due to variations of the above reasons.

For survey and census data, the main limitations concern birth omissions, misreporting of the date of birth of the child and, in the case of surveys, sampling variability.

Notes are used to indicate any differences between the data presented and the definition given above.

Figure 5.2: *World Health Organization*

Source:

5.1.3 Discrepancies between data presented in World Fertility Data 2012 and other estimates

Generally, there is no discrepancy between data presented in World Fertility Data 2012and the number of births and crude birth rate reported by national statistical systems. There is no attempt to provide estimates when country data are not available from published reports.

Data on the number of births and crude birth rate reported in World Fertility Data 2012differ from estimates produced by the United Nations Population Division and published in the World Population Prospects. The latter are best estimates based on all available demographic data and a cohort-component method used for estimation and projection.

For further details on estimates of the number of births and crude birth rate from the *World* Population Prospects, see: United Nations, Department of Economic and Social Affairs, Population Division (2011).

In Text Question

The birth to a state resident occurred in an area for which the state does not have a vital records exchange agreement. **True/False**

In Text Answer

True

5.1.3 Data coverage

World Fertility Data 2012 contains 1088 data points on the number of births and crude birth rate for 230 countries or areas of the world. Data are provided, where available, for five different reference dates: the years closest to 1970, 1985 and 1995, 2005 and the most recent data available. Data are available for five reference dates for 189 countries or areas. The data base presents data available as of October 2012.

The GFR, although an un-standardized measure, can be appropriate for synchronic or diachronic comparisons. However variations in population structure, especially for females age 20-29 years, can make comparisons between two GFRs less meaningful because some of such a comparison will be an artifact of the population differences rather than true fertility differences.

Live births sometimes are misrepresented in the numerator. Live births can be mistakenly classified and registered as fetal deaths or stillbirths when the neonate briefly shows signs of life and subsequently dies.

In some countries “live birth” may be defined differently than in the U.S. (or not applied to the same degree in practice), which follows the World Health Organization (WHO) definition. In the U.S., age of mother is often accurate to the single year of age.

5.1.4 Sometimes live births do not become part of the official count of, say, a state’s resident live birth total because:

a The birth to a state resident occurred in a state for which the state does not have a vital records exchange agreement.

b The birth to a state resident occurred in an area for which the state does have an exchange agreement but it arrived to the state’s vital registration office too late for inclusion in the state’s official count.

c The live birth occurred in the state but simply was not registered in time (e.g., an at-home birth) for inclusion in the state's official count. Also note that a state's official count of resident live births may vary somewhat from that determined by National Center for Health Statistics for that state due to variations of the above reasons.

A mid-year population number for females age 15-44 years, often derived as an estimate using a demographic method, best serves as the denominator. Decennial census counts sometimes are used, but in the U.S. they are for 1 April instead of the midyear 1 July date. For smaller geographic entities, decennial census counts might be used more commonly if population estimates by age and sex are unavailable.
If the number of resident live births is less than 100, it sometimes is advisable to combine time (additional years of births) and/or geographic areas (e.g., additional counties' numbers of live births) to increase the stability of the rate, at the expense of its temporal or spatial specificity.

As with other vital rates, confidence intervals surrounding the GFR as a point estimate can be calculated. Note that when the numerator or number of live births is less than 100, it is recommended confidence interval calculations be based on a Poisson distribution instead of a normal distribution.

Similar but conceptually different rates to the GFR to consider are: crude birth rate, total fertility rate and pregnancy rate. If the number of resident live births is small (< 10 or 20), it sometimes is advisable to combine time (additional years of births) and/or geographic areas (e.g., additional counties' numbers of live births) to increase the stability of the rate, at the expense of its temporal or spatial specificity.

Similar but conceptually different rates that provide more analytical information than the CBR are: general fertility rate, total fertility rate and pregnancy rate. before registration or within the first 24 hours of life, and the inclusion of births from previous periods. While most countries and areas report information on the number of live births by date of occurrence, others present data tabulated by the date of registration.

Depending on the timeliness with which live births are recorded, there can be considerable time lags between the date of occurrence and the date of registration. Population estimates may suffer from limitations connected to age misreporting and coverage.

5.2 Fertility Rate

General Fertility Rate is the number of resident live births for a specified geographic area (nation, state, county, etc.) during a specified period (usually a calendar year) divided by the female population age 15-44 years (usually estimated for a mid-year) for that area, and the resulting fraction multiplied by a 1,000.

Calculation:

(Number of resident live births / Number of females age 15-44 years) x 1,000

Number of Resident Live Births X 1,000

Number of Females Age 15-44 Years Population

Examples:

180,000 live births in calendar year 2008 among state residents

2,700,000 females age 15-44 years population estimated for 1 July, 2008 for state residents

180,000 X 1,000 = **66.7** live births per 1,000 female

2,700,000 state residents age 15-44 years

5.2.1 Technical Notes

The General Fertility Rate (GFR) is perhaps the most commonly used overall fertility measure because it matches often readily available numerator and denominator data in a broad age range that covers most of the female reproductive years and thus representing the population at greatest risk of giving birth.

The numerator includes all live births and not just those that occurred to women age 15 through 44 years of age. The use of age 15-44 years for fertility is a common convention because it represents the primary childbearing years. In addition, including younger or older age groups mainly would dilute the rate fraction. For example, only 0.3 percent of

all births to U.S. resident women occurred to those younger than 15 years of age and older than 44, based on 2008 data.

The GFR can be applied to subgroups of a population based on demographic characteristics other than age and sex. For example, the GFR could be particular to a race category, geographic area, marital status, etc., as long as both birth and population data can be obtained that match for that characteristic.

For example, to calculate the GFR for Pacific Islanders for a given state, one would need birth data that classified mothers by age and Pacific Islander race category as well as population that classified women by age and Pacific Islander.

In the case of race categories especially, care must be taken that the category definition(s) match for both the numerator and denominator data.

Table 5.1

Age-Specific Birth Rates for Japanese Women 1999-2005

Age (1)	Adjusted yearly Births 1999-2005 (2)	Female Population Census of (3)	Birth Rates (2) x 100 (3) (4)
15 - 49	56,558	4,229,005	13.4
20 - 24	626,240	3,870,468	161.8
25 - 29	809,727	3,341,590	242.3
30 - 34	515,268	2,825,769	182.3
35 - 39	291,728	2,651,741	109.8
40 -44	86,238	2,273,441	39.9
45 - 49	4,848	1,978,362	2.5

From the above Table, calculate the general fertility rate for Japanese women in 2005.

Solution

Number of births (B) = 2,390,607.

Estimated mid-year population of women (IS - 49) i.e. p^f (I5 - 49) is given as 21,76,376

GFR = $\frac{2,390,607}{}$ x $\frac{1,000}{}$

21, 176,376 1

= 112.89

5.2.2 Age-Specific Fertility Rate

Fertility rates can be calculated for each year of **age but in** general, fertility rates are given by age groups. Thus, the use of age groups will be particularly useful to those countries where their broken population is down into 5-years age groups (ages 15-19,20-24,25-29, etc).

Example

Table 5.2:calculate the age-specific fertility rate for Japanese women in the age-group 20 - 24 in 2005.

Solution

B_{20-24} = 626, 240

P_{20-24} = 3,870,486

$$ASFR = \frac{625,240}{3,870,486} \times \frac{1000}{1}$$

$$= 161.8$$

As was shown above, the general fertility and legitimate fertility rates by age can be calculated separately. Where there is no voluntary birth control, the fertility rate by age provides a relatively accurate measurement of the number of births. When these rates are known, it becomes possible to forecast the number of future births with some degree of accuracy.

However, where birth control is practiced, the use of these rates may prove to be very difficult. When the size of the family is voluntarily spaced, the age of women is no longer the only factor affecting fertility. Other factors come into the picture. These are age at marriage, length of time married, the number of children preceding a given birth, etc.

Basically, many factors affect fertility. Some of them are:

1. The availability and use of techniques of birth control;
2. The age at marriage;
3. The average time between births;

4. Duration of marriage; and
5. Diseases/epidemic.

In such a .situation, one can see that fertility rate by age becomes less significant. Despite these shortcomings, as long as one is cautious, fertility rates by age are still the best way of forecasting future births.

A distinction is sometimes made in demographic analysis, between "fertility" and "fecundity", fecundity referring to the biological capacity for having children (potential fertility) and the word fertility being used to refer to actual births (actual fertility).

The two terms mean the same thing when there is no intentional limitation of births, or birth control, but otherwise they are different in meaning; as a "fecund" couple may in fact remain voluntarily childless and therefore lack "fertility".

Images

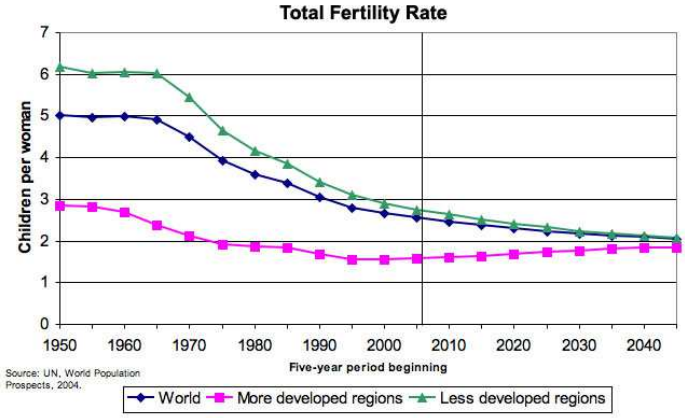

Figure 5.2: *Fertility rate*

Source:*https://www.learner.org/courses/envsci/visual/img_lrg/fert_rate.jpg*

Summary from Study Session 5

In this study session, you have learnt the following:

1. **Crude Birth Rate:** Crude Birth Rate is the number of resident live births for a specified geographic area (nation, state, county, etc.) during a specified period (usually a calendar year) divided by the total population (usually mid-year) for that area and multiplied by 1,000.
2. **Fertility Rate:** General Fertility Rate is the number of resident live births for a specified geographic area (nation, state, county, etc.) during a specified period (usually a calendar year) divided by the female population age 15-44 years (usually estimated for a mid-year) for that area, and the resulting fraction multiplied by a 1,000.

Self-Assessment Questions (SAQs) for study session

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 5.1 (Testing Learning Outcomes 5.1)

Define Crude Birth Rate

SAQ 5.2 (Testing Learning Outcomes 5.2)

Explain Age-Specific Fertility Rate

Notes on Study session 5

SAQ 5.1

Crude Birth Rate is the number of resident live births for a specified geographic area (nation, state, county, etc.) during a specified period (usually a calendar year) divided by the total population (usually mid-year) for that area and multiplied by 1,000.

SAQ 5.2

Fertility rates can be calculated for each year of **age but in** general, fertility rates are given by age groups. Thus, the use of age groups will be particularly useful to those countries where their broken population is down into 5-years age groups (ages 15-19,20-24,25-29, etc).

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Study Session 6: Methods of Measuring Mortality

Introduction

In study session 5, you have learnt about the methods of measuring natality (a positive change in population size). In this study session, you will learn about the negative changes in population size (i.e., mortality). The study of population changes must take into consideration the trends of any increase or decrease in population over a period of time.

Obviously, the two main factors which affect this trend are natality and mortality. Emphasis will be on the two types of mortality: endogenous and exogenous mortality. You will also learn the various methods of measuring mortality.

Learning Outcomes for Study Session 6

At the end of this study session, you should be able to:

6.1 Define Mortality Rate
6.2 Explain Types of Mortality
6.3 Highlight the Methods of Measuring Mortality
6.4 Discuss Mortality Rate by Age

6.1 Mortality Rate

Deaths, and counting deaths, are a crucial public health indicator for many reasons. Death is the final and most definitive health outcome of many important public health problems. And most important causes of poor health in a population, when common and severe enough, produce an elevation in the mortality rate.

Death is easily defined, making it a health outcome for which a standardized case definition is easily applied. Because death results from so many health problems - from chronic diseases, infectious diseases and injuries, the mortality rate can provide an overall indicator of general health status of a population.

Mortality rates can also provide information on nutritional status because widespread malnutrition among children or adults almost always results in an elevation of the mortality rate, especially if the level of communicable diseases is high. Nonetheless, the mortality rate is a relatively insensitive measure of population health status because conditions often must be quite poor before it is markedly elevated.

The mortality rate is also relatively non-specific; there are many causes of elevated mortality, any one of which might lead to an increase in the mortality rate. As a result, an elevated mortality rate can indicate that there is indeed a health problem in a population, but it cannot indicate the cause.

Mortality rates have been measured in many countries for hundreds of years. Deaths are often counted by various authorities, including religious leaders, civil authorities and public health professionals.

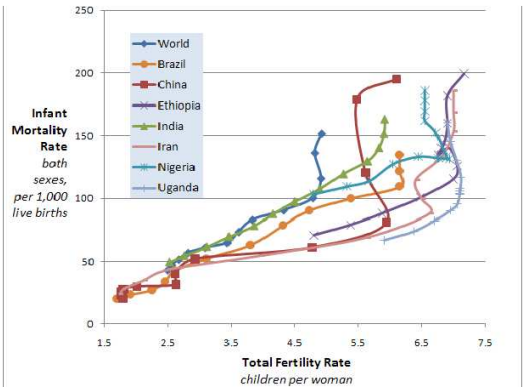

Figure 6.1: *Infant Mortality and Fertility rate Trends 1950-2010*
Source:*https://upload.wikimedia.org/wikipedia/commons/4/45/Plot-of-infant-mortality-and-total-fertility-rates-1950-2050-selected-countries.PNG*

6.2 Types of mortality rates

There are several different mortality rates used to monitor the level of mortality in populations. In humanitarian emergencies, the following are most commonly used:

6.2.1 Endogenous Mortality

This means death occurring from a cause which is to some extent inherent in the individual. Thus, when a child is born with deformities and dies as a result of this, its death can be placed in the category of endogenous mortality. Again, in this category are deaths due to old age or diseases which accompany old age such as vascular lesions and career.

6.2.2 Exogenous Mortality

This is concerned with other causes, such as accidents, contagious diseases and alimentary deficiencies. Although, there appears to be a clear-cut distinction between these two types of mortality, it is not all that clear when real situations are examined because the causes of death may be unknown or may not be declared or may be multiple.

Nonetheless, the distinction is very useful. An interesting fact is that, even though the process of hygiene and of medical care and the raising of the standard of living are capable of reducing exogenous mortality. Medical progress can indeed prevent certain premature deaths but it cannot prolong life beyond a certain limit.

Thus, when there is a decline in mortality, it affects the younger generation rather than the older ones. The net effect, therefore, is that a decline in the mortality rate has the effect of creating a younger population, that is, an increase in the population in comparison with the older sector.

In Text Question

Causes, such as accidents, contagious diseases and alimentary deficiencies are known as ____

(a) Fertility
(b) Infant
(c) Mortality
(d) Exogenous Mortality

In Text Answer

The answer is (d) Exogenous Mortality

6.3 Methods of Measuring Mortality

The measurements of mortality are technical and most methods require detailed statistics which are not available in most developing countries. However you will learn about the available ones in developing countries: They are:

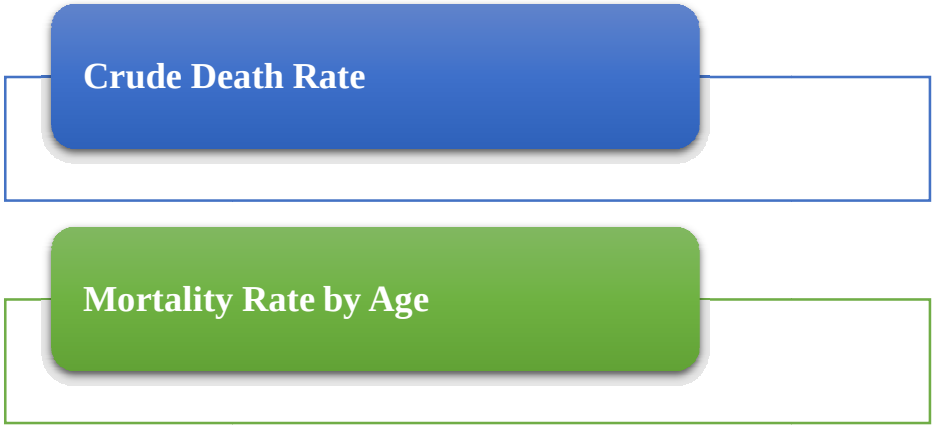

Figure 6.2: *Method of Measuring Mortality*

(a) Crude Death Rate

This is the simplest way of measuring mortality. The crude death rate is obtained by dividing the total number of deaths in a year by the average population figure for that year (i.e. the total mid-year population). Symbolically, crude death rate is given by

$$\frac{\text{No of death in a year}}{\text{Mid-year" total population}} \times 1000$$

Mathematically, the crude death rate may be expressed as:

$$dt = \frac{Dt}{Pt} \times \frac{1000}{1}$$

As stated under the crude birth rate, the mid-year total population is also referred to as the average annual population. It is also the average of the population at the

beginning or end of the year. Mid-year means July 1.

Where Pt = Average population in year t

dt = Total deaths in the country in year t and

Dt = Crude death rateAs stated under the crude death rate, the midyear total population is also referred to as the average annual population. It is also the average of the population at the beginning or the end of the year.

Example

In a country, there were 54, 000 deaths recorded in 2005. The midyear estimated population for the country was 5,000,000. Calculate the crude death rate of the country in 2005.

Solution

Recall the formula:

$dt = Dt \times 1000$

$Pt \quad 1$

Then for the country

$$d2005 = \frac{54{,}000 \times 1000}{5{,}000{,}000} \quad 1$$

$$d2005 = 10.8 \approx 11$$

The result indicates that there were 11 deaths in every 1000 persons in that country in the year 2005.Note that the calculation of crude death rate is straight forward because it does not require detailed statistics about mortality. However, it has the disadvantage of making international comparisons look very ridiculous.

For instance, in 1964, the crude birth rate of China, (Taiwan) was 5.7 per thousand while that of the United States in the same year was 9.4 per thousand. The conclusion from this is that mortality level that year was higher in the United States than in China (Taiwan). However, this was not the case because of the influence of the age structure of the two countries population.

The proportion of deaths in relation to the total population is a function of the age structure. A youthful population will invariably exhibit a lower death rate than an aging one as experienced between China (Taiwan) in 1964 and the United States. This same picture may be obtained when other developing countries with younger population are compared with the advanced countries with older population.

Note also that it is this diminution of the significance of the crude deaths rate of demographers that has led to the use of mortality rates by age. This is because mortality rates by age provide much more accurate indications of the level of mortality of a given population. Because of differences in mortality rates between sexes, mortality rates by age are usually calculated separately for men and for women.

(b) Mortality Rates by Age

In calculating mortality rates by age, the term "cohort" is much used when referring to people born during the same period, usually the same year. Through the years, it is obvious that the number of persons in a cohort will decrease because of deaths. By following the cohort trend - and of other cohorts - one can study the effects of mortality.

By comparing, for example, the number of deaths in a cohort at the age of 40 with the number of survivors at that age of the same cohort, one can obtain a measurement of mortality at age 40. Note that the calculation of mortality rates needs detailed statistical data, including statistics covering the number of deaths at a given age and the number of survivors at the same age for the cohorts.

In many developing countries, this detailed information is not available. Then, in that case, it is necessary to calculate the death rates at different ages and these rates in turn give the proportion of deaths of persons of each respective age during the year compared with the average total number of individuals of that age during that same year.

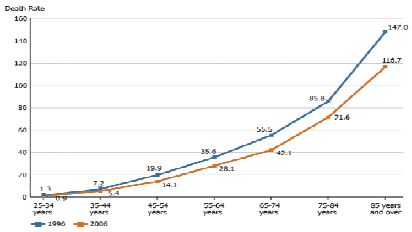

Figure 6.3: *Mortality Rates by Age*

Source: *http://www.prb.org/images09/AgeSpecificDeath.gif*

6.4 Age-Specific Death Rate

This is calculated by dividing the number of deaths in a year by the mid-year population of the specified age-group and multiplied by one thousand.

Table: 6.1

Age (1)	Population Census of 1946 (2)	Average Y.earlyDeaths 1945-47 (3)	Death Rate per 1080 Pop. (4)
1 - 4	700,762	20,683	
5 - 9	811,363	5,451	
10 - 14	805,642	2,589	
15 - 19	680,614	3,345-	
20 - 24	641,571	5,105	
25 - 34	1,027,405	9,305	
35 - 44	790,514	8,775	
45 - 54	515,695	8,209	
55 - 64	293,598	8,075	
65	229,498	21,958	
All Ages	6,657,339	125,803	

Example

From the above, calculate the age-specific death rate for Bangladesh in 2004 for the (25 - 34) grow

Solution

D_{25-34} = 9,305

P_{25-34} = 1, 027, 405

$$\therefore \text{ASDR} = \frac{9{,}305}{1{,}027{,}407} \times \frac{1000}{1}$$

ASDR = 9.1

6.4.1 Infant Mortality

It is essential that we devote special attention to a discussion of infant mortality for *two* main reasons:

1. Infant mortality is usually very high.
2. Infant mortality level is of much interest to educational planners because the number of children for whom schooling must be provided in the future depends on that level. Infant mortality is measured by the mortality rate at age 0, that is, the ratio of deaths from birth to 1 year of age to the total number of live births.

