

Introduction to Social and Economic Statistics

STA 212



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

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General Editor: Prof. Bayo Okunade

University of Ibadan Distance Learning Centre
University of Ibadan,
Nigeria

Telex: 31128NG

Tel: +234 (80775935727)

E-mail: ssu@dlc.ui.edu.ng

Website: www.dlc.ui.edu.ng

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.

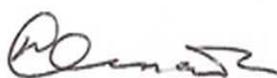
The implication of the above is that, a distance learner has a responsibility to develop requisite distance learning culture which includes diligent and disciplined self-study, seeking available administrative and academic support and acquisition of basic information technology skills. This is why you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



Professor Bayo Okunade

Director

Course Development Team

Content Authoring

Ojelabi Adedokun Oluwafemi

Content Editor

Prof. Remi Raji-Oyelade

Production Editor

Ogundele Olumuyiwa Caleb

Learning Design/Assessment Authoring

SkulPortal Technology

Managing Editor

Ogunmefun Oladele Abiodun

General Editor

Prof. Bayo Okunade

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Course Introduction

Statistics is a branch of applied mathematics. For its development and growth, a statistician must be involved in practical problems. Statistics cannot be limited to the realm of pure science, its tentacles cut across the economic and social aspects of life and society. This book focuses on the interface between social and economic investigations with particular emphasis on application of statistical methods to social and economic issues in Nigeria.

The Study Sessions are designed to help learners have a full grasp of the course in a general sense. About 65 years ago, social statistics were fed from population censuses or administrative systems. However, development of household surveys has increased the availability of social statistics.

The student who has gone through a one year course in statistics will find the theories and methods come practically alive as he applies them to social and economic situations he faces in his everyday interaction with the society. Some elementary knowledge of economic terminologies is assumed.

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

1. explain organisation of the Nigerian Statistical system
2. explain the nature and significance of social and economic statistics.
3. explain and apply the concept of index numbers; and
4. explain different methods of Standardization of rates.

Study Session 1: Organization of Statistical Systems

Introduction

Statistics, the science of counting is as old as the world itself. Its importance has been increasing with the age and advancements in the world. In earlier years, Governments used statistics to keep records on population, birth, deaths, marriages etc. for administrative purposes.

In this study session, you will be introduced to Organization Statistical system

Learning Outcomes for Study Session 1

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

- 1.1 Describe a national statistical system
- 1.2 Differentiate different types of statistical systems and learn about the National Bureau of Statistics (NBS) and the National Population Commission (NPC)
- 1.3 Discuss problems of the Nigerian statistical system and proffer solutions.
- 1.4 Explain the role of Data Producers
- 1.5 List the problems of the Nigerian statistical system

1.1 Statistical Systems

Yule and **Kendall** defined statistics as quantitative data affected to a marked extent by multiplicity of causes. Statistical data are used as tools to shape society. The availability of adequate statistical data in a usable form is central to designing well-articulated policies and are critical for efficient decision making in government, international bodies, private setup and personal research. It is thus imperative for governments to initiate a well-developed statistical organization saddled with the responsibility of producing needed statistical data.

Social Statistics is the numerical statement about social life. Social statistics is the use of statistical measurements and methodologies to study human behaviours in a social environment with the aim of enhancing better governance and social wellbeing.

One of the banes of developments in Africa is the absence of strong National Statistical System because statistical information is central to development. Also, it has been observed that rich nations are good producers and users of statistical information for development programming while emerging and poor nations have weak and ineffective National Statistical System. This is partly responsible for the poor management of the economy.

A National Statistical System can be described as a coordinated system of all legally supported agencies involved in developing and producing statistical information necessary to facilitate the fulfilment of a nation's objectives and goals.

It covers all official statistical activities in a country and includes organizations such as central statistical offices such as the National Bureau of Statistics (NBS) in the Nigerian case, specialized statistical offices in the political subdivision of the country as well as official statistical committees or boards.

Data may come from different sources, or different providers within the national statistical system. The National Bureau of Statistics (NBS) was, until recently, called the Federal Office of Statistics (FOS). The Nigerian National Statistics office started in 1978 with the establishment of a statistical unit in the office of the Colonial Secretary in the Cabinet secretariat of the British Colonial Administration.