Symbolically, this is given by

$$\frac{\text{No of deaths below 1 in a year}}{\text{No of live birth in a year}} \times \frac{1000}{1}$$

Mathematically, this is given as;

$$Mi,_0 = \frac{D_0 - 1}{B_0}$$

Where;

Bo = number of live births at period 0;

00-1 = number of deaths during period 0 to 1; and

Mi,o = infant mortality rate at period O.

Example

The reports on vital statistics in Batule for the year 2002 showed that there were 62,000 live births and 8,280 deaths among infants in the year. Calculate the infant death rate of Batule in 2002.

Solution

D_{2002} = 62,000

D_{2002} = 8,280

$$IDR = \frac{8,280}{62,000} \times \frac{1000}{1}$$

$$= 134$$

As earlier mentioned, this rate is generally much higher than other age-specific death rates - until a great age is reached. This and other age-specific rates up to the year of entry into the school system are of obvious significance to the educational planners in projecting future school intake and enrollment ratios.

In-Text Question

$$\frac{\text{No of deaths below 1 in a year}}{\text{No of live birth in a year}} \times \frac{1000}{1}$$

The formula above represents infants' mortality rate. True or False

In-Text Answer

True

Note that:

a. **U**sually still-births are distinguished from infant mortality when the distinction is carried further to include what is called prenatal mortality. Prenatal mortality is obtained by adding endogenous mortality to still-births.

b. **W**hile the concepts of prenatal mortality and infant mortality are theoretically very accurate, their measurement is often imperfect especially in developing countries. This is because a very large proportion of infant deaths (and also births} are often not registered.

Table 6.1: For Measuring Mortality Rate

Indicator	Basic formula	What it quantifies	Common applications
Indicators commonly used in emergencies			
Crude mortality rate (CMR, or death rate)	Deaths due to any cause, in any age group/(population at risk x period of time)	Rate of occurrence (incidence) of death in the general population	Usually expressed as deaths per 10,000 people per day; always presented
Age-specific mortality rate (or death rate)	Deaths in age group/(population in age group at risk x period of time for those within the age range)	Rate of occurrence of death in a given age group	Most common is under-5 mortality rate (U5MR): deaths among children <5 years per 10,000 children <5 years per day
Group-specific mortality rate	Deaths among members of a given sub-group/(population belonging to the group at risk x period of time)	Rate of occurrence of death in a given group	Usually calculated for especially vulnerable groups, such as IDPs, orphans, etc.
Period-specific mortality rate	Deaths during sub-period/(population at risk during sub-period x duration of sub-period)	Rate of occurrence of death during a specific sub-period within the crisis	Monthly MR, MR during epidemic period, MR before/after displacement
Cause-specific mortality rate	Deaths due to a given cause/(population at risk x period of time)	Rate of occurrence of death due to a given cause in the general population	MR due to intentional injury; MR due to disease causing epidemic
Proportionate mortality	Deaths due to a given cause/total deaths	Proportion of all deaths that are attributable to a given cause	Usually expressed as a percentage; can be calculated in the general population or among people dying in a health facility
Case-fatality ratio (or rate) or CFR	Deaths due to a given cause (disease)/total cases of given disease	Probability of dying as a result of a given disease/cause of ill health (lethality of a given disease)	Can be calculated for a given disease/cause, or when evaluating the situation in a whole hospitalisation ward
Excess mortality rate (and total number of excess deaths)	Observed MR – expected non-crisis MR (x population at risk x period of time)	Rate of occurrence of death attributable to crisis conditions (total death toll attributable to the crisis)	Fundamental and objective indicator of crisis severity
Indicators less commonly used in emergencies, but prominent in long-term development settings			
Neonatal mortality ratio (or rate)	Deaths among neonates <28 days old/Live births	Probability of dying before age 28 days	Usually calculated for a given year (i.e. on an annual basis), and out of 1,000 live births
Infant mortality ratio (or rate)	Deaths among children <1 year old over one year/Live births	Probability of dying before age 1 year	
Under 5 mortality ratio (or rate); also known as Child mortality ratio (or rate)	Deaths among children <5 years/Live births	Probability of dying before age 5 years	
Maternal mortality ratio	Deaths while pregnant or within 42 days of pregnancy termination, due to pregnancy-related causes/Live births	Probability of dying as a result of one's pregnancy	Usually calculated for a given year (i.e. on an annual basis), and out of 100,000 live births

Summary from Study Session 6

In this study session, you have learnt that:

1. Deaths, and counting deaths, are a crucial public health indicator for many reasons. Death is the final and most definitive health outcome of many important public health problems. And most important causes of poor health in a population, when common and severe enough, produce an elevation in the mortality rate.

2. Endogenous Mortality and Exogenous Mortality are types of mortality
3. Crude death rate and mortality death rate are Methods of Measuring Mortality

4. Age-Specific Death Rate is calculated by dividing the number of deaths in a year by the mid-year population of the specified age-group and multiplied by one thousand.

Self-Assessment Questions (SAQs) for study session 6

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 6.1 (Testing Learning Outcomes 6.1)

Define Mortality Rate

SAQ 6.2 (Testing Learning Outcomes 6.2)

Explain Types of Mortality Rate

SAQ 6.3 (Testing Learning Outcomes 6.3)

Discuss Method of Measuring Mortality

SAQ 6.4 (Testing Learning Outcomes 6.4)

Explain how to calculate Age-Specific Death Rate

Notes on Study Session 6

SAQ 6.1

This is the number of death in a particular place at a particular period. The mortality rate is a relatively insensitive measure of population health status because conditions often must be quite poor before it is markedly elevated.

SAQ 6.2

Endogenous Mortality

This means death occurring from a cause which is to some extent inherent in the individual. Thus, when a child is born with deformities and dies as a result of this, its death can be placed in the category of endogenous mortality. Again, in this category are deaths due to old age or diseases which accompany old age such as vascular lesions and career.

Exogenous Mortality

This is concerned with other causes, such as accidents, contagious diseases and alimentary deficiencies. Although, there appears to be a clear-cut distinction between these two types of mortality, it is not all that clear when real situations are examined because the causes of death may be unknown or may not be declared or may be multiple.

SAQ 6.3

(a) Crude Death Rate

This is the simplest way of measuring mortality. The crude death rate is obtained by dividing the total number of deaths in a year by the average population figure for that year (i.e. the total mid-year population). Symbolically, crude death rate is given by

$$\frac{\text{No of death in a year}}{\text{Mid-year" total population}} \times 1000$$

b) Mortality Rates by Age

In calculating mortality rates by age, the term "cohort" is much used when referring to people born during the same period, usually the same year. Through the years, it is obvious that the number of persons in a cohort will decrease because of deaths. By following the cohort trend - and of other cohorts - one can study the effects of mortality.

SAQ 6.4

This is calculated by dividing the number of deaths in a year by the mid-year population of the specified age-group and multiplied by one thousand.

Study Session 7: Population Growth and Forecasting Enrolment

Introduction

In study session 6, you have learnt about mortality rate. It is important to note that mortality rate can affect population growth. Population growth is the increase in the number of individuals in a population.

Population growth is of great importance because of its effects on the school age population and facility of educational institutions available. In this study, you will learn about population growth rate, population projection, school enrollment forecasting, and population explosion.

Learning Outcomes for Study Session 7

At the end of this study session, you should be able to:

7.1 Discuss Population Growth Rate
7.2 Explain Population Projection
7.3 Discuss the concept of Forecasting School Enrollment
7.4 Discuss Population Explosion

7.1 Population Growth

Natality and mortality jointly determine the growth of a population. Sometimes, however, international migrations also play a part, but the characteristics of these migrations are peculiar to each country and to specific situations. It is in this light that emigrational movements are usually set apart in the estimation of the total growth of a population.

7.1.1 The Natural Growth Rate of Population

The natural growth rate of a population, as stated above, is the difference between births and deaths. Thus, to have a measurement of the growth of a population, the difference

between the crude death rate and birth rate is calculated. This is what is called the crude natural rate of population growth.

Table 7.1: Growth Rate of Some Selected Countries

Kenya	birth rate	40.5	47.8	n.a	48.7
	death rate	6.0	17.5	n.a.	16.0
	growth rate	34.5	30.3	1l.a	32.7
Cote'Ivor	birth rate	58.5	48.8	n.a	48.7
	death rate	30.0	22.7	n.a	20.6
	growth rate	22.5	23.3.	n.a	25.0
Colombi	birth rate	42.4	44.6	44.6	40.6
	death rate	13.0	10.6	10.6	8.8
	growth rate	29.4	34.0	34.0	31.8

Note growth rate @ birth rate - death rate; n.a. = not available

Source: United Nations Demographic Yearbook 1963, 1970, 1974 and 1975, New York, 1964, 1971, 1975, and 1976.

In Table 7.1, we showed the trend of these rates in 3 selected countries for the period 2000 - 2003. Specifically, these rates were shown in 2 developing countries and 1 advanced country. The table showed that the rate of natural growth of population has remained very high in most of the countries except Gambia whose rate fell by about 40 per cent. In fact, it shows that the rate could be as high as 34 per thousand in these countries.

A continuation at this rate in the future means that the populations of these countries will double every 22 years. With the information provided by Table 7.1, it becomes necessary that these countries should resort to birth control.

What then is the cause of this increase in the rate of natural population growth? As stated earlier, this growth is the difference between the birth and death rates. Thus we have to look at these rates to be able to explain the increase.

First, we shall notice from **Table7.1**that there has been a decline in the death rate of some countries and where there has been an increase, as in Kenya and the Gambia, this has been compensated for to some extent by an increase in the birth rate e.g. in Kenya.

Second, is that the birth rate has tended to remain constant or even increase marginally over time. The effect is that the growth rate was on the increase over this period of time (2000 - 2003).

The major contrast between the developing countries and the advanced countries, as shown by Table 7.1 is that mortality is generally on the decline in the developing countries and the natality (birth rate) has remained firm or even increased.

On the other hand, in the two advanced countries the birth and death rates have stabilized around a certain figure, and that the growth rate is gradual for the period.

It should be pointed out that the crude rate of natural growth resulting from the crude rates of birth and death has the same disadvantages as these two later rates because it does not take into consideration the age structure which may be very different between countries and even in the same country from one period of time to another.

In Text Question

Natural Growth Rate is is the difference between births and deaths. **True/False**

In Text Answer

True

7.2 Population Projections

The main aim of the educational planner for projecting future population is to enable him to obtain an estimate of the children he would have to cater for in the future in his education plan. Hence, in this section, we are going to concern ourselves only with the projection of births which has a strong influence on the preparation of education plans.

7.2.1 Birth Projections

In making birth projections, we begin by calculating what is referred to as projective fertility rates. This is done by using the current fertility data and drawing up assumptions as to the future trend. The next step is to estimate the number of women in different cohorts.

Let us assume, for example, that the projective fertility rates by age and the numbers of women of different cohorts are as shown in Table 7.2

Table 7.2 Hypothetical Projective Fertility Rates by Age (per thousand)

Year of birth of Female Cohorts	Nos as at 1/7/1978*	Numbers as at 1/7/83*	Projective Fertility Rates 1978-1983 (%)
1963-1967	400800	387137	145
1958-1962	370000	385980	700
1953-1957	340400	321338	1055
1948-1952	381200	298790	895
1943-1947	296000	276464	680
1938-1942	266400	247485	415
1933-1937	222000	204240	155
1928-1932	170500	159132	25

Note: Figures taken from Ta Ngoc Chau Demographic Aspects of Educational Planning, Fundamentals of Educational Planning, No.9, UNESCO - IIEP 1969 p.73

Let us first consider the cohort of women born between 1958 and 1962, that is, those who were in the 15 - 19 age group as of 1 July 1978. On that date, they number 370,000. However, owing to deaths, their number will be reduced to 352,980 as of July 1983. The average number of these women during the period is therefore:

$$\underline{370000+385980}=361490$$

2

Furthermore, the table shows that the fertility rate of this cohort is 700 per thousand. The result is that the number of births which can be expected from this cohort during the period is

$$\frac{61490 \times 700}{1000} = 253043 \quad \ldots\ldots\ldots (7)$$

This procedure can be repeated for the other cohorts and when this is done, the result shows that 1,271,114 births are expected but this has to be broken down by sex. Usually this will be based on the ratio of boys to girls in the current population.

Assuming that the male : female ratio is 102:100, as was in the 1963 Nigerian population for 0-4 age group (see Figure 1), then the number of boys will be 641,850 and the number of girls will be 629,264.

However, a certain number of these children will die before 1 July 1983 so that in order to obtain the number in the 0 - 4 age group of 1 July 1983 we have to multiply these figures (by sex) by the corresponding rates of survival amongst children. When this is done we can make a forecast of school enrollment.

Table 7.3 Numbers of births forecast

Year of birth of female	Numbers at 1/7/78	Numbers at tn/83	Projective fertility rates 1978 -83 (0%)	No. of births forecast
1963 - 67	400800	387173	145	57128
1958 - 62	370000	352980	700	253043
1953 - 57	340400	321338	1055	349067
1948 - 52	318200	298790	895	276103
1943 - 47	296000	276464	680	187838
1938 - 42	266400	247485	415	110781
1933 - 37	222000	204240	155	33034
1928 - 32	170500	150132	25	4120

7.3 Forecasting School Enrollment

All you have learnt in this module has been mainly to find a way of forecasting school enrollments which is a crucial part in the process of preparing educational plans. This is because without a liable estimate of the expected school population, no educational planner would be able to proceed to formulate a plan that would be acceptable to the government.

Furthermore, the presence of such a forecast will aid the estimation of the total educational costs and the need to plan the necessary means of finding the funds. When attempting to forecast future school enrollment, at the national level, one has to estimate the school age population.

Population projections showing the future age structure of the population that is in a similar pattern as that shown above will have to be done. When these projections have been obtained, it may be necessary to adjust your estimates to reflect international migrations, but this will depend on each country's situation, as mentioned earlier on.

However, in general, such migrant movements have very little effect on the school age population except perhaps at the tertiary level. In a country where there is compulsory education, the forecasting of school enrollment figures does not present any particular difficulty.

This is because if the country has an effective system of compulsory education, school-enrolled population is approximately equivalent to the school age population. However, for the other levels the enrollment rates of the school age population must be available for schooling at that level.

7.4 Population Explosion

Population explosion refers to the rapid and dramatic rise in world population that has occurred over the last few hundred years. Between 1959 and 2000, the world’s population increased from 2.5 billion to 6.1 billion people. According to United Nations projections, the world population will be between 7.9 billion and 10.9 billion by 2050.

Most of the growth is currently taking place in the developing world, where rates of natural increase are much higher than in industrialized countries. Con-cern that this might lead to over population has led some countries to adopt population control policies.

However, since people in developing countries con-sume far less, especially of non-renewable resources, per head of population than people in industrialized countries, it has been argued that the West should set an example in population control instead of giving, for example, universal child benefit.

7.4.1 over Population

In the past, infant and childhood deaths and short life spans used to limit popu-lation growth. In today's world, thanks to improved nutrition, sanitation, and medical care, more babies survive their first few years of life.

The combination of a continuing high birth rate and a low death rate is creating a rapid popula-tion increase in many countries in Asia, Latin America and Africa and people generally lived longer. Over-population is defined as the condition of having more people than can live on the earth in comfort, happiness and health and still leave the world a fit place for future generations. But some people now believe that the greatest threat to the future comes from over-population.

It took the entire history of humankind for the population to reach 1 billion around 1810 Just 120 years later, this doubled to 2 billion people (1930); then 4 billion in 1975 (45 years).The number of people in the world has risen from 4.4 billion people in 1980 to 6.3 billion in 2005. And it is estimated that the popula-tion could double again to nearly 11 billion in less than 40 years. This means that more people are now being added each day than at any other time in hu-man history.

Figure 7.1: *Overpopulation*

In Text Question

Over population occur when available number of people is more than the ____

(a) Birth Rate

(b) Available resource

(c) Death Rate

(d) People

In Text Answer

The answer is (b) Available resource

7.4.2 The Causes of Rapid Population Growth

Until recently, birth rates and death rates were about the same, keeping the population stable. People had many children, but a large number of them died before age of five. During the Industrial Revolution, a period of history in Eu-rope and North America where there were great advances in science and tech-nology, the success in reducing death rates was attributable to several factors:

- Increases in food production and distribution
- Improvement in public health (water and sanitation).
- Medical technology (vaccines and antibiotics), along with gains in educa-tion and standards of living within many developing nations.

Without these attributes present in many children's lives, they could not have survived common diseases like measles or the flu. People were able to fight and cure deadly germs that once killed them. In addition, because of the technology, people could produce more and different kinds of food. Gradually, over a period of time, these discoveries and inventions spread throughout the world, lower-ing death rates and improving the quality of life for most people.

Summary from Study Session 7

In this study session, you have learnt that:

1. Natality and mortality jointly determine the growth of a population. Sometimes, however, international migrations also play a part, but the characteristics of these migrations are peculiar to each country and to specific situations.

2. The main aim of the educational planner for projecting future population is to enable him to obtain an estimate of the children he would have to cater for in the future in his education plan.

3. Forecast will aid the estimation of the total educational costs and the need to plan the necessary means of finding the funds. When attempting to forecast future school enrollment, at the national level, one has to estimate the school age population.

4. Population explosion refers to the rapid and dramatic rise in world population that has occurred over the last few hundred years. Between 1959 and 2000, the world's population increased from 2.5 billion to 6.1 billion people. According to United Nations projections, the world population will be between 7.9 billion and 10.9 billion by 2050.

Self-Assessment Questions (SAQs) for study session 7

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support

Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 7.1 (Testing Learning Outcomes 7.1)

Explain Population growth

SAQ 7.2 (Testing Learning Outcomes 7.2)

Discuss Population Projection

SAQ 7.3 (Testing Learning Outcomes 7.3)

Discuss the concept of Forecasting School Enrolment

SAQ 7.4 (Testing Learning Outcomes 7.4)

Explain Population Explosion

Notes on Study Session 7

SAQ 7.1

Natality and mortality jointly determine the growth of a population. Sometimes, however, international migrations also play a part, but the characteristics of these migrations are peculiar to each country and to specific situations.

SAQ 7.2

The main aim of the educational planner for projecting future population is to enable him to obtain an estimate of the children he would have to cater for in the future in his education plan. Hence, in this section, we are going to concern ourselves only with the projection of births which has a strong influence on the preparation of education plans.

SAQ 7.3

The presence of a forecast will aid the estimation of the total educational costs and the need to plan the necessary means of finding the funds. When attempting to forecast future school enrollment, at the national level, one has to estimate the school age population

SAQ 7.4

Population explosion refers to the rapid and dramatic rise in world population that has occurred over the last few hundred years. Between 1959 and 2000, the world's population increased from 2.5 billion to 6.1 billion people.

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Study Session 8: Population Structure and its Effects on Education

Introduction

You were introduced to population changes and enrollment forecasting in the last study. In this study session, you will be learning about the effects of population structure on education.

The study, of population structure is about the composition of the population and this could be the distribution based on certain pre-defined criteria. The educational planner invariably gets interested in studying the distribution of the population for diverse reasons.

Three of such reasons are that he may be interested in the population distribution by age and sex. This will enable him to measure the relative size of the population of school age, which is very important in the formulation of any educational policy.

It could also be that he is interested in the distribution of the population to know its distribution by sectors of economic activity, and within each of these sectors, by occupation.

By knowing this distribution the educational planner is able to estimate the need for each sector. Hence, he is able to determine targets for vocational, technical and tertiary education.

The educational planner may be interested in the geographical distribution of the population and this is important because it affects the costs of education as well as the choice of types, sizes and location of-educational institutions.

Learning Outcomes for Study Session 8

At the end of this study session, you should be able to:

8.1 Explain the effect of population Structure on Education
8.2 Discuss age Structure and School Enrolment Ratio
8.3 Discuss Population Change and Management Ratio

8.1 Effects of Population Structure on Education

Structure refers to the configuration of elements, constituents or parts in a complex entity, organization or arrangement. It is the way something is "made up" or composed. You can look at the composition or structure of a population from different viewpoints.

The structure of a population may be examined by age, by occupation or by geographical location. Let us first consider the effects of age distribution on education.

8.1.1 Age Structure

The age structure summarizes the demographic past of a population because the number of people at each age is determined by:

- ✓ The number of births in the generation from which they have come.
- ✓ The effects of mortality on that generation.
- ✓ The size of the net migration of the age structure of a population

Hence, a close examination of the age structure of a population may reveal past occurrences of demographic importance. Three major types of age distributions are noticeable: young, old and rejuvenated populations. A population is said to be young when the proportion of children (under 15 years old) is very high.

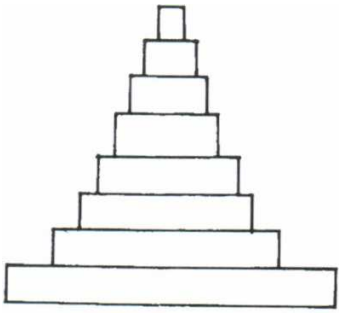
The population is aged when the adults are more in number than children. The youthfulness or agedness of a population is conspicuous in its age pyramid. A young population has a pyramid with a wide base; it tapers off to the top.

The wide base indicates preponderance of children and the contracted upper region shows that adults are relatively few. Most of the less developed countries have this age structure.

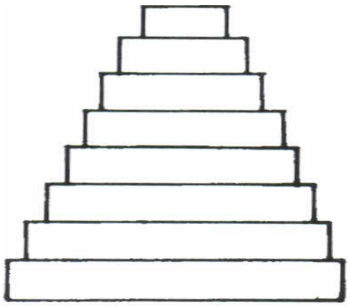
When there is considerable decrease in the birth rate, the pyramid shrinks or becomes deflated at the base.

This is an old 'population. Sweden, Germany, Japan and U.K. are in their old ages. If after experiencing a decrease in the birth rate, a country begins to show an increasing trend, the pyramid will be inflated at the middle signifying a rejuvenation of population. The decade after the Second World War witnessed rejuvenation of population in Europe and America.

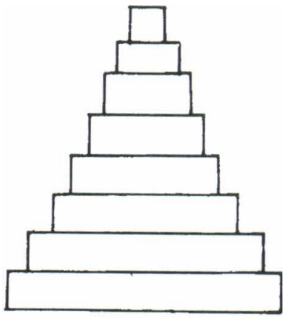
Figure 8.1 Population Pyramids



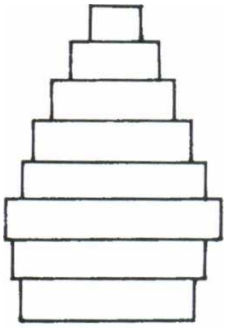
Very Young Population



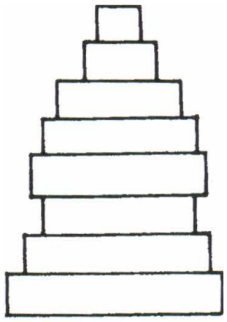
Old Population



Old Population



Very Old Population



Rejuvenated Population

8.1.2 Age Structure and Teacher Requirements

In developing countries, where the age structures are the youthful type; there is a smaller number of people in the older generations. Since teachers are usually older than students, this implies that teachers of any age group are recruited from older generation, which is comparatively less numerous.

This phenomenon may partially account for why developing countries encounter great difficulties in getting sufficient number of people to recruit as teachers. As a population matures towards the old age, the number of adults approaches the number of children and there is often no shortage of people to teach.

8.1.3 Age Structure and Educational Expenditure

Supporting the school age population is a burden for the economically active group. The 5-14 year age group does not exercise any economic activity but constitutes a dependency burden on the 25-64 year age group.
If the proportion of those dependent on the working population is high, the relative load of educational expenditure on the working class is heavy. A country with a youthful age structure, necessarily expends more economic resources on providing education for their young ones.

Table 8.1

Country	Year	(1) Population* Aged 5-14	Aged	(2) Population * Aged 15-64	(3) Burden (%) (1) /(2)
China	1970	2,453		4,232	58
Zambia	1975	1,343		2,499	54
India	1974	148,717		332,233	45
Canada	1975	4,332		14,466	30
UK	1975	7,910		30,906	26
Sweden	1974	1,139		5,260	22

*Population in thousands

Source: Culled from, United Nations Demographic Year Book, 1975 Pp 188-217

In Text Question

Structure refers to the configuration of elements, constituents or parts in a complex entity, organization or arrangement. **True/False**

In Text Answer

True

8.2 Age Structure and School Enrollment Ratios

The youthful age structure constitutes a planning problem since the size of school age children increases every year. The enrollment ratios will fall unless effort is made to enroll more children than in the preceding year. To provide schooling for the extra number of children, there must be continuous expansion in enrollments as well as in resources each year.

Thus, the youthfulness of age structure in developing countries constitutes a formidable barrier to progress towards their being at par with the rest of the world in education attainments. In the old age structures, enrollment is either constant or decreasing.

8.2.1 Occupational Structure

An occupational distribution of a population affords us the privilege of knowing the

proportion of the active population in the different sectors of economic activity (primary, secondary and tertiary sectors). It is also possible to know the percentages of the active population engaged in each occupation.

Given the desired level of productivity in each occupation and in each sector, it is possible to estimate the manpower requirements. Such estimates will affect the planning of future enrollments in technical, vocational and higher education.

8.2.2 Geographical Structure

School locational planners' have to take cognizance of the spatial distribution of a population in making plans. Two major parameters affect the starting of new schools: population size and catchment area is confined to the maximum.

Walking distance stipulated by official regulation if children have to walk to school. Means of transportation and availability of special facilities (e.g. School lunch) can also affect the location of schools.

Secondary schools need large catchment areas because of lower enrollment ratios. This catchment area can be larger where there is a school bus pick-up system.

The catchment area of a boarding school is not as much determined by home-school distance as by administrative and political factors, by and large, the geographical distribution of the potential clients of a school is an important consideration in the locational planning of that School.

In Text Question

The type of population that affords us the privilege of knowing the proportion of the active population in the different sectors of economic activity is ___

(a) Over population
(b) Under Population
(c) Occupational Structure
(d) Geographical Structure

In Text Answer

The Answer is (c) Occupational Structure

8.3 Population Changes and Management of Education

You have examined the effects that the structure of a static population has on the management of education. In real life situations, demographic characteristics are always changing.

An increase or decrease in the size of population is determined mainly by natality and mortality, since the effect of migration tends to be neutralized by emigration. Internal migrations have no perceptible effect on the total size, even though they dislocate the geographical structure of a population.

Natality is measured by crude birth rate and fertility rates while mortality is measured by crude death rate, infant mortality and age-specific death rate. The balance of births and death represent growth due to natural increase. The rate of population growth due to natural increase is a parameter of special interest to educational managers.

Effective management of education requires the ability to make a forecast of the population numbers that the education system will have to cater for in the near future. Estimates of future numbers are derived from projections based on population growth rates.

Since the expected sizes of future enrollments in schools have determinative effects on educational policy formulation, educational managers are better prepared for their assignments when they are adequately informed about the size of population, its structure and its rate of growth due to natural increase.

Summary from Study Session 8

In this study session, you have learnt that:

1. Structure refers to the configuration of elements, constituents or parts in a complex entity, organization or arrangement. It is the way something is "made up" or composed.

2 The youthful age structure constitutes a planning problem since the size of school age children increases every year. The enrollment ratios will fall unless effort is made to enroll more children than in the preceding year. To provide schooling for the extra number of children, there must be continuous expansion in enrollments as well as in resources each year.

3 An increase or decrease in the size of population is determined mainly by natality and mortality, since the effect of migration tends to be neutralized by emigration. Internal migrations have no perceptible effect on the total size, even though they dislocate the geographical structure of a population.

Self-Assessment Questions (SAQs) for study session 8

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 8.1 (Testing Learning Outcomes 8.1)

Mention how the number of people at each age are determined

SAQ 8.2 (Testing Learning Outcomes 8.2)

Explain the following:

- Occupational Structure
- Geographical Structure

SAQ 8.3 (Testing Learning Outcomes 8.3)

Explain Population Change and Management of Education

Notes on Study Session 8

SAQ 8.1

The age structure summarizes the demographic past of a population because the number of people at each age is determined by:

✓ The number of births in the generation from which they have come.

- ✓ The effects of mortality on that generation.
- ✓ The size of the net migration of the age structure of a population

SAQ 8.2

Occupational Structure

An occupational distribution of a population affords us the privilege of knowing the proportion of the active population in the different sectors of economic activity (primary, secondary and tertiary sectors).

Geographical Structure

School locational planners' have to take cognizance of the spatial distribution of a population in making plans. Two major parameters affect the starting of new schools: population size and catchment area is confined to the maximum.

Walking distance stipulated by official regulation if children have to walk to school. Means of transportation and availability of special facilities (e.g.school lunch) can also affect the location of schools.

SAQ 8.3

Effective management of education requires the ability to make a forecast of the population numbers that the education system will have to cater for in the near future. Estimates of future numbers are derived from projections based on population growth rates.

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Study Session 9: Determination of School Age Population

Introduction

As a manager of educational programme, you are expected to know about techniques for projecting future demands for education and to be proficient in calculating the number of children expected in various grades in the future.

As basis for your calculations you must be capable of determining the number of children that are qualified by age to be in each grade. But figures in national census data are usually presented in 5 or 10 year age groups.

This study session shows you how to break up the 5 years age-group population (or 10 year age-groups) into single-year ages. Once you can determine the single year ages of any census figure, you will be able to calculate school age population at any level.

Learning Outcomes for Study Session 9

At the end of this study session, you should be able to:

9.1 Discuss the determination of school age Population

9.2 Explain Using the Sprague Multipliers

9.3 Calculate the Estimate of number of children of 6, 7 and 8 years of age.

9.1 Determining the School Age Populations

The groupings in census reports do not often correspond to school age populations. Hence, educational managers need to know the techniques of estimating these populations (e.g., primary and secondary school age population), from the national census data.

The most popular technique splits the number in a census age-group into numbers for single-year age. The single-year age population is then summed up to arrive at the

required school age population.

This method will first require splitting the ten-year age-groups into two groups each by the following formula:

$P_a = \frac{1}{2} P_o + \frac{1}{8}(P_{-1} - P_{+1})$

where P_o is the ten-year age-group tobe split

P_{-1} is the ten-year age-group preceding P_o

P_{+1} is the ten-year age-group following P_o

P_a is the first 5-year age-group of P_o

The age group 0-9 has no preceding age-group, just as the last age group has no succeeding one. Hence, the above formula is not useful in splitting the first and last ten-year age groups on a population pyramid. However, empirical studies show that 0-4 year age group comprises about 55 per cent of the first ten-year age group in developing countries.

Example

Given the following data:

Age	**Population**
0-9	450,058
10-19	395,289
20-29	355,718

Here you are required to split the 10-19 year age groups into two five age groups (10-14 and 15-19). The formula above gives:

$$\mathbf{P_{10-14} = P_{10-19} + 1/8(P_{0-9} - P_{20-29})}$$

$= \frac{1}{2}(395,289) + 1/8\,(450,058 - 335,718)$

$= 203,541$

$= 395,289 - 203,541 = 191,748$

In Text Question

The total population for age group of 0-9, 10-19, 20-29 is ____

(a) 121,748

(b) 200,406

(c) 542,325
(d) 191,748

In Text Answer

The answer is (d) 191,748

9.1.1 Dividing the Five Year Age Groups into Single Year Groups

If it is possible to know the actual number of children aged 6, 7, 8 …, then it will be easy to compute the school age populations. Two ways of making interpolations can be used to break up the numbers in the five year age groups into single year brackets. A manager must not lose sight of the limits of the accuracy of such derived data.

The splitting techniques cannot guarantee exact single term figures for any particular society. But when there is reason to believe that there has been no great variation in the birth rates in the preceding years, the interpolations can be fairly reliable.

Epidemic years of genocide and baby booms are common causes of variations in the birth rates. The two methods of interpolation cannot be relied upon when such incidences are noticeable.

9.2 Using the Sprague Multipliers

Table of Sprague multipliers (coefficients) are established to facilitate computation when splitting numbers. The procedure for operation requires knowing the numbers in the age-group under consideration, as well as numbers in the two preceding and the two following age-groups. There are five different types of age groups to consider.

The first is (0-4 year age group) that has no preceding age group. The next is the (5-9) year age group with one preceding age group. The third is made of (70-74) year group and the 75+.

The interpolation of the first group is based on the numbers in the three following age groups. The procedures are reversed when splitting numbers in the last two age groups into single year numbers.

In Text Question

Sprague multipliers are established to facilitate computation when splitting numbers. **True/False**

In Text Answer

True

First Table 9.1: Sprague Multiplier

Age	Age Groups					
	0-4	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**
0 years	+0.3616	-0.2768	+0.1488	-0.0336	-	-
1 year	+0.2640	-0.0960	+0.0400	-0.0080	-	-
2 years	+0.8140	+0.400	+0.0320	+0.0080	-	-
3 years	+0.1200	+0.1360	-0.720	+0.0160	-	-
4 years	+0.0701	+0.1968	-0.0848	+0.0176	-	-

Second Table 9.2

Age	Age Groups					
	0-4	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**
5 years	+0.0336	+0.2272	-0.0752	-0.0144	-	-
6 years	+0.0000	+0.2272	-0.0480	+0.0080	-	-
7 years	-0.0080	+0.2160	-0.0080	+0.0000	-	-
8 years	-0.0160	+0.1840	+0.0400	-0.0080	-	-
9 years	-0.0176	+0.1408	+0.0912	-0.0144	-	-

Intermediate Table 9.3

10 years	-0.0128	+0.0848	+0.1504	-0.0240	+0.0016	-
11 years	-0.0016	+0.0144	+0.2224	-0.0416	+0.0064	-
12 years	+0.0064	-0.0336	+0.2544	-0.0336	+0.0064	-
13 years	+0.0064	-0.0416	+0.2224	+0.0144	-0.0016	-
14 years	+0.0016	-0.0240	+0.1504	+0.0848	-0.0128	-

15 years	-	-0.0128	+0.0848	+0.1504	-0.0240	+0.0016
16 years	-	-0.0016	+0.0144	+0.2224	-0.0416	+0.0064
17 years	-	+0.0064	-0.0336	+0.2544	-0.0336	+0.0064
18 years	-	+0.0064	-0.0416	+0.2224	+0.0144	-0.0016
19 years	-	+0.0016	-0.0240	+0.1504	+0.0848	-0.0128

9.2.1Procedure for Calculation

Any single-year age data can be estimated by multiplying the number in in the appropriate five-year age-group with the coefficients indicated against the single-year age for which, the number is to be estimated.

Question:

Using our earlier example (the 10 year figures have been split into 5 year age-groups, estimate the number of 6-year olds in the population.

Age Group	population
0-4	247,537
5-9	202,526
10-14	203,541
15-19	191,748
20-24	185,780

Computation

The coefficients indicated against the 6-year olds, in the second table, are multiplied with the numbers in the corresponding 5-year age groups.

That is:

(+O.0080) x 247,532 + (+O.2320) x 202,525 + (-0.0480) x 203,541 + (+0.0080) + 191748 = (+1980.3) + (+46986.0) + (-9770) + (+1534.0) = 1980.3 + 46989 - 9770 + 1534 = 40,730

To know the primary-age population, it will be necessary to add up the single-year age data that make up the primary school age. To know the primary school age population, it will be necessary to add up the single-year age data that make up the primary school age.

Note that the Sprague multipliers for the 100 year and l l-year age-groups are in the intermediate Table.

Example

Given the following distribution of the Nigerian population in 5 -year age-groups, estimate the number of children aged 6, 7 and 8 who could be in primary 1 to 3 in a universal system of primary schooling:

Table 9.4

Age Groups	Population
0-4	9,549,000
5-9	8,439,000
10-14	5,937,000
15-19	5,251,000

Computation

The coefficients along each line of 6, 7 and 8 year-olds are to be used. Part of the second Table of Sprague multipliers would therefore be relevant:

Table 9.5

Age	0-4	5-9	10-14	15-19
6	+0.0090	+0.2320	-0.0480	+0.0080
7	-0.0080	+0.2160	-0.0080	+0.0000
8	-0.0160	+0.1840	+0.0400	-0.0080

Each 5-year age group population is multiplied by the corresponding coefficient indicated among the line of 6 years. Then the 4 products are added up. To obtain estimates for 7 and 8-year-olds the same procedure is followed in each case (see below).

The three totals are then added to know the total number of children that could be enrolled in the first three classes of a universal primary school system:

9.3Estimate of number of children of 6, 7 and 8 years of age.

Age	**9,549,000 multiplied by the corresponding coefficient gives:**	**8,439,000 multiplied by the corresponding coefficient gives:**	**5,937,000 multiplied by the corresponding coefficient gives:**	**5,21,000 multiplied by the corresponding coefficient gives:**	**Total**
6	**+79,392**	**+1,957,848**	**-248,976**	**+42,008**	**1,991,272**
7	**-76,392**	**+1,822,824**	**-47,496**	**+0**	**1,698,936**
8	**-152,784**	**+1,522,776**	**+237,748**	**-42,008**	**1,381,732**
	Total	**4,871,940**			

9.3.1 Using International Comparisons

Some countries are able to keep detailed demographic statistics through some form of civil registrations. Such countries may be able to obtain reliable single year age distribution of their population.

The percentage of one total population (or group population) represented by each group (or single-year age population) can be computed. Countries with similar demographic characteristics (identical nationality, mortality and reproduction rates) can use the percentages to compute their own figures for the different single-year age populations.

Example

Colombia and Nigeria have similar demographic characteristics. Colombia has the following data for the 5 - 9 year age groups:

Age	**Age Fraction**
5 years	23.4
6 years	22.1
7 years	19.4
8 years	17.9
9 years	17.2
Total	100.00

Estimate the number of 5-year olds in Nigeria if the 5 to 9-year age group is 6,932,000.

Computation

23.4% of 6,932,000 =

$\frac{23.4 \text{ X } 6;932,000}{100}$

1,622,088

You can estimate each of the other single-year age population in the same way.

Questions

1. Search for the latest estimate of the population of your country in the UNESCO statistical year book and;

a Calculate the primary school age population using the estimates.

b Calculate the number of taxable adults if children of 16 years and below, as well as adults of 60 years and above are exempted from paying tax.

2. Below is the illiterate population of Burkina Faso by age-group and by sex, 1976.

The population of adults who were 15 years and above was 3,669,703. If men and women in Burkina Faso married at the mean ages of 25 and 20 respectively, how many new brides and bridegrooms would be unable to sign the marriage register? (Number of illiterate brides and illiterate bridegrooms). (Note: some 10year age-group will have to be split in 1 to 2 first).

Iterate Population of Burkina Faso by Age-group and by sex, 1976

Age-group			45 - 54		497,851
				Total	360,700
15+			55 - 59	3,346,7	114,883
10-14				69	320,054
			60+	543,32	
15	-	19		9	
				459,11	
20	-	24		8	
				357,10	
25	-	34		4	
35	-	44		693,73	
				0	

Male	
1,549,971	Female
277,378	1,769,7
217,592	98
145,652	265,95
282,038	1
222,574	241,52
175,243	6
61,438	211,45
168,056	2
	411,69
	2
	275,27
	7
	185,45
	7
	53,445
	151,998

Source: UNESCO, 1986 statistical Year book.

3. The single-year age-group populations of Nigeria gave the following percentage to the total population in 1963:

Primary Level		**Secondary Level**	
6 years	1.22%	12 years	2.08%
7 years	3.05%	13 years	1.97%
8 years	2.97%	14 years	1.91 %
9 years	2.67%	15 years	1.85%
10 years	2.46%	16 years	1.77%
11 years	2.25%	17 years	1.78%
Total	**16.02%**	**Total**	**11.36%**

Given that total population of Nigeria in 1980 was estimated to be 84,732,000 and assuming that these percentages have remained constant over the years.

i. Compute the population of the primary school age-group in 1980.

ii. Compute the population of the secondary school age group in 1980.

iii. What must have been the number of pupils placed in Primary 1 if there was free and compulsory universal primary education in 1980?

iv. The projections for 1990 is 169,067,000. Answer questions i, ii, iii for the year 1990,

4. In 1963, the population of Nigeria was as shown below:

Age-groups	**Population 000**	**Percentages**
0-4 years	9549	17.2
5-9 years	8439	15.2
10-14 years	5937	10.7
15-19 years	5251	9.4
20-24 years	6928	12.4
25-29 years	5571	10.0
30+	14000	25.1
Total	55670	100.00

Calculate

(i) Primary school age population (1963)

(ii) Secondary school age population (1963)

Calculate primary school age population for your state for 1985 using the

above percentages if the total population for the various state during the year 1985 is as shown below: (In '000)

S/N	States	Population
1	Anambra	6,180
2	Bauchi	4,170
3	Bendel	4,230
4.	Benue	4,179
5.	Borno	5,152
6.	Cross River	5,978
7.	Gongola	4,478
8.	Imo	6,313
9.	Kaduna	7,044
10.	Kano	9,926
11.	Kwara	2,947
12.	Lagos	2,920
13.	Niger	2,053
14.	Ogun	2,666
15.	Ondo	4,692
16.	Oyo	8,953
17.	Plateau	3,484
18.	Rivers	2,956
19.	Sokoto	7,802

Summary from Study Session 9

In this study session, you have learnt the following:

1. **Determining the School Age Populations**

   The groupings in census reports do not often correspond to school age populations. Hence, educational managers need to know the techniques of estimating these populations (e.g, primary and secondary school age population), from the national census data.

2. Using the Sprague Multipliers

Table of Sprague multipliers (coefficients) are established to facilitate computation when splitting numbers. The procedure for operation requires knowing the numbers in the age-group under consideration, as well as numbers in the two preceding and the two following age-groups. There are five different types of age groups to consider.

3. Using International Comparisons

Some countries are able to keep detailed demographic statistics through some form of civil registrations. Such countries may be able to obtain reliable single year age distribution of their population.