The unit was concerned with the collection and publication of statistics on trade. In 1947, a statistics unit was established in the department of customs and excise. In 1949, the unit which had become a department had its responsibilities expanded to form the nucleus of a centralized National Statistical Office for the country.

When the Federal system of government was adopted in 1958, the central and the regional governments had their statistics establishments incorporated with a decentralized National Statistical System.

In-Text Question

Describe National Statistical System

In-Text Answer

A National Statistical System can be described as a coordinated system of all legally supported agencies involved in developing and producing statistical information necessary to facilitate the fulfilment of a nation's objectives and goals.

1.2 Types of National Statistical System

There are two broad types of namely: centralised and decentralised. A centralised national statistical system is one where the whole process of data production and dissemination to the governments and other users of statistics is carried out by an organ of the government. The central agency is in charge of the entire survey infrastructure, with responsibility for some integrating functions.

It also controls all the statistical activities of the nation. The decentralised system gives other agencies legal authority and control over their resources for collecting needed data. It employs a division of responsibility between the various data collection agencies at different tiers of government and the different agencies are free to collect data to satisfy their respective needs.

1.2.1 Decentralised System

This system employs a division of responsibilities between the state, local and federal government. These responsibilities however, have to be coordinated centrally. The Nigerian statistical system embraces the decentralized system with the National Bureau of Statistics (NBS) as the lead agency for coordination and production of statistics. Variant of decentralization system include:

1. Decentralized by areas of specialization – this consists of various national statistical offices each specializing in a subject field with minimum control and co-ordination possibly through a committee.
2. Decentralized by subject – housing, agriculture, health, education etc. with a co-ordinating body.

1.2.2 Centralised System

In this system, a bulk of statistical services is reposed in one body having offices and officers in all departments of the national government. This body is therefore responsible for coordinating the statistical activities of the nation. A centralized system can be:

1. Centralised with a major operating office for general statistics and specialised offices under a co-ordinating authority or
2. Fully centralized consisting of one central statistical office responsible for all statistical data – all data are sent by various organizations to this body for collation and publication.

Advantages and Disadvantages of Centralised and Decentralised Statistical System

	Centralised	Decentralised
Advantages	Ability to plan and coordinate across whole statistical system Ability to set long term priorities and divert funding to them. Organisational focus on statistical issues emphasises integrity and impartiality and common work ethos	Policy relevance Strong statistical linkage to administrative management and information systems
Disadvantages	Divorced from main Government users, perceived lack of responsiveness	Difficult to coordinate and plan system wide, sectorial interests take precedence over common good Open to political pressure, perceived if not actual Difficult to set common standards.

In-Text Question

Describe types of National Statistical System

In-Text Answer

The two broad types of National Statistical System are: centralised and decentralised.

1.3 Nigerian National Statistical System

In 1988, the Nigerian government promulgated decree 43 which decentralised the Nigerian statistical structure by the establishment of Department of Planning, Research and Statistics (DPRS) in each ministry and parastatal with the National bureau of Statistics as the lead agency for coordination and production of statistics. The system in its current decentralised form, was established by the Statistics Act of 2007.

1.3.1 Elements of Nigeria National Statistical System

A National Statistical System (NSS) comprises four main components namely, Data Producers, Data users, Data suppliers and Research and training institutions. The producers of statistics include the National Bureau of Statistics (NBS) as the coordinating agency of the system, federal ministries, public agencies, state statistical agencies and local government statistics units.

On the other hand, Data users include key users such as policy and decision makers; while Data suppliers are made up of establishments and households. For Research and Training institution, we have higher education institutions and various research institutes.

Characteristics of an Effective National Statistical System

- institutional framework: legal enforcement powers that also offer
- protection of core values: legitimacy and credibility, confidentiality, privacy
- non-political objectivity

1.3.2 Functions of the National Statistical System

The Central function of the national statistical system is to collect, compile and publish an integrated set of statistical data relating to economic/social structural activities of the country. These involve:

1. Determination of what statistical data is required and how best to produce them. This necessitates a periodic review of the statistical data produced.
2. Development of integrated statistical data. This calls for co-ordination of different statistical agencies by recommending common definitions, classifications and techniques, proper coverage and comparable time reference. In Nigeria, there are

- over 1,600 statistical outfits; which if not well-coordinated, will lead to circulation of conflicting and non-consistent statistics.
3. Develop and issue statistical standards adapted to the needs of the country.
 4. Research into statistical operation and techniques.
 5. Co-ordinate statistical activities of different national offices.
 6. Train statistical personnel.
 7. Maintain quality, integrity, independence and objectivity of statistics.
 8. Participate in international statistical activities.

1.3.3 Objectives of Nigeria National Statistical System

- To raise public awareness about the importance and role of statistical information to the society
- To collect, process, analyses and disseminate quality statistical data.
- To promote the use of best practice and international standards in statistical production, management and dissemination.
- To promote the use of statistical data and information at individual, institutional, local government area, national and international levels, especially for evidence based policy design and decision making.
- To build sustainable capacity for the production and use of statistical data and information in the country for planning purpose.

1.3.4 Statistical Offices

The fundamental objective of national statistical offices is to provide relevant, accurate, timely, coherent and complete statistical data. Such data will be a clear and precise panorama of a country which will be required and essential for rational planning and decision making process. Moreover, a statistical office has the role of pioneering and coordinating all statistical systems in order to ensure standards in production of statistical as well as prevent information pollution in the country. Different types of statistical offices are listed below:

1. Large scale field organisation like those for census and sample surveys for example the National Population Commission
2. Large scale data processing organizations.
3. Agencies concerned with statistical data arising as by-products of administration.
4. Specialized statistical organization like statistical officers in Ministry of Agriculture, Health or Education etc.
5. Central co-ordinating office.
6. Central statistical offices with operating responsibilities.
7. Differentiate between the operations of the National Population Commission and the National Bureau of Statistics (NBS)

1.4 Data Producers

Nigeria employs the decentralization system in its data production. This is partly in line with its federal status and common practices in many countries of the world. All the three tiers of government namely Federal, State and Local government are involved in data production. (Data production involves collection, compilation, analysis and publication of data).

Data producers ensure availability of high quality and accessible statistical data and information covering all possible areas of economic and social subject matter. Such data and information must be of high quality. A high quality data is characterized by Relevance, Comprehensiveness, Accuracy, Consistency, Timeliness, Space, disaggregated by main domains (e.g. gender, vulnerable groups, etc.) and accessibility.

The main institutions and agencies involved in data collection and/or compilation include:

At federal level

- National Bureau of Statistics (NBS) formerly (Federal Office of Statistics)
- Central Bank of Nigeria (CBN)
- National Population Commission
- National Data Bank (NDB)
- Departments of Planning, Research and Statistics (DPRS) of Ministries and Parastatals
- Research and Training Institutions among others

At State level

- The State Statistical Agencies (SSAs)
- Budget and Planning Departments of Local Government Councils.

1. The National Bureau of Statistics (NBS)

In 1928, a Statistics Unit was established in the office of the colonial secretary in the cabinet secretariat of the British colonial administration in 1947, the Unit became Department of Statistics with the expansion of its responsibilities in 1949 to form the nucleus of a centralised national statistics office for the country.

By 1957, the Statistics Act was enacted, and a decentralised national statistical system was adopted for the country and in 1960, the Department of Statistics was moved from Customs and Excise to the ministry of finance and later federal ministry of economic development, with the name changed to the **Federal Office of Statistics**, (FOS). The FOS was merged with the national data bank (NDB) in 2004.

The merger of FOS and NDB led to the establishment of the National Bureau of Statistics (NBS). The Statistics Act of 1957 was repealed and the Statistics Act of 2007 was enacted. The NBS is thus the main national agency responsible for the development and management of official statistics in the country. It is the authoritative source and custodian of official statistics in the country. The statistics Acts of 2007 outlined NBS key functions.