Self-Assessment Questions (SAQs) for study session 9

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 9.1 (Testing Learning Outcomes 9.1)

Explain the Determination of School Age Populations

SAQ 9.2 (Testing Learning Outcomes 9.2)

Explain the Sprague Multipliers Techniques of age determination

SAQ 9.3 (Testing Learning Outcomes 9.3)

Explain International Comparisons of demography statistics of the population

Notes on Study Session 9

SAQ 9.1

The most popular technique splits the number in a census age-group into numbers for single-year age. The single-year age population is then summed up to arrive at the required school age population.

This method will first require splitting the ten-year age-groups into two groups each by the following formula:

$$P_a = \frac{1}{2} P_o + \frac{1}{8} (P_{-1} - P_{+1})$$

where Po is the ten-year age-group tobe split

P_{-1} is the ten-year age-group preceding Po

P_{+1} is the ten-year age-group following Po

Pa is the first 5-year age-group of P_O

SAQ 9.2

Table of Sprague multipliers (coefficients) are established to facilitate computation when splitting numbers. The procedure for operation requires knowing the numbers in the age-group under consideration, as well as numbers in the two preceding and the two following age-groups. There are five different types of age groups to consider.

The first is (0-4 year age group) that has no preceding age group. The next is the (5-9) year age group with one preceding age group. The third is made of (70-74) year group and the 75+.

The interpolation of the first group is based on the numbers in the three following age groups. The procedures are reversed when splitting numbers in the last two age groups into single year n

SAQ 9.3

Some countries are able to keep detailed demographic statistics through some form of civil registrations. Such countries may be able to obtain reliable single year age distribution of their population.

The percentage of one total population (or group population) represented by each group (or single-year age population) can be computed. Countries with similar demographic characteristics (identical nationality, mortality and reproduction rates) can use the percentages to compute their own figures for the different single-year age populations.

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Study Session 10 : Demography And School Enrolment 1

Introduction

In study session eight, you have learnt about the effects of population structure on the education sector. You will learn in this study, the effects or relationship between demography and schools enrollment. Some indices are important in determining educational status of a population and these include; age, sex, literacy and educational attainment.

The age and sex distribution provide a basis for the calculation of enrollment ratios and rates and the literacy rate gives a better insight into the educational needs of the people. Previous Nigerian censuses before the 2006 national censuses did not provide such information.

Though the 2006 national census attempted to provide such, it is yet to be conclusive and needs more censuses to enable continuous data. However, as at today, the actual level of literacy in Nigeria has not been estimated correctly. What most planners do today is to calculate the enrollment ratios, wastages and efficiency directly from school records. The literacy and illiteracy ratio in the society are unknown parameters.

Learning Outcomes for Study Session 10

At the end of this study session, you should be able to:

10.1 Highlight on the Stages of Education

10.2 Explain school Enrolment

10.3 Discuss on Age-Specific Enrollment Ratio

10.1 Stages in Education

There are three stages in education viz;

a. Input

b. Process and

c. Output

The educational stages are diagrammatically represented as;

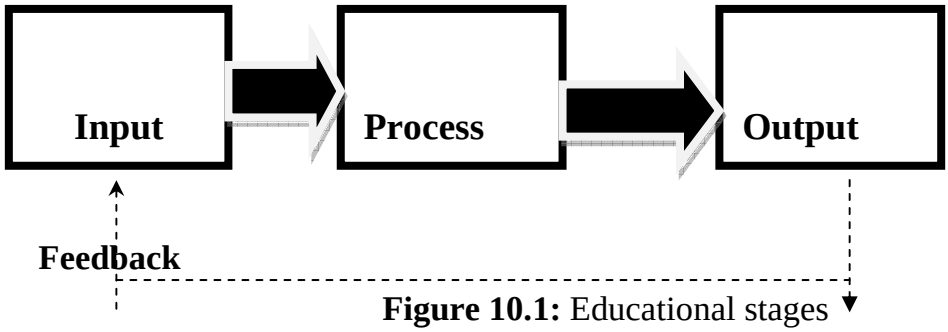

Figure 10.1: Educational stages

In the first stage of the educational level i.e the input stage, resources flow into the educational system. These input include; human resources (teachers, school children, administrators etc). Other inputs that flow into the system include; financial and material resources, especially provision of infrastructure and necessary school equipment.

The second stage is the information flow process. This information flow involves the changing process of the inputs especially the information presentation through curriculum, packages and instruction in the educational levels or systems. The third stage is the presentation of the finished item i.e the graduate.

The graduate goes into the open labour market and the system receives feedback that is shown in the diagram in broken lines. The purpose of the feedback is to inform the school system of how efficient its curriculum is. The feedback will generate further research and development. It will lead to educational system evaluation etc

Each stage in the educational system has its corresponding parameters for measurement. They measure the relevance and irrelevance of any stage of the system. Educational planners must be versed in the art of preparing these parameters and using them to prepare educational plans and reports.

The measure of relevance at the input stage is enrollment ratios. Enrollment ratios consist of the general enrollment ratio [GER] and enrollment ratios at each specific level that will be treated as we go on. In the aspect of processing, we have different rates. These rates provide the function of giving quantitative measures to internal efficiency of a system.

The output system in Nigeria has no measure. The evidence is clear for all to see.
To get a clearer understanding of what we are to do, students are advised to revert to lecture four where the sources of educational data was exhaustively discussed. Mentioned therein were: school statistics, census returns, special surveys etc. Each of these methods mentioned have their advantages and disadvantages.

In Text Question

The educational Stages are Child, Teenage, and Adult. **True/False**

In Text Answer

False (Input, Process and Output)

10.2 School Enrollment Statistics

School Enrollment

The Current Population Survey (CPS) has public and private school information in several detailed tables. In the table packages since 2006, Table 3 has public and private enrollment for students in nursery, kindergarten, and elementary school. The report shows public and private college enrollment.
Historical Table A-1 shows public and private enrollment for every level of schooling. In the 2005 and older detailed table packages, the report also shows public and private school enrollment for nursery and kindergarten students. This contain public and private school enrollment for nursery, kindergarten, elementary, and high school students.
The American Community Survey (ACS) provides public and private school enrollment tables through American Fact Finder in tables S1401, B14002, B14003, and B14004. To access these tables, visit the ACS Data on School Enrollment website.

10.2.1 Enrollment Trends

Enrollment trends in schools can be calculated in two ways; absolute increase or decrease in enrollment over a specific period of time or the growth rate of enrollment over the period in question. We present here the data for 4 secondary schools in Kwara state, Nigeria.

Table 10.1 Enrollment in 4 Secondary Schools in Oyi LGA in Kwara State from 1979/80 and 1980/81

School	Enrollment 1979/80		Enrollment 1980/1981	
	Boys	**Total**	**Boys**	**Total**
A	0	1,480	0	1,525
B	560	560	605	605
C	0	580	0	595
D	430	760	455	795
Total	**990**	**3,380**	**1,060**	**3,520**

(i) Increase in Enrollment

From the data in Table 10.1, the absolute increase or decrease in total enrollment is;

Increase = $E_{1980/81} - E_{1979/80}$

Where E = Enrollment

In general, if t is the starting year, the formula become;

E_{t-1} - E_t

(ii) Growth Rate of Enrollment

The growth rate of enrollment can be computed using the formula:

$$\text{Growth rate} = \frac{E_{1980/81} - E_{1979/80}}{E1979/80} \times 100$$

Or $\frac{E_{t+I} - E_t}{Et} \times 100$

Using the formula above on data presented and compare your results with Table 10.2

Table 10.2: Increase and Growth rate of Enrollment in 4 Secondary Schools in Oyi LGA of Kwara State

School	Absolute Increase		Growth Rate %	
	Boys	**Total**	**Boys**	**Total**
A	0	45	0	3.0
B	45	45	8.0	8.0
C	0	15	0	2.6
D	25	35	6.0	4.6
Total	70	140	7.1	4.1

This is the ratio between the number of students enrolled of a given age and the size of the population in the given age-group.
There are three types of enrollment ratios discussed here namely;

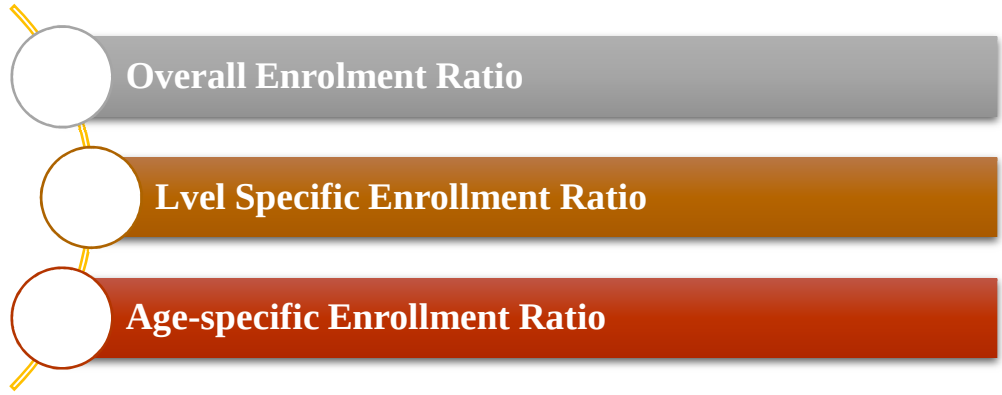

Figure 10.2: *Types of Enrollment*

The overall, crude or general enrollment ratio may be expressed as;

$\frac{E_t}{P_{(a,t)}} \times 100$ where

Et = Total enrollment at all levels and ages covered in year t
P (a,t) = Total population in age-group 'a' that corresponds to all levels (often 6-24) years in year t.

if for example, the total enrollment at all levels of education in 1982 is 8.3 million and the total school age population (6-24) years in the same is 35.5 million, then the overall enrollment ratio in 1982 is;

$\frac{E_{1982}}{P_{(a, 1982)}} \times 100$

i.e $\frac{8.3}{35.5} \times 100 = 23.4\%$

10.2.2 Level Specific Enrollment Ratio

This is often referred to as 'enrollment ratio for primary, secondary or higher education', it may be defined as the ratio between the primary enrollment at

educational level ‘h’ and the population that should be enrolled at that level of education. It may be expressed as;

$$\frac{E_{(h,t)}}{P_{(b,t)}} \times 100$$

Where E (h,t) = Total enrollment at level ‘h’ in year ‘t’

And P (b,t) = Total population in the age groups ‘b’ that correspond to level ‘h’ in year ‘t’

As the numerator includes all students enrolled regardless of age, the level-specific enrollment ratio is often referred to as the gross level enrollment ratio. It can be adjusted for length of schooling and entry age to make international comparisons of enrollment ratios possible.

In Text Question

Specific enrollment ratio is the ratio between the primary enrollment at educational level and the population that should be enrolled at that level of education. **True/False**

In Text Answer

True

10.3 Age-Specific Enrollment Ratio

The Net Enrolment Rate (NER) in primary education is the ratio of the number of children of official primary school age who are enrolled in primary education to the total population of children of official primary school age, expressed as a percentage.

10.3.1 Concepts

Children of official primary school age are defined by the International Standard Classification of Education (ISCED97). The customary or legal age of entrance to primary school is not younger than five years or older than seven years and in principle covers six years of full-time schooling.

Where more than one system of primary education exists within a country, the most widespread or common structure is used for determining the official school age group.

Primary education normally consists of programmes designed on a unit or project basis to give pupils a sound basic education in reading, writing and mathematics along with an elementary understanding of other subjects such as history, geography, natural science, social science, art and music.

Figure 10.3: *Specific Age Enrollment*

10.3.2 Method of computation

To calculate the indicator, it is necessary to first determine the population of official primary school age, preferably by reference to the theoretical starting age and duration of ISCED97 Level 1 (primary education), for international comparability.

Then, the number of pupils of the official primary school age who are enrolled in primary education is divided by the population for the same age-group and the result is multiplied by 100.

Some children of primary school age might enter primary school early and advance to secondary school before they reach the official upper age limit of primary education. The NER does not include those children, underestimating the number of children who actually receive a full course of primary education.

To overcome this limitation, an adjusted net enrolment rate in primary education can be calculated as the number of children of official primary school age who are enrolled either in primary or secondary education expressed as a percentage of the total population of children of official primary school age.

The age-specific enrollment ratio relates the enrollment of a given age or in a given year to the population of the same age in the same year. It could be expressed as;

$$\frac{E_{(b,t)}}{P_{(b,t)}} \times 100$$

Where $E_{(b,t)}$ = Enrollment in age ‘b’ in year ‘t’

$P_{(b,t)}$ = Total population of age ‘b’ in year ‘t’

Note that only those enrolled students of the correct age group need appear in the numerator. It implies that the over-aged or under-aged students enrolled in the year under consideration will be excluded in the computation. For the reason mentioned,

this computation or ratio is usually taken as thenet level enrollment ratio when it relates to level.

For example, at the primary level, the age-specific enrollment ratio (net level enrollment ratio) will be a summation of only the pupils of ages 6-11 that are enrolled, divided by the summation of all children in the given age bracket (6-11) in the society multiplied by 100. In mathematical or statistical notation, the age specific enrollment ratio is

$$b = 11$$

$$b = 6^{\frac{E(b,t)}{P_{(b,t)}}} \times 100$$

The use of enrollment ratios depends very much on data availability and the purpose for which they are required. The crude enrollment ratio is the least instructive. It merely gives us an idea of how many people, relative to school-age population, is actually in the schools.

The level-specific (gross level) enrollment ratio helps to identify the relative absorbing capacity of educational systems while the age-specific enrollment ratio indicates the percentage of the enrolled people in a given age group. There can sometimes be wide gaps between the three different enrollment ratios.

The age-specific (net level) ratio gives a somewhat partial picture as it excludes those students who are actually enrolled but are outside the prescribed age group. The performance of the educational sector as the population served may thus be under-valued.

The level-specific (gross) ratio gives an often over-stated index as it includes under and over-aged students. These points are illustrated by applying the three types of enrollment ratios in three selected Asian Countries for 1972.

Table 10.3: Two Types of Enrollment Ratios in Three Asian Countries in 1972

Country	Level-specific Enrollment Ratio $\underline{E}_{primary}$ $P_{6\text{-}11}$	Age-specific Enrollment Ratio $\underline{E}_{6\text{-}11}$ P_6-11	Age-specific Enrollment Ratio $\underline{E}_{Secondary}$ P_{12}-17	Age-specific Enrollment Ratio $\underline{E}_{12\text{-}17}$ P_{12}-17
	1	2	3	4
Indonesia	62.2	46.7	12.5	28.5
Iran	67.1	56.2	38.0	44.6
Korea	107.7	98.5	47.0	54.4

Summary from Study Session 10

In this study session, you have learnt the following:

1. **Stages in Education**

   There are three stages in education:

   - Input
   - Process and
   - Output

2. **School Enrollment Statistics**

   The Current Population Survey (CPS) has public and private school information in several detailed tables. In the table packages since 2006, Table 3 has public and private enrollment for students in nursery, kindergarten, and elementary school. The report shows public and private college enrollment.

3. **Age-Specific Enrollment Ratio**

   he net enrolment rate (NER) in primary education is the ratio of the number of children of official primary school age who are enrolled in primary education to the total population of children of official primary school age, expressed as a percentage.

Self-Assessment Questions (SAQs) for study session 10

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study

Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 10.1 (Testing Learning Outcomes 10.1)

List out the three stages in Education

SAQ 10.2 (Testing Learning Outcomes 10.2)

Explain school Enrolment

SAQ 10.3 (Testing Learning Outcomes 10.3)

Discuss on Age-Specific Enrollment Ratio

Notes on Study Session 10

SAQ 10.1

There are three stages in education viz;

d. Input
e. Process and
f. Output

SAQ 10.2

The Current Population Survey (CPS) has public and private school information in several detailed tables. In the table packages since 2006, Table 3 has public and private enrollment for students in nursery, kindergarten, and elementary school. The report shows public and private college enrollment.

SAQ 10.3

The Net Enrolment Rate (NER) in primary education is the ratio of the number of children of official primary school age who are enrolled in primary education to the total population of children of official primary school age, expressed as a percentage.

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Study Session 11: Demography and School Enrolment 2

Introduction

The last study session focused on the indicators that display a country's educational performance especially as it relates to the indicators that determine the general efficiency of the educational system level by level.

This study session will examine some other school indices that deal with enrollment but focusing on the internal efficiency of the school system. This study session will work on some of those critical indicators as internal efficiency, wastages, ratios etc.

Learning Outcomes for Study Session 11

At the end of this study session, you should be able to:

11.1 Explain how to Measuring Efficiency and Wastage

11.2 Discuss Literacy and Educational Attainment

11.3 Discuss Basic Statistical Indicators

11.1 Measuring Efficiency and Wastage

While enrollment ratios are indicators of a country's educational performance, enrollment rates tell you about the internal efficiency of a school system. They show us how well students have progressed from one grade to another. To ensure this, three concepts stand out distinctly and they are; promotion, repetition and dropout rates.

The total number enrolled in a grade level in any particular year is made up of all students promoted to this level plus those who are now repeating this grade level minus those who have dropped out. Note that the outflows (transfers) in a country will cancel out if the system is closed. When dealing with individual schools however, transfers can be considered as positive or negative drop outs.

Grade enrollment can therefore be represented by the formula:

$E_{(g,t)} = P_{(g,t)} + R_{(g,t)}$

Where;

$E_{(g,t)}$ = Enrollment in the grade level of this year

$P_{(g,t)}$ = Promotees to the grade level this year

$R_{(g,t)}$ = Repeaters in the grade level of this year

To calculate the wastage ratio of a grade level, we need information on the number of drop outs. To know how many have dropped out, we can use the formula;

$$D(g, t) = E_{(g,t)} - R_{(g,t)} - P_{(g+1,t+1)}$$

Once the number of promotees and repeaters are known, the drop outs can be determined. This can be computed using the following set of formulae:

In Text Question

Enrollment rates tell you about the internal efficiency of a school system. **True/False**

In Text Answers

True

11.1.1 The Promotion Rate

Measure the likelihood of a student moving from a given grade to the next grade in a given level of education regardless of repetition. The effective promotion rate for grade Gi and year t is defined as the ratio between promotees from grade Gi to the next grade Gi+1 between school years t and t+1 and the number of students enrolled in grade Gi in a given year who do not repeat that grade the following year.

Purpose

To show the real transition from one grade to the next grade regardless of repetition. This indicator measures the share of pupils enrolled in a given grade who will effectively transit to the next grade without repetition or after repeating the grade one time or more.

Calculation Method

The number of new entrants to the following grade for the following year (t+1) is divided by the number of students enrolled in the given grade in the given year t minus the number of repeaters from the given grade in the following year (t+1) and multiplied by 100.

Thus, the number of students in a particular grade level divided by the number of students enrolled in the previous year multiplied by 100:

$$P = \frac{P_{(g,t)}}{E_{(g-1,t-1)}} \times \frac{100}{1}$$

11.1.2 The Repetition Rate

Grade retention or grade repetition is the process of having a student repeat an educational course, usually one previously failed. Students who repeat a course are referred as "repeaters". Repeaters can be referred to as having been "held back".

The primary alternative to grade retention (for those who have failed) is a policy of social promotion, under the ideological principle that staying with their same-age peers is important. Social promotion is the promotion of all students, regardless of achievement, from one class to the next.

Social promotion is somewhat more accepted in countries which use tracking to group students according to academic ability. Regardless of whether a failing student is retained or promoted, academic scholars believe that underperformance must be addressed with intensive remedial help, such as summer school programs.

In most countries, grade retention has been banned or strongly discouraged. In Canada and the United States, grade retention can be used from Kindergarten through twelfth grade. However, with older students, retention is usually restricted to the specific classes that the student failed, so that a student can be, for example, promoted in a math class but retained in a language class.

Where it is permitted, grade retention is most common among students in early elementary school. Most schools refuse to retain a student more than once in a single grade, or more than two or three years across all grades.

Students with intellectual disabilities are only retained when parents and school officials agree to do so. Children who are relatively young in their age cohort are four times more likely to be retained.

This is the number of students repeating a given level divided by the number enrolled in the same grade level the year before multiplied by 100;

$$R = \frac{r_{(g,t)}}{E_{(g,t-1)}} \times 100$$

11.1.3 Dropout Rate

This is the number of students that drop out of a given level divided by the number enrolled in that grade level in the same year multiplied by 100 represented statistically as;

$$D = \frac{d_{(g,t)}}{E_{(g,t)}} \times \frac{100}{1}$$

By law, there is an automatic promotion in Nigeria. Though the law of automatic promotion is being reviewed and is still undergoing review, repeating a class is not uncommon in educational practice. In some cases, it could be out of a parent's wish. If promotion is automatic, and attendance is compulsory (no drop-out allowed), then wastage ratio would be + 1 and this will show a seemingly perfect internal efficiency of the system.

11.2 Literacy and Educational Attainment

Educational attainment refers to the highest level of schooling that a person has reached. At the primary and secondary school level, educational attainment refers to the number of grades completed. At the postsecondary level, it refers to institutions attended and certificates, degrees or diplomas obtained. Person refers to an individual and is the unit of analysis for most social statistics programs.

11.2.1 Conformity to relevant internationally recognized standards

This standard is compatible with the United Nations (UN) recommendation for measuring educational attainment.