Functions of National Bureau of Statistics

- a. To coordinate the National Statistical System.
- b. To advise the federal, state and local government on all matters related to statistical and development.
- c. To develop and promote use of statistical standards and appropriate methodologies in the system.

- d. To collect, compile, analyse, interpret, publish and disseminate statistical information alone or in collaboration with other agencies, both governmental non-governmental agencies.
- e. To develop and maintain a comprehensive national data bank by encouraging unit of line ministries and agencies develop their sectorial data bank and forward to the bureau.
- f. To provide a focal point of contact with international agencies on statistical matters.
- g. To carry out all other functions relating to statistics as the federal government only assign to the bureau.

2. **The Board of the NBS**

The governing board of the Bureau comprises of 15 members:

- 6 Political members from each of the six geo-political zone of the country appointed by the President and approved and confirmed by the senate
- 9 Institutional members. The members are
 - The Minister of National Planning Commission or his Representative
 - The Governor of Central Bank of Nigeria or his Representative
 - The Minister of Finance or his Representative
 - The Minister of Agriculture or his Representative
 - The Minister of Education or his Representative
 - The group Managing Director NNPC or his Representative
 - The President Manufacturer Association of Nigeria or his Representative
 - The President of Nigeria Statistical Association
 - Statistician General and Chief Executive of the NSO as the secretary

The Chairman of the Board is appointed by the President on the recommendation of the Minister of National Planning Commission.

3. **National Population Commission of Nigeria**

The National Population Commission of Nigeria (formerly National Population Commission) was first established as the National Census Board in 1972. The legal institutions creating it, Decree no 23 of 1989 charge the commission with the following responsibilities;

- a. To undertake the enumeration of the population of Nigeria periodically through censuses and sample surveys.
- b. To establish and maintain a machinery for continuous and universal registration of births and deaths throughout the country.
- c. To prepare and maintain a national framework for the delineation exercise for censuses and sample surveys
- d. To collect, collect and publish data on migration statistics.
- e. To conduct researches, monitor the national population policy and set up a national population information data bank
- f. To provide information and data on population for purpose of facilitation of national planning and economic development.
- g. To advise the federal government on any population and related matters and problems.
- h. To disseminate information and educate the general public about the activities of the commission
- i. To arrange for the appointment and training of enumerators and all other categories of staff of the commission.

4. Central Bank of Nigeria

The central bank of Nigeria publishes banking, financial, agricultural and foreign trade statistics through it's:

- a. Annual Report and Statement of Account
- b. Economic and Financial Review.
- c. Monthly Report.
- d. Nigeria principal economic and financial indicators.
- e. Statistical Bulletins, etc.

1.4.1 Data Users and Their Roles

Data users demand and utilize statistical products and services. They are the most important component of the National Statistical system. Statistical data and information are produced because users are there to demand and use them. They are the sustainers of the system as their

need is the *raison d'être* of the statistical system hence the national statistical system will be sustained to the extent that it is user-focused and demand-driven.

Data users are diverse and large they include:

- Policy and decision makers in government ministries and institutions, and quasigovernmental bodies,
- Politicians (e.g. Members of Senate and House of Assemblies),
- Authorities in States and Local Governments,
- Researchers and academicians,
- NGOs,
- Private sector Organizations,
- The donor community,
- International organizations and development partners,
- The media,
- The general public.

1.4.2 Purpose and Uses of Statistical Data:

(i) Governments

Governments and their ministries are the major users of statistical data and information in any country. They use them for planning, administration, monitoring, governance and accountability.

In particular, they use the statistical data and information to:

- assess policy and programme options aimed at improving the wellbeing of the population e.g. building roads, providing clean water, building schools, providing relief in case of disaster, etc.;
- monitor implementation of development activities and to measure their impact;
- Make governance and administration such as deciding on grants to give to different administrative units, demarcating constituencies for electoral purposes, etc. effective.
- identify vulnerable groups in society (e.g. the poor, aged, children and socially disadvantaged) for whom it designs special programmes usually multi-sectorial in nature e.g. NEEDS;
- Demonstrate progress against development targets and also to plan and monitor the implementation and success of policies developed to achieve the targets.