Educational attainment is defined as the highest grade completed within the most advanced level attended in the educational system of the country where the education was received. Some countries may also find it useful to present data on educational attainment in terms of highest grade attended.

For international purposes, a "grade" is a stage of instruction usually covered in the course of a school year. Information on educational attainment should preferably be collected for all persons 5 years of age and over.

This standard follows the recommendations of the UN in measuring the grade or programme level completed in educational institutions. The exception being the class "Some postsecondary education (highest)" which includes persons who have received

some postsecondary education but, have not received a postsecondary certificate, diploma or degree.

The UN concept of Educations attainment does not include credentials conferred by professional organizations. Such credentials are excluded from the current standard.

Another relevant international standard is the International Standard Classification of Education (ISCED). ISCED classifies educational programmes and includes a classification of the levels of educational attainment. This standard does not use ISCED but, rather, a classification that reflects the language used to describe education levels in Canada.

In societies where literacy and literacy rates are available, some measures of educational attainments of the total population can be quite useful. Literacy is the ability of a person to both write and read. The crude rates of literacy as well as the age specific literacy rates can be computed.

In Text Question

At the primary and secondary school level, educational attainment refers to the number of grades _____

(a) Completed

(b) Partial completed

(c) Failed

(d) Rewrite

In Text Answer

The answer is (a) Completed

11.2.2The Age-Specific Illiteracy Rate

This can be statistically expressed as;

$$\frac{1_{(b,t)}}{P_{(b,t)}} \quad x \quad 100$$

Where

$1_{(b,t)}$ = Number of illiterates in age – group b in year t

$P_{(b,t)}$ = Total population of age-group b in year t

1 = Number of illiterates

I + L = P

11.2.3 The Crude Illiteracy Rate

The crude Illiteracy rate can be statistically expressed as;

$$\sum_{b=15}^{b=m} \frac{1_{(b,t)}}{P_{(b,t)}}$$

Summing the expression from b = 15 to b = m means the illiteracy level of the population aged 15 and above.

11.2.4The Specific Grade Attainment Rate

The specific grade attainment rate can be statistically expressed as;

$$\frac{C^{g}_{(b,t)}}{P_{(b,t)}} \times 100$$

Where;

$C^{g}_{(b,t)}$ = Persons at age b who completed exact grade level b

11.2.5The Cumulative Grade Attainment Rate

This rate can be statistically expressed as;

$$\frac{C^{g+}(b,t)}{P(b,t)} \times 100$$

Where

C^{g+} (b,t) = persons at age b who completed grade level g or beyond

Two other measures of central tendency frequently employed in the analysis of education attainment data are the median and the mean years of school completed.

(a) The median constitutes the middle value, in terms of years of schooling which divides the distribution of the population by educational attainment into two parts above and below which lies and equal number of values. The median is a positional measure indicating at what educational level the middle person is located in the distribution.

(b) The median is the arithmetic average of the years of schooling completed by all persons in a population.

11.3 Basic Statistical Indicators

The Statistical Indicators comprises of the mean median and mode which helps in data collection and analysis. The terms mean, median and mode are used to describe the central tendency of a large data set. Range provides provides context for the mean, median and mode.

When working with a large data set, it can be useful to represent the entire data set with a single value that describes the "middle" or "average" value of the entire set. In statistics, that single value is called the central tendency and mean, median and mode are all ways to describe it.

To find the mean, add up the values in the data set and then divide by the number of values that you added. To find the median, list the values of the data set in numerical order and identify which value appears in the middle of the list. To find the mode, identify which value in the data set occurs most often.

Range, which is the difference between the largest and smallest value in the data set, describes how well the central tendency represents the data. If the range is large, the central tendency is not as representative of the data as it would be if the range was small.

Image

11.3.1 How are mean, median, mode and range used in the data center

IT professionals need to understand the definition of mean, median, mode and range to plan capacity and balance load, manage systems, perform maintenance and troubleshoot issues.

These various tasks dictate that the administrator calculate mean, median, mode or range, or often some combination, to show a statistically significant quantity, trend or deviation from the norm.

Finding the mean, median, mode and range is only the start. The administrator then needs to apply this information to investigate root causes of a problem accurately forecast future needs or set acceptable working parameters for IT systems.

Mean

The mean is the average of all numbers and is sometimes called the arithmetic mean. To calculate mean, add together all of the numbers in a set and then divide the sum by the total count of numbers. For example, in a data center rack, five servers consume 100 watts, 98 watts, 105 watts, 90 watts and 102 watts of power, respectively.

The mean power use of that rack is calculated as (100 + 98 + 105 + 90 + 102 W)/5 servers = a calculated mean of 99 W per server. Intelligent power distribution units report the mean power utilization of the rack to systems management software.

Median

In the data center, means and medians are often tracked over time to spot trends, which inform capacity planning or power cost predictions. The statistical median is the middle number in a sequence of numbers.

To find the median, organize each number in order by size; the number in the middle is the median. For the five servers in the rack, arrange the power consumption figures from lowest to highest: 90 W, 98 W, 100 W, 102 W and 105 W.

The median power consumption of the rack is 100 W. If there is an even set of numbers, average the two middle numbers. For example, if the rack had a sixth server that used 110 W, the new number set would be 90 W, 98 W, 100 W, 102 W, 105 W and 110 W. Find the median by averaging the two middle numbers: (100 + 102)/2 = 101 W.

Mode

The mode is the number that occurs most often within a set of numbers. For the server power consumption examples above, there is no mode because each element is different.

But suppose the administrator measured the power consumption of an entire network operations center (NOC) and the set of numbers is 90 W, 104 W, 98 W, 98 W, 105 W, 92 W, 102 W, 100 W, 110 W, 98 W, 210 W and 115 W.

The mode is 98 W since that power consumption measurement occurs most often amongst the 12 servers. Mode helps identify the most common or frequent occurrence of a characteristic. It is possible to have two modes (bimodal), three modes (trimodal) or more modes within larger sets of numbers.

Range

The range is the difference between the highest and lowest values within a set of numbers. To calculate range, subtract the smallest number from the largest number in the set. If a six-server rack includes 90 W, 98 W, 100 W, 102 W, 105 W and 110 W, the power consumption range is 110 W - 90 W = 20 W.

Question

Using the information provided in this data bank, complete Table 11.2 and calculate the promotion, repetition and drop-out rates for school 'A' Report year results in Tables 11.3, 11.4 and 11.5

Table 11.1 Data Bank

Enrollment by grades with respect to five secondary schools in Ibadan Municipal Local Governments

Classes	**1**	**11**	**111**	**IV**	**V**	**Total**
A	240	237	188	174	137	976
B	171	212	204	183	104	874
C	195	179	192	175	159	900
D	204	206	235	132	110	887
E	245	268	198	153	138	1,002
Total	**1,055**	**1,102**	**1,017**	**817**	**648**	**4,639**

Table 11. 2 Promotion, Repetition and Drop Out rates for School 'A' in Ibadan Municipal Local Governments

School Year						
X	Enrollment					
	Drop-out					
X_1	Promotees					
	Repeaters	70	60	23	12	2
	Total Enrollment	230	250	203	172	158

Table 11.2 Promotion Rates

School	1/11	11/111	111/IV	IV/V
A				
B	100.0	85.8	71.1	78.1
C	82.6	105.0	81.8	94.3
D	N/A	N/A	N/A	N/A
E	90.2	88.1	82.8	96.7
Total	**87.3**	**87.7**	**80.0**	**89.3**

Table 11.3 Repetition Rates

Schools	**1**	**2**	**3**	**4**	**5**
A	13.4				
B	13.4	14.1	14.7	19.7	0.0
C	0.0	14.0	7.8	11.4	0.0
D	N/A	N/A	N/A	N/A	N/A
E	82	8.2	17.7	9.8	0.0
Total	**13.3**	**15.3**	**13.2**	**12.2**	**0.4**

Table 11.4 Drop-Out Rated

School	**1/11**	**11/111**	**111/IV**	**IV/V**
A				
B	-13.4	0.0	14.2	22
C	17.4	-19.0	10.4	-5.7
D	N/A	N/A	N/A	N/A
E	16	3.7	-0.5	-6.5
Total	**-0.6**	**-3.0**	**6.8**	**-1.5**

Summary from Study Session 11

In this study session, you have learnt the following:

1. **Measuring Efficiency and Wastage**

   While enrollment ratios are indicators of a country's educational performance, enrollment rates tell about the internal efficiency of a school system. They show us how well students have progressed from one grade to another. To

ensure this, three concepts stand out distinctly and they are; promotion, repetition and dropout rates.

2. **Literacy and Educational Attainment**

   Educational attainment refers to the highest level of schooling that a person has reached. At the primary and secondary school level, educational attainment refers to the number of grades completed.

   At the postsecondary level, it refers to institutions attended and certificates, degrees or diplomas obtained. Person refers to an individual and is the unit of analysis for most social statistics programs.

3. **Basic Statistical Indicators**

   The Statistical Indicators comprises of the mean median and mode which helps in data collection and analysis. The terms mean, median and mode are used to describe the central tendency of a large data set. Range provides provides context for the mean, median and mode.

Self-Assessment Questions (SAQs) for study session 11

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 11.1 (Testing Learning Outcomes 11.1)

Explain the following Promotion Rate

SAQ 11.2 (Testing Learning Outcomes 11.2)

Discuss Literacy and Educational Attainment

SAQ 11.3 (Testing Learning Outcomes 11.3)

Discuss on the following:

- Mean
- Median

Notes on Study Session 11

SAQ 11.1

Promotion rate is the effective promotion rate for grade Gi and year t is defined as the ratio between promotees from grade Gi to the next grade Gi+1 between school years t and t+1 and the number of students enrolled in grade Gi in a given year who do not repeat that grade the following year.

SAQ11.2

Educational attainment refers to the highest level of schooling that a person has reached. At the primary and secondary school level, educational attainment refers to the number of grades completed. At the postsecondary level, it refers to institutions attended and certificates, degrees or diplomas obtained. Person refers to an individual and is the unit of analysis for most social statistics programs.

SAQ 11.3

The mean is the average of all numbers and is sometimes called the arithmetic mean. To calculate mean, add together all of the numbers in a set and then divide the sum by the total count of numbers.

The statistical median is the middle number in a sequence of numbers.

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Study Session 12: General Methods of Collecting Educational Statistics

Introduction

In the initial study session of this module, specifically study 1-3, you have learnt about the relationship among educational statistics, demography and education. You were able to discover the positivity or negativity between education, demography and statistics.

As you move towards the end of this module, there is the need to once again look in-depth into educational data and statistics.
The immediate source of educational statistics is the records of schools, colleges, polytechnics, colleges of education and universities; local and state educational offices; departments within the Ministry of Education; and other Government departments, chiefly the Central Statistical Office i.e. (the Office of Statistics).

The department responsible for the census as the National Population Commission (NPC) and or the registration of births and deaths; and the public works departments. In addition, statisticians could undertake special inquiries for example, at schools or homes.

Learning Outcomes for Study Session 12

At the end of this study session, you should be able to:

12.1 Explain Method of Obtain the necessary Information

12.2 Discuss types of information and Respondent

12.1 Methods of Obtaining the Necessary Information

The three main methods for obtaining the necessary information are:

Figure 12.1: Method of Obtaining Information

(1) Personal Inquiry

Personal inquiry usually suffices to obtain such information as is available from universities, other departments in the Ministry and other Government departments. It is strongly recommended that the personal approach should also be considered in dealing with local officers and with local school management, an approach, which, should be literally personal.

A discussion with those concerned often helps to discover what is available or could be made available under certain conditions. This will also secure the cooperation of voluntary or independent organisations, without which educational statistics will remain seriously defective. Subsequently, written communication may be sufficient, particularly where a periodic return can be introduced.

In the early days, the statistician must also be a salesman. Personal contacts are not feasible with more than a few schools at a time and to obtain the information from them, either a postal census or a sample inquiry is necessary. Although personal contact is ruled out in the case of a postal census, it is recommended that even postal communications should be as personal in tone as possible.

(2) Postal Census/Inquiry

The greater part of educational statistics are collected in practice by means of a postal census in the form of a questionnaire sent annually, or occasionally more frequently, to the heads of all schools in the educational system, either directly or through local officers.

The school heads are called upon to report on the "population" (of pupils and teachers) for which they are responsible, in the same way as in the normal population census in which the heads of households have report on the persons for which they are responsible.

The major difference is that in the latter case, specially trained enumerators question the heads of household personally, since these heads may be illiterate and some of the information may not otherwise be easy to obtain.

Nevertheless, the similarity is close between the two censuses and there is much that the educational statistician can learn from the demographer. One of the subjects in which the educational statistician might usefully be trained is demography.

Since the annual questionnaire has become the usual method of collecting educational statistics and presents a number of conveniences to the statistician, there is the danger of misusing it to gain information that could properly be obtained elsewhere, from local authorities or from other departments within the Ministry of Education.

If the requirements of the sound collection of statistics are to be met, the questionnaire must not be overloaded, and the alternative sources of information must be fully explored.

In Text Question

The greater parts of educational statistics are collected in practice by means of a postal census in the form of a questionnaire. **True/False**

In Text Answer

True

(3) Sample Surveys/Inquires

Special sample inquiries may either take the form of a postal questionnaire to a selected sample of schools, or of home, etc. or which is usually found to be the more rewarding and at times essential, in developing countries by arranging for trained enumerators to visit these schools or homes, etc.

The sample inquiry is a new and increasingly important source of information in developing countries but its use calls for resources not always available at present with the educational statistician (see note at the end of this lecture). Nevertheless, professional training in sampling techniques, as well as demography, will be increasingly required of him.

12.1.1 Two general rules in deciding methods for collecting statistics

They are as follows

a. Suit the method to the requirements of the information, to the convenience of the information and to the resources available to the statistician; never to the case of the statistician.

b. Personal knowledge of the source, of the records and of the people using them will help the statistician to frame his inquiries realistically.

In Text Question

There are three rules in determine method of data collection. **True/False**

In Text Answer

False

12.2 Types of Information and Respondents

Where individual details are required, for example, in examining the home backgrounds of particular types of pupil, their individual school histories, sample inquiries are usually necessary in order not to have an unmanageable mass of material or information that is too vague or inaccurate.

This will also keep the cost of the inquiry down to reasonable figures. The respondent in such inquiries need not to be specially numerate to provide suitable answers since it will be the interviewer's responsibility, to obtain and record the necessary information. The greater part of the information required by the educational statistician is of a different kind.

He needs totals or aggregates of pupils of a particular age in a particular grade. For this purpose, the individual items in the records of the schools, or in other sources, have first to be summarised before being entered in the postal questionnaire. The initial statistical work of this simple kind has to be carried out at the source, in the school, for example, by the headmaster.

The apparent simplicity of the postal questionnaire method rests in this way upon the ability and opportunity of the respondent to carry out this preliminary work for the statisticians. This is a situation that must always be kept well in mind by the statistician.

In developing countries, particularly at the first level, many schools are staffed with teachers inadequately trained, grossly overburdened with work, and ill supplied with facilities at home or at school.

The headmasters themselves, although likely to be among the best educated individuals in a developing country, may not as such be competent in maintaining the

school records. Not all well-educated persons are necessarily good at figures. They may delegate the work to a teacher or a clerk and not themselves adequately check the result.

The educational statistician can help in a number of ways. He should, as far as possible, gain personal experience of the conditions under which teachers and headmaster have to work in maintaining records.

Not only is this an essential prerequisite for a good design of basic record, it will enable him also to explain the importance of such matters as accuracy and cross checking on the spot and also the valuable uses to which this information when correctly presented can be put.

There are clearly physical limits to such personal help by the educational statistician or members of his staff. A talk or an appeal by him at district meetings of teachers, the organisation of local seminars on educational statistics (possibly in relation to planning techniques) and even the introduction of short courses on elementary statistical techniques in training colleges or in refresher courses organised by the inspectorate, are all possibilities that should be considered.

With regard to other sources, other departments of government or the universities the statistician must assume that those responsible for the preliminary shaping of this material have the necessary skills and opportunities to summarise and if necessary analyse their records, and he will shape his inquiries accordingly.

Should this assumption not hold, usually for temporary reasons, he will need to draw upon his tact and own skill in assisting the respondent to meet his requirements.

1. It is possible to apply modern techniques in obtaining additional information required by the educational statistician, particularly in the field of pupil statistics.

   The invaluable contribution made by sampling techniques in solving a number of problems confronting the central statistical offices in developing countries in agricultural, demographic and household budgetary surveys has resulted in an increasing body of knowledge about the practical problems of sampling techniques in such countries.

   With access to this experience, the educational statistician can consider inquiries based on samples of educational institutions, pupils or parents and in this way:

   a. Check his existing information for gaps and incompletion, on the assumption that trained enumerators will be more accurate than, say, headmasters; and

   b. Collect detailed background information which can only be obtained by an expert interviewer asking questions from the headmaster, the pupil or his parents.

2. The basic idea of sampling is straightforward but expert knowledge is essential for designing an actual sample inquiry. With this knowledge, it is possible to calculate by how much the results obtained from the sample are likely to differ from the results obtained from a complete census. The difference is called the sampling error.

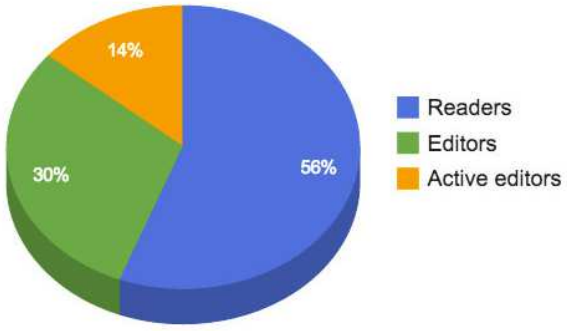

Figure 12.2: *Respondent by Group*

12.2.1 The advantages of sampling

The following are some of the advantages of sampling:

1. **The sampling** error can be calculated;
2. **The costs** can be kept down by keeping to the maximum accepted error; and
3. **By reducing** substantially the number of units to be enumerated, much more detailed and precise information, collected by a small corps of skilled enumerators, can be obtained.
4. **Offers Sample of the Whole Population of a Region**: This is one great advantage of this kind of survey method. This might be ideal to utilize to understand what if one who likes to understand what people all through the place are planning, like getting ideas on a problem to assist politician take a position on a law for latest improvements. This kind of survey mar also be better for the government to utilize in learning regarding the preferences of many people about a recreational service for the area.
5. **You Can Get Feedback:** Another benefit the random sampling could provide is that you can get feedback from a person which is really utilizing a service. You can also control for randomness through having a skilled interviewer choose the one passing the interviewer or the person the interviewers passes upon concluding an interview with the past selected individual. This method can also be adapted for quote sample, wherein the interviewer is requested to get the person for a many classifications, and as every category is filled.

12.2.2 The Disadvantages

1. **It presupposes** a good "frame" or comprehensive list of the units (schools, pupils or parents), each fully identifiable and able to be located, from which to draw the sample;
2. **It can be costly** both in money and in human resources; and
3. **"Human errors"** (as distinct from the sampling error) that arise when, for example, the enumerator makes a mistake or allows personal bias to flavour the replies, can be magnified in the result. This is why sampling is expensive in highly qualified manpower, since the enumerators must be persons of good intelligence, suitably trained.
4. **The extent to which the educational** statistician can use sampling in developing countries will in the immediate future depend for the most part upon the facilities available in the Central Statistical Office. It is a field which is likely to expand.
5. **Biased Results:** This is one of the major disadvantages of random sampling. For instance, a interviewer searching to forecast will be succeed the next vote might just survey a region closer to them and take for granted the reason that the area is situated in the southern portion of the US and so will possibly have a further conservative slant.

   Individual prejudices might also creep into the information, as an assessor might not spread the questionnaires to specific group of people. These aspects often lead to twisted information gathering, rendering the information not valuable for monitoring trends all through the whole population.
6. **Laborious and Time Consuming:** This is also one major drawback of the random sampling as one try to get a sampling of all and sundry in the entire population. Also while many organizations doing international surveys search to utilize multi stage as well as it make the process of colleting samples more manageable, there could be issues doing this.

Summary from Study Session 12

In this study session, you have learnt the following:

1. **Methods of Obtaining the Necessary Information**

   - Personal Inquiry
   - Postal Census/Inquiry
   - Sample Surveys/Inquires

2. **Types of Information and Respondents**

Where individual details are required, for example, in examining the home backgrounds of particular types of pupil, their individual school histories, sample inquiries are usually necessary in order not to have an unmanageable mass of material or information that is too vague or inaccurate.

Self-Assessment Questions (SAQs) for study session 12

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 12.1 (Testing Learning Outcomes 12.1)

Explain the methods for obtaining the necessary information

SAQ 12.2 (Testing Learning Outcomes 12.2)

Discuss advantage and Disadvantage of Sampling

Notes on Study Session 12

SAQ 12.1

Personal inquiry usually suffices to obtain such information as is available from universities, other departments in the Ministry and other Government departments

The greater part of educational statistics are collected in practice by means of a postal census in the form of a questionnaire sent annually, or occasionally more frequently, to the heads of all schools in the educational system, either directly or through local officers.

Special sample inquiries may either take the form of a postal questionnaire to a selected sample of schools, or of home, etc. or which is usually found to be the more rewarding and at times essential, in developing countries by arranging for trained enumerators to visit these schools or homes, etc.

SAQ 12.2

The advantages of sampling

- **The sampling** error can be calculated;
- **The costs** can be kept down by keeping to the maximum accepted error; and

- **By reducing** substantially the number of units to be enumerated, much more detailed and precise information, collected by a small corps of skilled enumerators, can be obtained

The Disadvantages

- **It presupposes** a good "frame" or comprehensive list of the units (schools, pupils or parents), each fully identifiable and able to be located, from which to draw the sample;
- **It can be costly** both in money and in human resources; and
- **"Human errors"** (as distinct from the sampling error) that arise when, for example, the enumerator makes a mistake or allows personal bias to flavour the replies, can be magnified in the result. This is why sampling is expensive in highly qualified manpower, since the enumerators must be persons of good intelligence, suitably trained.

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Study Session 13: Collecting School Statistics Using the Annual Questionnaire

Introduction

Although the use of an annual questionnaire completed usually by the head of the school will remain the main method of collecting school statistics for many years in developing countries, mention is made in this study session of some alternatives which include the individual data system. You will also learn about the basic forms of design of questionnaire.

Learning Outcomes for Study Session 13

At the end of this study session, you should be able to:

13.1 Discuss the Individual Data

13.2 Enumerate on the Duplication of Register Entries

13.3 Explain the Annual Questionnaire: Design

13.4 Outline the Basic form of Design

13.5 Discuss the basic Forms of Design of Annual Questionnaire

13.1 The Individual Data System (IDS)

The advantages of IDS are such that its advocates claim that it will eventually provide the main source of all educational statistics. The idea is straightforward. On entering the educational system, the pupil, or his parent, completes a questionnaire with the required information on sex; age and such background information as may be needed. It might even include psychological facts about the child's interest to the educator.

This information is entered on a separate card for each pupil in every school and kept in a central register. At the same time, the pupil is given a unique code number which also appears on this card. This code number will accompany the student's name on all class registers and other documents in the educational system. Each change of grade or examination success, or similar events of interest, would be recorded in the central register.

Similarly, important changes in his home circumstances, such as the death of a father, would be reported. This reporting need not to be at shorter intervals than every year provided that the educational institution records the events as they occur. With such a system, complicated problems of flow statistics can be dealt with almost in a routine manner.

Any cohort or other group of pupils (for example, coming from certain types of homes) could be examined in relation to its present place in the educational system and to that of previous years. Forecasting models of the most complex kind could then be built. The IDS is nevertheless very much a question of the future.

In developed as in undeveloped countries there may be emotional resistance to the idea of submitting a child's educational career to such impersonal treatment. Furthermore, decentralized statistics are required in a decentra1ised educational system and under the IDS; there could be a difficult problem of the necessary feedback of statistical information to the locality.

The sheer size of the school population to be recorded is also a daunting prospect, although using a sample of pupils for the fuller information, and continuing to maintain the traditional system of enumerating all schools for the basic information, might meet the requirements of planning.

So far as developing countries are concerned that the central register would need to be maintained on magnetic tape by an electronic computer, in view of the amount of information to be processed, and that the procedure would put an even greater burden than at present on those responsible for obtaining the initial information, rule it out.

The cumulative card system noted above, perhaps used with coded registration numbers and could provide a central register of individualized data for each school. To tap this source, the statistician would continue to use a questionnaire.

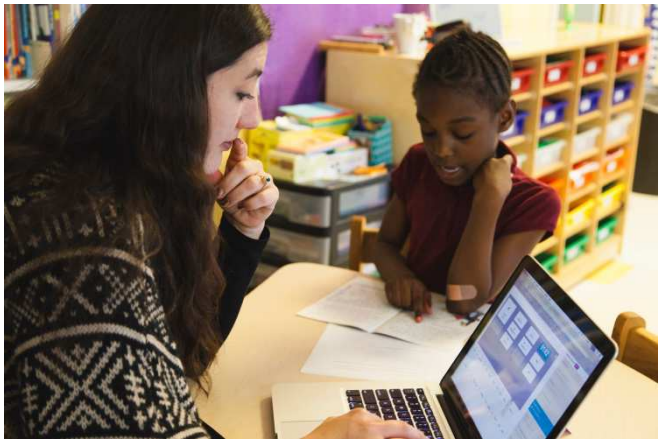

Figure 13.1: *Individual Data System*
Source:*https://uchicagoimpact.org/sites/uchicagoimpact.uchicago.edu/files/uploads/STEP_OnlineAssessment_DMS_2.jpg*

13.2 Duplication of Register Entries

A simple variant of IDS is to provide headquarters with copies of the class register entries, leaving it to the statistician to extract and summarize the information, either on an individual pupil basis or in aggregates. Thus if the register were interleaved with two perforated sheets, and the register proper, carbon backed, a copy of the entries would automatically appear on the first perforated sheet.

This copy might be detached shortly after the commencement of the school year and sent to the statistician. Subsequent additions and amendments to the register would appear on the second perforated sheet, which could be detached and sent to the statistician towards the end of the school year.

In this way, information would reach the statistician with a minimum of error and delay, the burden on headmasters or local officers would be considerably lightened, and there would exist records of individual children at headquarters which could be analyzed either in terms of stock or flow.

On the other hand, a relatively extensive and reliable statistical unit would be required to deal with this information and there would be a similar problem, as with the IDS, of the necessary feedback to local officers unless these were required to obtain an additional return from the schools. Whether a system of this kind, limited to the dispatch of register copies to the local officer, is feasible could be determined by a simple trial in a selected area.

In Text Question

Additions and amendments to the register would appear on the second perforated sheet, which could be detached and sent to the statistician towards the end of the school year. **True/False**

In Text Answer

True

13.2.1 Monthly Pay Vouchers

The monthly pay voucher has been used from time to time as the source of such school statistics as pupil's enrollment. This is a source which is particularly subject to error (sometimes conscious error on the part of teachers) and gives rise to difficulties when defining "enrollment". A questionnaire drawing upon the information in the class registers is to be preferred.

13.3 The Annual Questionnaire Design

The main statistical method for obtaining school statistics is the questionnaire, issued annually, or at more frequent interval; by the Ministry of Education to heads of schools. The form of this questionnaire is the direct responsibility of the statistician and he should design it with the conditions under which it is to be completed clearly in mind. At no other point in the arrangements for collecting statistics is it so important to obtain the best advice on design.

Considerable experience has been gained in recent years by office efficiency experts and business records firms in the field of record and questionnaire design. The expenditure incurred in introducing a modern system is a sound investment. Help should also be obtained from the Central Statistical Office.

The form should be clear, that is, easy to read, clear in its instructions, unencumbered with unnecessary detail and should be specific regarding both the kind of information requested and the data to which it refers. Extremes of size should be avoided. If too small, it may easily become crumpled or get lost. If too large, it could become unmanageable and also forbidding to the eye.

Specifically, this "questionnaire" is a set of summary tables of a simple kind rather

than a set of questions, and it should conform to the conditions of a good table Space should be provided for figures to be entered clearly and easily for them to be aggregated for cross checking.

These conditions may require more than one form, if it is not to be too large or too crowded, and in this event, each should be clearly identifiable. It is certainly not convenient to have a single questionnaire for all types of schools at all levels. The information required differs in coverage and accessibility, and the quality of the information differs.

Separate forms for each type of school at each level is desirable and these may be distinguished by colour to avoid confusion in distribution and subsequent sorting. The questionnaire should also be designed not only to make it possible for the informant to supply the information as conveniently as possible but also with its use in view as a more or less permanent record in order to avoid further copying of the material at the headquarters.

To avoid a mass of letter press on the tables, simplified instructions could be printed on the reverse side, or more fully in an accompanying leaflet. In either event, it is useful to offset the impersonal character of such a document by a covering letter, and couching the instructions in suitable language.

Opportunity should be taken to explain the use to be made of statistics and the tone of the communication should indicate that the statistician is aware of the respondent's problems. These considerations, suggest that the form should be printed in a standard form on standard paper, accompanied by the necessary information, and not sent for reproduction by local offices or voluntary organizations.

If a new form is proposed, it is essential that it should first be given a trial by a pilot test in a selected group of schools, before it is sent for final printing.

13.4 A Basic Form of Design of Annual Questionnaire

To illustrate the problems of a suitable design for the annual questionnaire and to propose an elementary model which could be adapted for use by a particular country, the form opposite shows a simple basic design. The proposed design would fit comfortably into a form 35 cm by 25 cm. which is a manageable size with a space for

additional information and office use.

The space will be found useful for the initials of a checking officer and any brief office comments. For purposes of illustration, the scholastic year is assumed to begin on September II.
The following are simple basic design information:

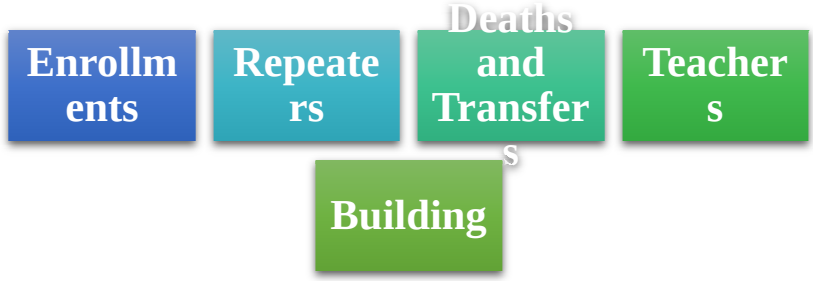

Figure 13.2: *Simple Basic Design Information*

The enrollment table requires ages at the last birthday since the age information is usually recorded most conveniently in this portion in the class registers. ("How old are you?" may elicit more accurate answers than "When were you born?" and it may be desirable not to ask the teacher to convert age into birth year. This position will, however, change with the increasing use of birth certificates).

The alternative is to give the year of birth, and with this, some statisticians find an advantage, the ages being quickly calculated when required but the form would have to be printed afresh each year. The instructions must emphasis that enrollment means all pupils on the class registers at the date stated.
Attendance statistics are another matter and are not suited to the annual questionnaire method. Items (b) and (c) are required for the calculation of dropout. They remain essential while repeating continues on any substantial scale.

The instructions should make it clear that this table refers to events occurring during the previous scholastic year, for example, the numbers transferred to Grade I from another school during the year; 11 September, 1966 to 10 September, 1967. The reasons for the difference in date are discussed below. For teachers, it is simplest to record those in the establishment at the commencement of the school year.

It will be necessary to define **"part time"** in the instructions. It can only be a broad

classification and part time teachers will be those who teach for less than what is customarily regarded as full time at the particular level of education. It may be helpful to provide for more details about qualifications; nationality may also be required.

The annual questionnaire is not, nevertheless, the appropriate means for obtaining full details about teachers (this should be obtained from employing bodies) and restricted to only information which is necessary to have on a school basis.

Much more details, for example, on salaries and experiences, are required when considering the general question of teacher supply but at the first level, for example, the main features of their distribution between individual schools can be obtained from the suggested information.

Similar considerations hold for building statistics. Full documentation of state schools should be provided by the department responsible for these buildings and, the particulars of other buildings should be available at the time of registration and on the occasion of any subsequent rebuilding.

Although, further detail is inappropriate to the questionnaire and should be obtained by special inquiry of the schools or the builders, the small table in the basic form will provide minimum information for all schools.

This will be useful both as a check on other information and for giving a general picture of accommodation. It should be emphasized that it is not a straight forward matter to answer this simple question: When desks flow out into a corridor or office is "classroom" created? It must be left to the headmaster to decide. Furthermore, the area in fact may have to be estimated by him, and the instructions should mention this.
This does not necessarily invalidate the information if the statistician is aware of its approximate character. The blank box for official use might be reduced to provide space for such additional information as the number of shifts (with shift classes, it is evident that one grade may consist of more than one class).

A grade is a stage of instruction usually covered in the course of a school year (or standard, form or year of study). A class is a group of pupils usually instructed together by a teacher (or a group of teachers) and it may be helpful to know the number of boarders. Financial statistics are best omitted altogether and obtained by

other means.

In Text Question

The enrollment table requires ages. **True/False**

In Text Answer

True

13.5 Dispatch of the Questionnaire

In order to minimize the burden on the respondents, a single annual questionnaire is to be preferred. It is true that if a return is made at the beginning and at the end of the school year, it is possible to collect more information, for example, transfers need to appear only in the second return.

There is, nevertheless, the possibility that the first return may be completed hastily if it is known that a second will also be required and it is the first return that is more important if information is to be made available to planners as soon as possible.

The best time for completing a return by the headmaster is the middle of the second term but in practice, the need to obtain early information means that the questionnaire is completed during the first term, after sufficient time for the registers to be made up and the initial school arrangements to settle down. (Where there is a fee paying system, enrollments may not be firm until well into the school year).

Figure 13.3: *Questionnaire*

13.5.1 Completing the Questionnaire

The completion of the questionnaire is a statistical exercise requiring careful reference to the sources, such as class registers, aggregating and cross checking the figures. Thus, the total of pupils can be obtained either by aggregating the bottom totals or the side totals. Both operations should be carried out and the figures used should agree with both.

It is a sound principle that a single person should agree with both and should also be responsible for such a return and the headmaster is clearly indicated. He should be helped by the local officer. As an interim measure, the returns could be the personal responsibility of this officer but only where it is possible to get good staff in the local office.

If the questionnaire is left as an additional task for an overburdened or possibly inefficient local office secretariat, considerable error and delay can result. On the other hand, where the local officer can make this his personal responsibility, and he is aware of the need for good statistics, his detailed knowledge of the condition in the different schools would make it possible for him to complete the questionnaire satisfactorily.

It would not be necessary for bundle of class registers to pass to the local office for this purpose. For example, arrangements could be made for a special enrollment list, included as a standard blank form in the class register, to be filled up by the teacher on the date required and sent to the local officer.

This entails yet a further record that requires copying from the class teacher, and since the person responsible for the questionnaire would be one stage further remove from the source of his information, the situation can breed errors.

On the other hand, the arrangement has obvious advantages in districts where schools are poorly staffed and where in any event, a local officer's detailed help is needed in completing the return. The eventual objective is for the headmaster to be personally responsible for this exercise.

The same considerations hold in the arrangements for returning the completed questionnaire. It should be sent to the Ministry through the local officers, rather than direct, since the personal knowledge of the local officer enables him to check the

return. It is essential to note that only the person responsible can lead to errors of omission and to delay.

Where the return is subsequently checked, and inconsistencies are found, the checking officer should clear his corrections with the person responsible for completing the questionnaire in the first place before sending it on. This may take time but if, in completing a questionnaire, the informant knows that another will himself correct the information, the informant may be casual The checking officer should also initial the questionnaire.

Copies of the return are usually required by the employing bodies as well as local officers and the Ministry. Where and by what method it should be duplicated for these several uses depend in a large measure upon local conditions.

A form that is completed in a clear hand (and this at least should be expected of headmasters) can be easily and inexpensively reproduced by modern, method, but it is doubtful whether a machine of this kind could be justified except in the Ministry of Education itself.

On this matter, expert advice of the kind mentioned above should be obtained. An alternative to duplication by the Ministry is to supply carbon sheets, or preferably carbon backed paper, for use in special pads of annual return forms. To have questionnaire forms of different colours to be sent to different bodies has been found of assistance.

After the check by a local officer, there is little point in a further check at a higher level, province or region, before reaching the statistician. This means further delay without usually the time or detailed knowledge on the part of the officer concerned to undertake a proper check. On the other hand, the provincial officer may be the appropriate person to receive the annual returns direct from secondary schools.

13.5.2 Improving the Response Rate

Inaccuracy and delay are the chief defects in present arrangements for the annual questionnaire in developing countries and these defects may be encouraged by the effort to increase the coverage of the school list. The above consideration will serve to improve not only accuracy but also the extent to which questionnaires are completed

and returned promptly to the statistician, that is, the response rate.

In this field, as in others, it should be a condition of granting financial assistance to voluntary bodies that suitable statistics are supplied promptly to the statistician and that this should be made quite clear to the bodies concerned from the start.

It will then rest upon the statistician, for these and other schools, to make arrangements that will have in the convenience of the respondent to make himself known to them and familiar with the conditions under which they work, and to minimize the burden placed upon them while demonstrating the importance of the material that he requests from them.

Summary from Study Session 13

In this study session, you have learnt the following:

1. **The Individual Data System (IDS)**

   The advantages of IDS are such that its advocates claim that it will eventually provide the main source of all educational statistics. The idea is straightforward.

   On entering the educational system, the pupil, or his parent, completes a questionnaire with the required information on sex; age and such background information as may be needed. It might even include psychological facts about the child's interest to the educator.

2. **Duplication of Register Entries**

   A simple variant of IDS is to provide headquarters with copies of the class register entries, leaving it to the statistician to extract and summarize the information, either on an individual pupil basis or in aggregates. Thus if the register were interleaved with two perforated sheets, and the register proper, carbon backed, a copy of the entries would automatically appear on the first perforated sheet.

3. **The Annual Questionnaire Design**

   The main statistical method for obtaining school statistics is the questionnaire, issued annually, or at more frequent interval; by the Ministry of Education to heads of schools. The form of this questionnaire is the direct responsibility of

the statistician and he should design it with the conditions under which it is to be completed clearly in mind.

4. **A Basic Form of Design of Annual Questionnaire**

   To illustrate the problems of a suitable design for the annual questionnaire and to propose an elementary model which could be adapted for use by a particular country, the form opposite shows a simple basic design.

5. **Dispatch of the Questionnaire**

   In order to minimize the burden on the respondents, a single annual questionnaire is to be preferred. It is true that if a return is made at the beginning and at the end of the school year, it is possible to collect more information, for example, transfers need to appear only in the second return.

Self-Assessment Questions (SAQs) for study session 13

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 13.1 (Testing Learning Outcomes 13.1)

Discuss the Individual Data System (IDS)

SAQ 13.2 (Testing Learning Outcomes 13.2)

Explain the Monthly Pay Vouchers

SAQ 13.3 (Testing Learning Outcomes 13.3)

Explain the Annual Questionnaire Design

SAQ 13.4 (Testing Learning Outcomes 13.4)

Identify some simple basic design information

SAQ 13.5 (Testing Learning Outcomes 13.5)

Explain the modalities involved in completing the questionnaire

Notes on Study Session 13

SAQ 13.1

The IDS are such that its advocates claim that it will eventually provide the main source of all educational statistics. The idea is straightforward. On entering the

educational system, the pupil, or his parent, completes a questionnaire with the required information on sex; age and such background information as may be needed. It might even include psychological facts about the child's interest to the educator.

SAQ13.2

This is a source which is particularly subject to error (sometimes conscious error on the part of teachers) and gives rise to difficulties when defining "enrollment

SAQ 13.3

The main statistical method for obtaining school statistics is the questionnaire, issued annually, or at more frequent interval; by the Ministry of Education to heads of schools. The form of this questionnaire is the direct responsibility of the statistician and he should design it with the conditions under which it is to be completed clearly in mind. At no other point in the arrangements for collecting statistics is it so important to obtain the best advice on design.

SAQ 13.4

1. Enrolment
2. Repeaters
3. Death and Transfers
4. Teachers
5. Building

SAQ 13.5

The completion of the questionnaire is a statistical exercise requiring careful reference to the sources, such as class registers, aggregating and cross checking the figures. Thus, the total of pupils can be obtained either by aggregating the bottom totals or the side totals. Both operations should be carried out and the figures used should agree with both.

It is a sound principle that a single person should agree with both and should also be responsible for such a return and the headmaster is clearly indicated. He should be helped by the local officer. As an interim measure, the returns could be the personal responsibility of this officer but only where it is possible to get good staff in the local office.

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Study Session 14: Collecting Other Statistics

Introduction

There are various techniques for collecting educational statistics other than the use of annual questionnaire. In this study session, you will learn the techniques usually adopted in collecting attendance statistics, pupil background statistics, statistics of leavers, teacher statistics, financial statistics and statistics of third level institutions and some other statistics.

Learning Outcomes for Study Session 14

At the end of this study session, you should be able to:

14.1 Explain Attendance Statistics

14.2 Explain Teachers' Supply:(College Records)

14.3 Explain how to collect statistics of School Equipment

14.1 Attendance Statistics

Statistics of absenteeism, as distinct from enrollment, are obtained from attendance records. The annual questionnaire asks for statistics as at a particular date, but attendance may vary considerably from day to day and, where there is a high degree of absenteeism, the number attending on a particular day may not be very informative. Some kind of continuous records over a period must be introduced.

One convenient way of doing so is for the headmaster to make a monthly return to the local officer, showing as a minimum:

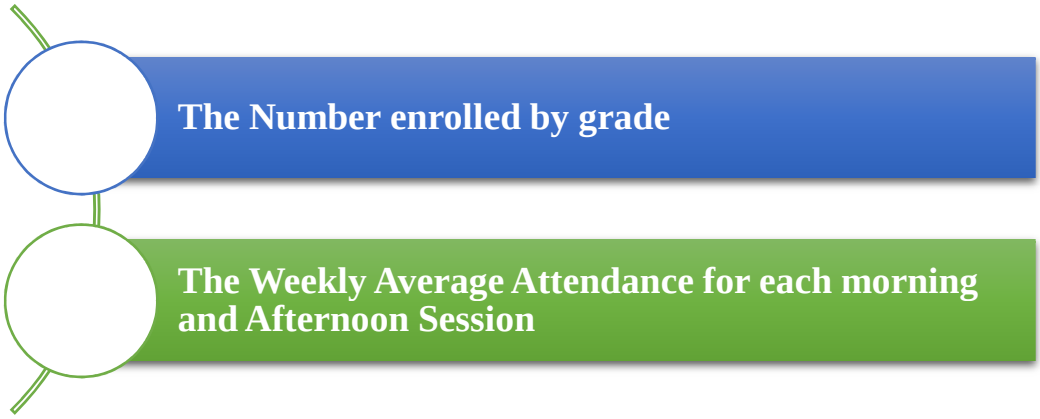

Figure 14.1: *Headmaster Monthly Return to Local Officer*

The headmaster could, as a weekly routine, examine the register and complete his calculation for that week. Alternatively, the total sessional attendance could be noted by the teacher at the time of each role-call, and handed to the headmaster at the end of each week.

It should be the normal duty of the local officer to make periodic spot checks to determine the accuracy with which the register is maintained, and eye should also be kept on the weekly attendance return.

The headmaster could either complete the monthly attendance return or send this with his comments to the local officers (and presumably to the employing authority); or send the weekly attendance records to the local officer who would store them and complete the monthly attendance record himself.

The average used should be arithmetic mean. The statistician will also be interested in the extent to which sessional attendances fluctuate around this average. One rough indicator of this fluctuation is to show on the monthly attendance return the number of sessions at which not more than five pupils were absent.

The definition of these "best session" would depend upon local conditions; a too optimistic standard should not be used since the result would be merely a succession of noughts, which is not helpful. Some idea of the causes of absenteeism can be gathered from the monthly attendance report. For example, if a weekly average is abnormally low the headmaster will comment for example, that it was due a local festival.

Further analysis would require a special inquiry by the statistician, consulting the weekly record or the class register directly.

He may be interested solely in a particular region or type of school; and he may use a sample of returns, schools or pupils, for the purpose. This would make possible an investigation into the family and other background of the pupils concerned, which is essential to a proper study of absenteeism.

In Text Question

It should be the normal duty of the local officer to make periodic spot checks to determine the accuracy with which the register is maintained. **True/False**

In Text Answer

True

14.1.1 Pupil Background Statistics

A full understanding of the pupils' progress or lack of it, at school requires information on his home background. Such information, to the extent that it will throw light on the educational output of the, different types of homes and, in its turn, the kind of homes resulting from different type of education, is also necessary if the requirement of long term educational investment planning are to be met. The main types of information for this purpose are:

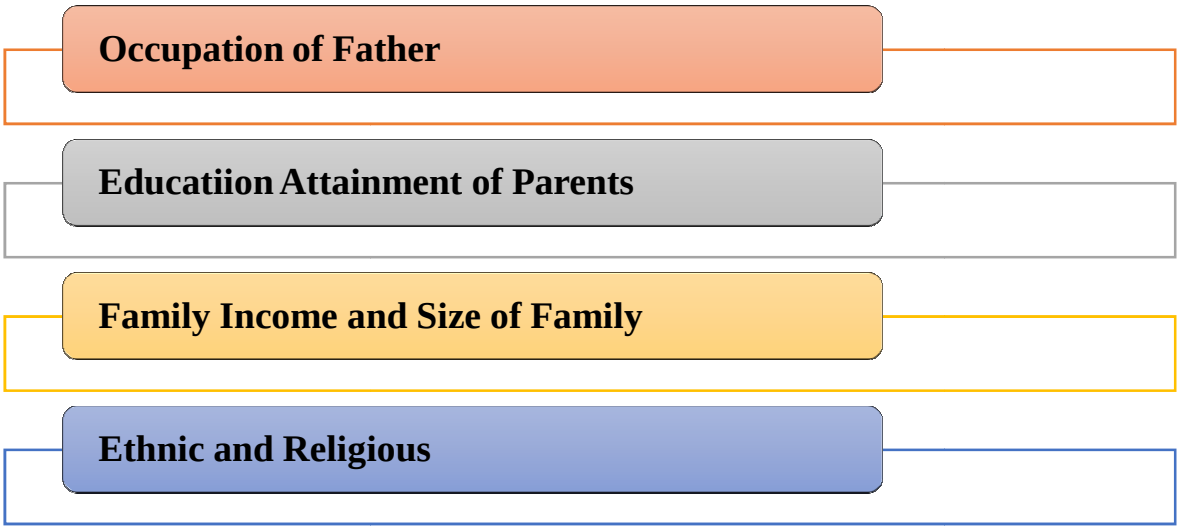

Figure 14.2: *Types of Information*

Some of this information could, in favourable circumstances, be obtained on the occasion of the annual return. Fuller information requires a special inquiry, in a selected region or on a national basis, and based upon sampling techniques.

Such inquiries clearly merge into others undertaken for different purposes; for example, family income and size of family are obtained in the course of a household budgetary survey undertaken by another Government Department usually in connection with a retail price index.

For such information to be useful to the educational statistician it must also include

matching information on the children's education but these raises problems, for example, of overloading the schedule of questions to be answered and the department responsible for the inquiry may resist this additional questions.

This resistance will be effective if the educational statistician is not clear in his own mind about what he wants to know and how this information can be reduced to a minimum.

14.1.2 Statistics of Leavers

Statistics of examination successes provide a measure of the "output of education" and also a partial but valuable guide as to the supply of qualified persons for the economy. Detailed records are maintained by the examining body as well as by the school and the former might be more readily tabbed by the educational statistician. At the third level, it is important to know the output by type of degree and by subject.

At the second level, as a minimum, the statistician should have figures out by type of examination and, where subjects are separately taken, by selected subjects of importance. At all levels, some ideas of the failure (or success) rate are also necessary, so that the output can be set against the input.

The possibility of an end of course return by the headmaster should also be considered. Some broad information on the intention of leavers with regard to further education or employment could be obtained form pupils who are leaving and this in a summary form would greatly assist the planner's estimate of output.

Local officers would also be interested. Preliminary investigation should accordingly be made into what is practicable. This data, it should be recognized, may not be very reliable since intentions are not always realized.

In Text Question

Statistics of examination successes provide a measure of the "input of education" and also a partial but valuable guide as to the supply of qualified persons for the economy.
True/False

In Text Answer

False (output of Education)

14.1.3 Teacher Statistics

The educational statistician is in a special position in regard to teachers since it should be able to document in detail both the supply and the demand of what, in a developing country, is a critical category of highly qualified manpower. The schools both produced teachers and provide their employment.

14.1.4 Employing Bodies' Return

An annual return from each employing body should supply the following information for each type of school:

1. Number of teachers in post on the first day of the school year by kind of qualification (for example, whether holding a teaching certificate, or degree; in the later case, the subject should be noted);
2. Number of teachers for whom this was their first appointment;
3. Previous employment of those appointed since the last return and not covered by (b);
4. Number of teachers leaving since previous year due to:
    - ❖ Transfer to another school;
    - ❖ Living the teaching profession (if possible with an indication of their new occupation, for example, household duties, industry, etc.);
    - ❖ Retirement;
    - ❖ Death.
5. Average salary paid in each grade.

It should be noted that a simple classification (for example, of household duties, government service, industry, others) is necessary for both items (5) and (4) (b). With this information combined with that of the annual questionnaire, it is possible to evaluate the total stock of teachers by qualification, and by different types of school, by regions and for the country as a whole.

A general idea can be obtained of wastage and also of the immediate sources of teachers supply. Finally, there will be an approximate figure of the cost per teacher. The information can be cross-checked from materials within the Ministry where super-annuation schemes are in operation.

14.2 Teachers' Supply: College Records

Since the greatest part of the supply of teachers derived directly from colleges and universities, their records of leavers will provide a detailed account of this sector of supply. Consolidated information can be obtained from teacher training organizations where such exist or, are at the province officer level, from returns from the colleges.

These officers, or those from the Ministry, will be in touch with employing bodies either directly or through local officers concerning future staffing requirement in relation to the likely supply from the teacher training colleges, and some matching of college leavers and first appointment recorded in the employing bodies' returns is possible.

The supply of teachers with higher qualifications is less easy to show because of the variety of occupation open to university leavers and much will depend upon records of first appointment after leaving university; these records are likely to be kept to an increasing extent by universities and other bodies partly in connection with there own appointments' guidance work and partly to help in documenting the flows of and demand for highly qualified manpower.

14.2.1 I.D.S. for Teachers

It is highly desirable that the cumulative card system should be introduced in teacher - training colleges, giving to each student a unique registration number. Either the card itself, a new card linked to the old by the registration number for each teacher on appointment to a schoo1, could then be used or a central index card should also be supplied for each teacher coming from other sources.

lf this card index were maintained centrally, either by a periodic return from the employing authority or by this authority sending to the central registry a carbon copy of each note of appointment or dismissal or retirement which would obviate the need for the annual return from the employment body it would provide the most flexible source of information possible both for assessing teacher supply and for answering ad hoc question about it.

Where facilities are not yet available for such a system in the Ministry, and this may apply to a number of developing countries the maintenance of this teacher records on an individual basis by employing bodies and possibly by the local officer, is desirable.

14.2.2 Statistics of Third-Level Institutions

The educational statistician is dependent upon what statistics are made available by the university bodies and similar authorities. Their own requirements for planning will make these bodies increasingly sensitive to the need for good statistics.

In a developing country like Nigeria, there may be insufficient statistical advice available within the administration of the university or other body and the educational statistician should, where required, provide guidance in the keeping of records and on the application of statistical techniques.

He should endeavour to ensure that total enrollment statistics are readily available, classified according to the subjects of study (a suitable system of classification is given in the UNESCO Manual of Statistics and supplemented by examination statistics. Similarly, teacher records should be fully adequate and related to those from other sources.

The main difficulty in analyzing statistics of institutions of higher education is the absence of division into years of study or grades; there is no record comparable to the class register in the schools at the first and second levels. Furthermore, distinction must be made between those studying for the first degrees and post-graduate students.

As a result, the normal concepts of "wastage" cannot be applied: in the absence of distinct grades, "repeating" has very little meaning.

The alternative is to collect information which shows, in addition to numbers of new entrants, total enrollment of students and their distribution by actual number of years' study undertaken to date. this will reveal, for example, the extent to which there is any retardation (as distinct from repeating), that is to say, students taking longer than the minimum period to complete the course of study, for either the first or a higher degree.

It will be necessary to take into account at this level the number to travel overseas to study or of foreign students studying in the home universities; these can be significant in the case of developing countries. The latter figure is usually easily ascertained.

A large promotion of the former is known since they are financed from public funds

either from the host countries or from the home countries; the main gap will be that of those wholly financed privately. Migration returns may assist in filling this gap and some help is possible from the statistics of the countries where the students are enrolled.

14.3 School Equipment

This is time consuming to record and difficult to classify. Statistics, for example, of the number of volumes in school libraries may be collected but, unless the quality and accessibility are also known, the figures may not mean much.

It is preferable to consider using such records as exist in the local offices for the purpose, since the local officer has a considerable amount acquired in his allocating funds for school equipment of various kinds. A direct inquiry would serve this end.

14.3.1 School Buildings

At some point, the statistician should make a complete inventory of school buildings, linked with the school list to ensure that it is complete. The inventory may be shown as a map. Detailed information on new buildings should then be obtained by means of a return from those responsible for building schools for the purpose of keeping the inventory up to date and to observe progress.

An annual return should suffice showing at a specified date (which might be that of the annual questionnaire in order to cross-check the information) (see the following page).

	Value	**Type**	**Classrooms**		**No. of places**
			No	**Area**	
Buildings started during previous 12 months					
Buildings in progress. during previous 12 months					
Buildings completed during previous 12months.					

It may not be possible to proceed at once to a full analysis of this material but it is basic information for planning.

Figure 14.3: *School Stationeries*

Source:*http://www.cheshunt.herts.sch.uk/_files/images/C77772C61E8BBB090EB3C2CA147F5040.jpg*

14.3.2 Financial Statistics

Information on financial resources and expenditure is of crucial importance for all types of educational evaluation and planning but collecting suitable statistics for this purpose presents such technical and conceptual difficulties that simple recommendation in this field must be of a limited character until considerably more research into methods and possibilities in developing countries has been carried out.

The technical complexity lies in the nature of the source material: the accounts and budgets of the various bodies, public and private, national and local that are concerned with education. Even confining ‘education' to the formal system still entails a mass of materials which in developing countries may be ill or inexpertly maintained and certainly based on a great variety of conflicting classifications.

More access to the material is thus an operation which alone demands time, special skill and diplomatic tact.

The conceptual complexity arises from the inadequacy of the accounting procedures of the various bodies, sometimes even for their own immediate purposes of budgetary control, and certainly for the wider purposes of educational planning. Basically what is required is the calculation of expenditure at each level of education per 'unit' of pupils, teachers, buildings, etc., distinguishing between capital and recurrent expenditure.

This information could then be used in analyzing educational expenditure and for example to forecast outlay to achieve particular targets, and to relate these outlays to alternative uses of available income.

Some of the problems involved may be indicated. Many relate to definitions:

1. **What is the appropriate 'unit'?** If the student, should this be 'student-hour'? And based on enrollment or average attendance? For school buildings, is the unit the whole building, the classroom, the pupil place?

2. **The distinction between capital and recurrent expenditure:** Capital outlay being the expenditure on land, buildings, equipment, etc. is not always clear. In particular, the initial outlay may affect the subsequent maintenance and running expenses so that some account should be taken of the expected life of the premises of other objects of capital outlay;

3. **The allocation of actual expenditure to particular purposes**. This may be a technical matter of reclassifying the accounts of the spending body. It can also be a conceptual matter as, for example, in the treatment of teachers' superannuating payment; or the tracing of the eventual outlay of a grant from a central body for expending by a local body;

4. **The "cost" of education.** The term 'cost' has been used to mean actual expenditure (for which outlay is the preferred term) and economic cost of the total resources used up: thus part of the 'cost' of producing a student who otherwise would be a member of the labour force is the income foregone by that student.

This must be entered against the eventual benefit the economy receives from his being educated. Such cost benefit calculations are proposed for example for educational investment planning, but much research is yet required on the economics of education before suitable concepts for these wider uses can be formulated.

This is a field in which the educational statistician can helpfully obtain the advice of the national account statistician with experience of developing countries.

He will necessarily confine himself initially to collecting and classifying information on income and expenditure of bodies in the formal educational system, working first on the account of public bodies, national, and local, with whose accountants he should

be able to discuss his problems.

Drawing also upon the experience of those in the Central Statistical Office or Ministries of Finance who may already have worked upon the functional classification of government accounts.

He may find it necessary to accept as an interim arrangement the accounting usages of the bodies concerned in regard to the distinction between capital and recurrent, and the allocation of outlay to particular purposes.

With this information he should show:

a. The sources of educational finance, at each level, distinguishing between public funds, central and local, as well as foreign aid; and private funds, fees and other sources.

b. Expenditure on education, distinguishing between capital and recurring outlays separately for each of the main type of institution (for example, government schools and others) at each level; with recurring expenditure analyzed into outlays on administration, teachers' salaries and other expenditures; and capital expenditure on main types of outlay (land, equipment, etc.), public and private. Debt servicing should be shown as a separate category.

It is preferable to record that which is specifically known and can be verified, with all its limitations, than to hazard guesses. When the information is presented, every care should nevertheless be taken to ensure the gaps in the coverage are quite clearly stated.

14.3.3 Stock of Education Statistics

From a narrow point of view, a country's stock of education is described by its educational facilities and the numbers using them. For wider planning purposes and for assessing the level of education of the country as a whole, a measure of the number of educated persons within and outside the educational system is necessary.

Such statistics are usually obtained by means of the general population census and the information, which has in consequence to be provided by the head of the household, has to be simple in character.

One or more of the following questions are asked in these censuses; they refer to those 14 years of age or more:

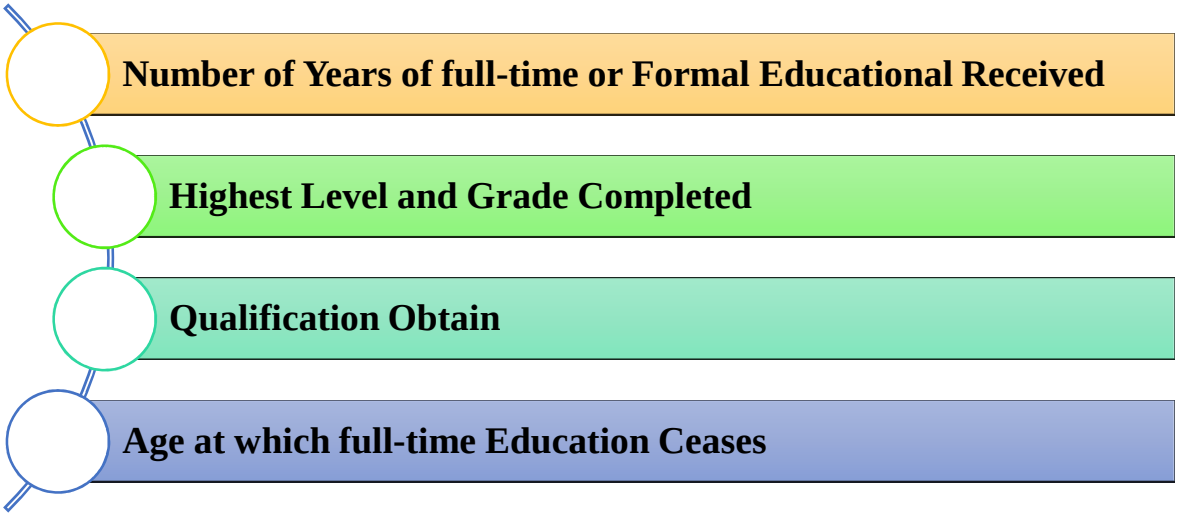

Figure 14.4: *Censuses Question*

Educational planners are particularly interested in (1) and (3). The opportunity may be taken in relation to (3) to get particular details of those highly qualified person in short supply at the time.

This information is of value to manpower budgeting. The information about length of schooling is of importance to developing countries since their educational statistics may not have been in existence for a sufficient number of years to give an alternative estimate of this stock.

A general summary, every ten years, of the amount of education that has been received at that date provides, in any event, useful check on the results of educational plans.

14.3.4 Literacy

Literacy statistics have their greatest use in the more backward countries where educational facilities are meagre and a minimum education indicator such as the extent of literacy can be expected to show how quickly conditions are improving. Literacy can nevertheless only be approximately measured and the basis can vary between one census and another and certainly between one country and another.

The reason for this is that a person's ability to read or write is not a simple matter to determine on the threshold of a house by an enumerator who may be far from skilled

in this particular field. Generally speaking, as the country's educational system improves, measures of literacy become less valuable than those showing the amount and kind of education being received.

When literacy statistics are being collected at the time of the general population census, a more satisfactory test could be applied to an inquiry limited to particular rural or urban areas, or on a sample basis. In multilingual countries, it is necessary either to limit the inquiry expressly to a chosen language or collect statistics on a multiple basis.

It is also helpful to consider a category of semi-literates (those who only read) in order to describe the actual position more precisely; and also those who read and write by rote only (in connection with literature) should be a separate category.

Summary from Study Session 14

In this study session, you have learnt the following:

1. **Attendance Statistics**
   Statistics of absenteeism, as distinct from enrollment, are obtained from attendance records. The annual questionnaire asks for statistics as at a particular date, but attendance may vary considerably from day to day and, where there is a high degree of absenteeism, the number attending on a particular day may not be very informative. Some kind of continuous records over a period must be introduced.
2. **Teacher Supply: College Records**
   Since the greatest part of the supply of teachers derived directly from colleges and universities, their records of leavers will provide a detailed account of this sector of supply. Consolidated information can be obtained from teacher training organizations where such exist or, are at the province officer level, from returns from the colleges.
3. **School Equipment**
   This is time consuming to record and difficult to classify. Statistics, for example, of the number of volumes in school libraries may be collected but, unless the quality and accessibility are also known, the figures may not mean much.

Self-Assessment Questions (SAQs) for study session 14

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 14.1 (Testing Learning Outcomes 14.1)

Discuss Attendance Statistics

SAQ 14.2 (Testing Learning Outcomes 14.2)

Explain the Statistics of Third-Level Institutions

SAQ 14.3 (Testing Learning Outcomes 14.3

Discuss the ways of taking inventory of School Buildings

Notes on Study Session 14

SAQ 14.1

Statistics of absenteeism, as distinct from enrollment, are obtained from attendance records. The annual questionnaire asks for statistics as at a particular date, but attendance may vary considerably from day to day and, where there is a high degree of absenteeism, the number attending on a particular day may not be very informative. Some kind of continuous records over a period must be introduced.

SAQ 14.2

The educational statistician is dependent upon what statistics are made available by the university bodies and similar authorities. Their own requirements for planning will make these bodies increasingly sensitive to the need for good statistics.

SAQ 14.3

At some point, the statistician should make a complete inventory of school buildings, linked with the school list to ensure that it is complete. The inventory may be shown as a map. Detailed information on new buildings should then be obtained by means of a return from those responsible for building schools for the purpose of keeping the inventory up to date and to observe progress.

An annual return should suffice showing at a specified date (which might be that of the annual questionnaire in order to cross-check the information) (see the following page).

Value	Type	Classrooms	No. of places
		No	Area
Buildings started during previous 12 months			
Buildings in progress. during previous 12 months			
Buildings completed during previous 12months.			

It may not be possible to proceed at once to a full analysis of this material but it is basic information for planning.

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Study Session 15: School Records-Statistics

Introduction

Looking at the objectives/philosophy of any institution, be it primary, secondary and tertiary vis-à-vis the magnitude of academic records generated by institutions established a very long time ago coupled with the explosive school enrollment at all levels of education in recent time, there is little that memory can do.

Records management is a universal concept in institutions that are established to produce graduates at whatever level of education. It is quite obvious that records are the focus from which decisions which form the basis of existence of any institution are derived.

In order that satisfactory statistics can be collected from the schools, a few basic records- must be properly kept and maintained: the school list; in certain conditions the school register; and the class register. This study focuses on these records.

Learning Outcomes for Study Session 15

At the end of this study session, you should be able to:

15.1 Discuss the School List
15.2 Explain ways of Maintaining the School List
15.3 Discuss the School Registers
15.4 Discuss on Estimating or Checking Ages

15.1 The School List

The statistician must first have available a list of all the schools that he wishes to document. This is necessary to ensure that all schools are sent the necessary inquiry forms from the statistician and as a check on the response rate. It can also be used as a "frame" from which to draw a selection of schools when a sample inquiry is contemplated.

The information, suitably transferred to a school map, is also of use to the planners. The list must record as a minimum for each school its full address and the name of the

headmaster.

For use as a sampling frame, further particulars (level and type of school, numbers of pupils, sex classification, and number of teachers) would be desirable. In Nigeria these lists are seldom fully satisfactory as regards their comprehensiveness, the details collected and .the way in which they are maintained.

In Text Question

The list must record as a minimum for each school its full address and the name of the headmaster. **True/False**

In Text Answer

True

15.1.1 Legal Definition of a School

It is increasingly the practice to make it a legal condition of operating a school that it should be licensed by the Ministry of Education. Applications for a license, if passing first through the hands of the local officer can be checked by him from his knowledge of local conditions and sent on to the Ministry with his recommendations; it is also possible for him to extract the information required for compiling a school list.

A "school" is generally defined as a group of pupils (students) of one or more grades organized to receive instruction of a given type and level under one teacher, or under more than one teacher and with an immediate head. For legal purposes, this definition needs further clarification.

Figure 15.1: *School*

There must first be a limit put on size. To be workable, compulsory registration of schools should legally define a lower limit to the number of pupils, as for example by defining the school as "an institution providing education for five or more pupils between the ages of 5 and 9".

The age range depends upon the age at which children enter primary schools and leave at the secondary schools, and upon the extent to which it is proposed to include pre-primary schools and those dealing with further education. Institutions of higher learning, it should be noted, require a much simpler treatment. They are fewer in number and are normally established under public acts of various kinds.

What is meant by "education" may be more difficult to define and some guideline are given above to make as clear a distinction as is possible between, for example, a koranic school and an institution of pre-primary education or primary education.

What types of instruction to include under the various levels of education will be determined by those responsible for educational policy in the country. A frequent omission in practice is many types of technical training that are of special interest to manpower planning. Part-time education poses special problems as to what to include.

15.1.2 Comprehensiveness of the School List

Once the appropriate definition of a school has been determined, the prime consideration is that the list should be comprehensive. Relying solely upon legal registration may result in omissions because of:

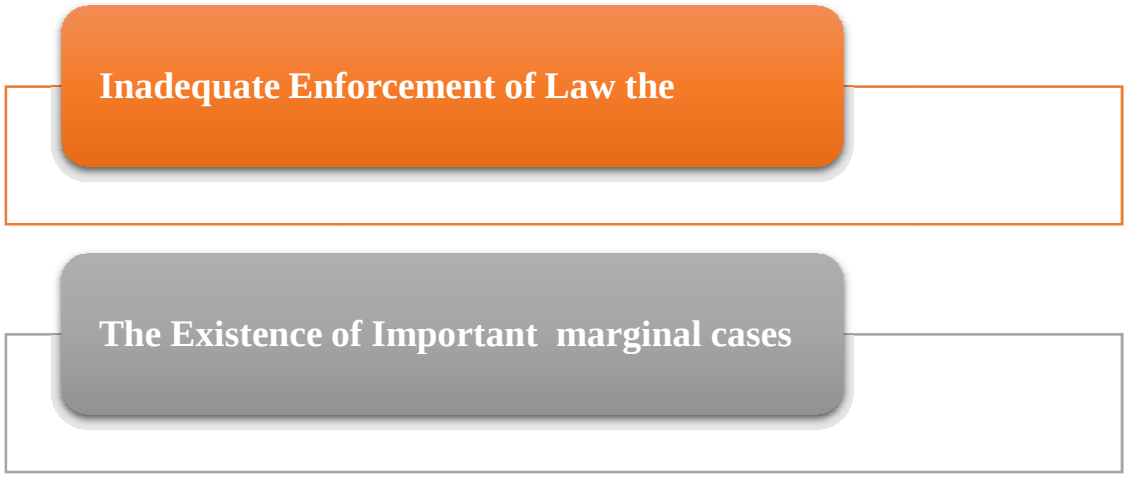

Figure 15.2: *School List*

Full responsibility for remedying these omissions should rest upon the local officer in the first instance. A school can be defined once its activity is inspected. The local officers should know their district sufficiently well to be aware of the existence of a new school and to be in a position without delay, to inspect its work.

They will consult the list of schools which missions and other non-official bodies prepare for the schools they are operating, and also, as a further check, teachers' payrolls where these are available from employing authorities. At the same time, the role of the statistician is not a passive one. He or his representative should visit selected areas periodically to examine the lists. If gaps are thought to exist, the statistician will discuss how they may be filled.

15.2 Maintaining the School List

One possible system for maintaining the school list is to use the actual application forms required to obtain a license. The information required could, for example, be supplied on the reverse side of this form and the form designed accordingly.

If completed in duplicate by the applicant a copy could go to the Ministry for ultimate use by the statistician, but this should not remove from the local office the final responsibility for the school list as such, for reasons noted above. The law or ordinance that requires the licensing of schools should also provide for the supply of this information as a condition of the license.

A further method would be to prepare separate sheets for each kind of school, state, voluntary and special, and to bundle them first according to level and then into districts. Such an arrangement would make possible quick summary statements of the stock position. Yet another possibility is that the lists should consist of a card index; the school cards could be quickly sorted to reply to particular inquiries, or for drawing a sample of schools.

Whatever the method used, the schools should be separately coded, that is, given a letter or number or both for quick and informative identification. The level of education provided by the school might be coded in a simple fashion and added to the distinct code to give informative registration number to each school.

Thus a primary school in the district of S-- might be registered S/P/9. Where mechanized data processing is in operation, the school code number will be purely numerical and based on the requirements of punched cards or other means used for feeding information into the sorters.

Figure 15.3: *Classroom Student*

15.2.1 Location of the List

In some developed countries all the detailed information collected by the Ministry of Education from schools and about schools, not only at registration but subsequently, is recorded by the Ministry on a master list. Magnetic tape recording makes it possible both to keep the information on this record up to date and to have quick access to it for analysis purposes. Developing countries are unlikely to have or to afford such equipment.

For them to endeavour to maintain a list in any detail at headquarters would mean considerable manual copying: this leads to error and is probably a wasteful use of manpower in the circumstance. Until more favorable conditions obtain, it is more realistic to maintain lists at the district offices, available for consultation by the educational statistician, so far as first level schools are concerned.

For second level and higher 1evel schools, the number involved being much smaller and the information required more extended, the possibility should be considered of maintaining a record by the statistician in the form, for example, of a separate file for each school; there could also be a nominal card index (that is arranged alphabetically by name) of these schools giving the registered number and location, for quick reference.

As the statistical work of the Ministry develops, contacts with the local office will become more extensive. Should this eventually take the form of appointing regional or district statisticians, located in the local office, the maintenance of the school list will come more directly under the supervision of file educational statistician.

If increasing use is made of sample surveys by the statistics, this closer coordination will be necessary since the coverage and description of schools required for these purposes could differ in some regards from those required solely for administrative purposes.

In Text Question

Magnetic tape recording makes it possible both to keep the information on this record up to date and to have quick access to it for analysis purposes. **True/False**

In Text Answer

True

15.2.2 School Records

The basic school records are the schools register, where one is maintained, and the class register. Whatever care is subsequently taken with the statistics compiled from these records, their quality and coverage depend upon the skill and facilities available in the school itself when these registers are originally made up.

In principle they constitute a continuous record of the population at school. In practice they easily become unreliable where school conditions are unsatisfactory, teachers are inadequately trained and the headmasters lack the time to produce good records.

15.3 School Registers

The school system of enrollment or registration varies from one institution to another. Where class organization is less formal, as in the universities and some marginal further education schools (normally where attendance is not considered to be administratively a special problem), the school register, consisting of a list of pupils enrolled, with particulars for each, is the main record.

At the other extreme, at the first level, no school register as such may exist, initial enrollment being recorded direct into class registers, which then carry the subsequent history of the pupil. At the second level, a school registers in one form or another is usually maintained in addition to class registers.

The number of pupils smaller than at the primary level; they are older and have already been documented at lower schools and are better educated; recording facilities-space, documents, clerical help and the level of education of those in charge

better. These school registers, which record the pupils' record while at school, have increased importance where less weight is given to examinations in assessing the pupils' achievements.

A system, of cumulative record cards, a card for each pupil being added as he enrolls, the card **being removed as he leaves for** one reason or another, is recommended for this purpose. Such a system lends itself extremely well to the provision of both stock and flow statistics. Entrants and leavers can be sorted out according to type, and the number or repeaters similarly found. It is local form of the individualized data system.

In those countries where pupils are provided with identity cards that follow the pupil from school to school or level to level, the collection of cards in the headmaster's possession provides a system of record cards that has many of the advantages of the cumulative card system, if designed and used for that purpose. Care must be exercised to guard against loss in the course of transfers and promotions and to ensure that the particulars are up to date.

It is unwise to introduce a system of records, whatever its advantages on other grounds, if the time, the willingness to maintain them and the human resources to maintain them are not certain to be forthcoming.

Nevertheless, if headmasters can be provided with better facilities and if, as a result of such measures as those suggested above, they have an interest in good statistics, they could maintain a school registers of one kind or another which could be of considerable help to the educational statistician.

Such an arrangement would have that the special advantage of placing the responsibility for all initial enrollments clearly upon the headmaster rather than upon the teacher. Until such arrangements are possible, the class register will continue to provide the main original record for many primary schools.

15.3.1 Class Registers

Class registers are, particularly for first level schools, the main source for statistics of:

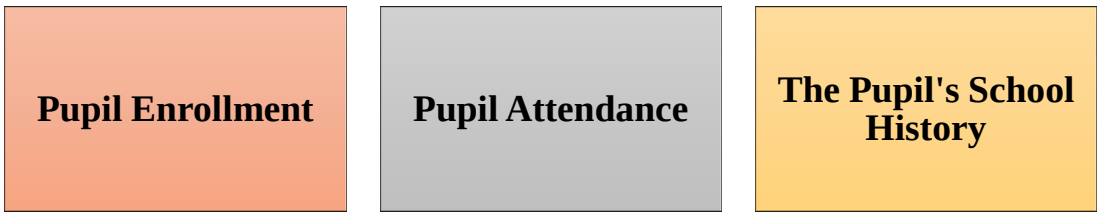

Figure 15.4: *Class Register*

There are thus strong grounds for their being designed at the outset as statistics as well as administrative documents. They should be durable, laid out for the convenience of the teacher and for ease of statistical summary, and printed in a standardized form.

There should be ample room to record against each pupil: class number for registered number, sex, age, previous grade (stating whether in another school) and reason for leaving. This will provide a clear record of repeaters, deaths and transfers. The problem of recording ages is referred to below.

The registers should be designed in the light of the school conditions. It may be helpful to design special simplified registers for schools in the more backward areas. In the more developed areas, the information collected might be extended, for example, to include the occupation of the parents. If a cumulative card system is introduced, the class registers can again be simplified.

15.3.2 Recording Ages

Once the age of the child on entry into the school is correctly known, and subsequent records properly maintained, the remaining information about the age structure of pupils is obtained simply by adding a year to the age after each year of schooling. Where the child's birth has been registered, there is no problem beyond that of ensuring that the informant is speaking the truth.

In those areas where registration does not exist, the age of the entrant will have to be estimated. It is possible also that the ages of some of the children in higher grades will

also have to be estimated since age assessment in the past may have been carried out on the basis of snap judgments by headmasters or teachers or by using certain very general rules such as the assumption that the existence of two eye teeth indicate ten years of age.

The statistician should see that more rigorous tests are applied to new entrants and either treat the early information with special caution or endeavour to improve its quality. In the school register, each child's age should be recorded as at the last birthday.

It will help the educational statistician if' the entry is also coded, for example, C = Certificated; E = Estimated, so that the number or percentage of ages that are estimated in each grade can then be noted. This would serve to indicate how far the statistician could rely upon these statistics and also serve as a yardstick for the progress being made in obtaining better information about ages.

In Text Question

In the school register, each child's age should be recorded as at the last(a) absent (b) Punctuality(c) birthday (d) Regularity

In Text Answer

The answer is (c) birthday

15.4 Estimating or Checking Ages

The limit of knowledge on the part of the individual in most developing countries of his age is a problem to which demographers have had to devote considerable attention in recent censuses and techniques have been developed to meet the situation. Merely recording the numbers in five yearly age groups from 5 - 9, 10 - 14, and so on, is of little help to the educational statistician who must know the ages by individual years.

(In any event, this system appears to have provided very little additional accuracy in estimating the ages). The two major types of procedure widely used by demographers are:

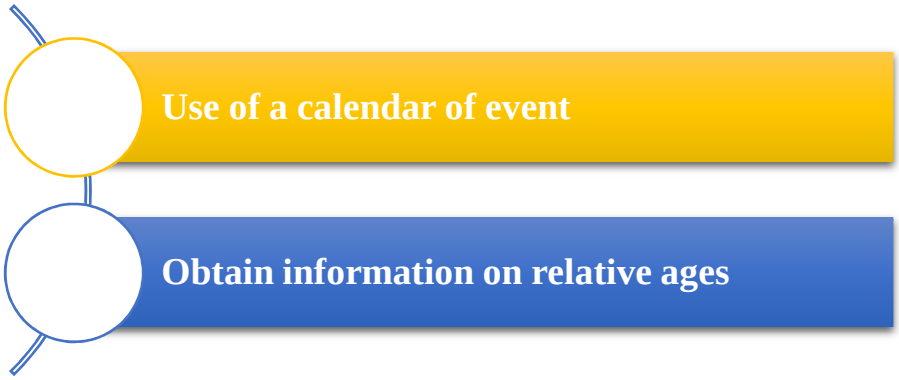

Figure 15.5: *Types of Procedure Widely used by Demographers*

1. Use of a calendar of event

The idea of chronological age is often foreign to the psychology of people in pre literate societies but there are often clearer views regarding seniority rights and relations to companions of similar ages. The latter approach may be of some assistance to the educational statistician where the age of a child's companion is known with some certainty; but the possibilities are limited.

The calendar of events approach is mere hopeful particularly at the very young age level. It consists in relating the birth in the memory of the informant to a particular historical event, the date of which is already known to the interviewer. The great increase in census activity in developing countries will help substantially in working this procedure.

2. Obtain information on relative ages

There is, first, the increasing awareness of age amongst the younger people as the result of the census operation itself. In the second place, a census officer will have already prepared a calendar of events applicable to the locality and this calendar of events could be either borrowed, or the experience of the officers who were concerned drawn upon, for compiling a similar one for use in the schools.

These techniques of age assessment are particularly suited to the discussions and talks of the kind mentioned above.

The statistician should also arrange for checks of the actual procedures adopted by headmasters or other recording agents both to acquaint himself more clearly with the problems involved in particular localities, and also to ensure that the fullest use is being made of what techniques are available. In addition, the local officer could keep a special eye on this activity.

Some developing countries are experimenting with sample recording areas for the purpose of obtaining better information on births and deaths. The arrangement broadly is that of appointing a trustworthy recorder in selected areas of a size that makes it possible for him to obtain information on vital events both by personal inquiry and by his being known and recognized in the area as appointed for that purpose.

In areas where this arrangement is in operation, contact between the 1ocal headmasters and the recorder could prove mutually helpful. The educational statistician should endeavor to keep In touch with developments in the field of civil registration in order to seek ways of improving the information on ages.

15.4.1 Pupil registration Numbers: Coding

Each pupil will receive a number on the class register which will correspond with that on the school register, if one is maintained. It is desirable that he should be given a unique number that identifies him throughout his school career. Checking at every stage would be helped by this device.

It is possible to use the registration number not merely to identify the pupil but also, by applying a simple system to numerical coding, to show some of his individual characteristics. Thus assuming a child enters grade 1 at 6 in 1960, a registration number could be given to him showing first; the year of entry, 0 (since the final integer in the year figure is sufficient to identify the child's entry date), second, his age, 6, and third, his grade, 1.

His registration number would then be 061 (a number he himself might easily remember) and he would thus be able to give these particulars wherever be eventually finds himself. An examination of the class or school register in 1966 which shows that the child has reached the sixth grade also shows that in doing so he has been promoted regularly.

By comparing the number of all those children in the sixth grade everywhere having this number in lower grades, measure of dropout is quickly obtained. Further information about those in the latter group could be obtained by extending the code number. But this is prone to the possibility of error in the original recording and subsequent copying.

It should be noted that it has not yet been tried out in practice to discover, for example, how best to report the information so obtained, whether it should be derived directly from the class register or from a school register in the form of a cumulative card index.

Summary from Study Session 15

In this study session, you have learnt the following:

1. **The School List**

   The statistician must first have available a list of all the schools that he wishes to document. This is necessary to ensure that all schools are sent the necessary inquiry forms from the statistician and as a check on the response rate. It can also be used as a "frame" from which to draw a selection of schools when a sample inquiry is contemplated.

2. **Maintaining the School List**

   One possible system for maintaining the school list is to use the actual application forms required to obtain a license. The information required could, for example, be supplied on the reverse side of this form and the form designed accordingly.

3. **School Registers**

   The school system of enrollment or registration varies from one institution to another. Where class organization is less formal, as in the universities and some marginal further education schools (normally where attendance is not considered to be administratively a special problem), the school register, consisting of a list of pupils enrolled, with particulars for each, is the main record.

4. **Estimating or Checking Ages**

   The limit of knowledge on the part of the individual in most developing countries of his age is a problem to which demographers have had to devote

considerable attention in recent censuses and techniques have been developed to meet the situation.

Self-Assessment Questions (SAQs) for study session 15

Now that you have completed this study session, you can assess how well you have achieved its Learning outcomes by answering the following questions. Write your answers in your study Diary and discuss them with your Tutor at the next study Support Meeting. You can check your answers with the Notes on the Self-Assessment questions at the end of this Module.

SAQ 15.1 (Testing Learning Outcomes 15.1)

Discuss the school List

SAQ 15.2 (Testing Learning Outcomes 15.2)

Enumerate how to maintain the school List

SAQ 15.3 (Testing Learning Outcomes 15.3)

Explain the School Register

SAQ 15.4 (Testing Learning Outcomes 15.1)

In Estimating or Checking Ages, mention the two procedures involved

Notes on Study Session 15

SAQ 15.1

The statistician must first have available a list of all the schools that he wishes to document. This is necessary to ensure that all schools are sent the necessary inquiry forms from the statistician and as a check on the response rate. It can also be used as a "frame" from which to draw a selection of schools when a sample inquiry is contemplated.

The information, suitably transferred to a school map, is also of use to the planners. The list must record as a minimum for each school its full address and the name of the headmaster. For use as a sampling frame, further particulars (level and type of school, numbers of pupils, sex classification, and number of teachers) would be desirable.

SAQ 15.2

One possible system for maintaining the school list is to use the actual application forms required to obtain a license. The information required could, for example, be supplied on the reverse side of this form and the form designed accordingly.

If completed in duplicate by the applicant a copy could go to the Ministry for ultimate use by the statistician, but this should not remove from the local office the final responsibility for the school list as such, for reasons noted above. The law or ordinance that requires the licensing of schools should also provide for the supply of this information as a condition of the license

SAQ 15.3

The school system of enrollment or registration varies from one institution to another. Where class organization is less formal, as in the universities and some marginal further education schools (normally where attendance is not considered to be administratively a special problem), the school register, consisting of a list of pupils enrolled, with particulars for each, is the main record.

At the other extreme, at the first level, no school register as such may exist, initial enrollment being recorded direct into class registers, which then carry the subsequent history of the pupil. At the second level, a school registers in one form or another is usually maintained in addition to class registers.

SAQ 15.4

Use of calendar of events

Obtaining information on relative ages.

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