(ii) Private sector

Business enterprises and other economic agents use data to assess opportunities, risks and prospects of a venture. They also use data to plan, make decisions, monitor, evaluate and report on business activities.

(iii) Non-Government Organizations (NGOs) and Community-based Organizations (CBOs)

These need population statistics with respect to their target groups to accomplish their purposes and plan, implement, monitor and evaluate their activities and to report back to their headquarters.

(iv) International organizations and development partners

These use statistics to assess requirements for assistance and/or participation in development initiatives and to evaluate the effectiveness of the assistance given e.g. on reduction of poverty, elimination of polio etc.

(v) The Media and the general public

The media and the general public also use statistics for various purposes including analysing events, making decisions, assessment of government and government projects etc.

1.4.3 Data Suppliers and Their Roles

Data suppliers mainly include:

Households, Individuals and groups within specified organizations, Establishments. Their role is to cooperate with data collecting agencies in supplying accurate data and information when requested and in the form they are required.

1.4.4 Research and Training Institutions and Their Roles

Data producers often do not have enough resources to fully analyse the data collected. Hence, researchers, academicians, policy-analysts and specialists are expected to bring their knowledge and expertise to bear on the process of data analysis in order to add value to data and to do definitive and especially policy-related analyses.

This enables them to turn data into usable information. Some of the research institutions are: Nigerian Institute of Social and Economic Research (NISER), Centre for Econometric and Allied Research (CEAR), Federal Institute for Industrial Research, Oshodi (FIIRO), Departments of Statistics in Universities and Polytechnics.

Also, training institutions use live data from the system for teaching and illustration purposes. They are expected to play the important role of developing and promoting appropriate data Collection methodologies. Those involved include the Federal Schools of Statistics and Departments of Statistics at Nigerian Universities

1.5 Problems of the Nigerian Statistical System

Every system has its teething problems. However, some of them often go beyond the teething stage and hinder full realization of the goals and objectives of the system. In the case of the Nigerian statistical system, the identified problems are:

1. **Political Factors:** In the recent past before the advent of democracy in 1999; incessant military interventions brought about unfavourable political climate in the country and thus adversely affected data collection, data integrity as well as true reporting. Moreover, there was no systematic planning hence, the use of data for policies formulation was relegated to the background. At the advent of democratic governance, some other problems began to emerge as politician were fond of manipulating figures to favour their political ambitions rather than national interest.
2. **Inadequate Infrastructure:** Infrastructures such as communication equipment, transportation facilities and accommodation for the staff were far below the minimum requirement for optimal performance.
3. **Lack of Dedication:** The military culture brought in corruption and waned dedication to duty. This rubbed on every facet of the country including enumerators. Also, suspicion by respondent and lack of effective legal frame work for enforcement of respondent cooperation stalled effective statistical activities.
4. **Inadequate Funds:** Inadequate funding and facilities as a result of global national economic recession; competing government priorities of other sectors; etc. hamper the activities of the national statistical offices. Thus the office could not adequately

- conduct relevant surveys and censuses to generate statistical information for policy makers, researchers, etc. Moreover, there is little or nothing of public enlightenment on the need and uses of statistical services.
5. **Government Interest and Manipulations:** Government do make attempts at reducing the impact of unfavourable data by inducing the statistical office to change the format of statistics table or to hold back publications of some items or convey false interpretation of some figure.
 6. **International Pressure:** The requirements from the international bodies like the IBRD, (World Bank), IMF, UNO etc., encourage manipulations of statistics. In order to present a 'good picture' about the country to the international bodies.
 7. **Administrative Data:** Birth and deaths registration, Access to data, Methodological and practical challenges in handling large data counting, imperfect data, privacy issues e.g. the age, women in purdah etc.)
 8. **Neglect** and non-recognition from Government
 9. **Staffing:** Rather than complain of understaffing the real issues is overstaffing with non-professionals and poor staff. For example, as at 2006, only 15% of the workforce in the FOS were professionals and sub-professionals.

Improving the Nigerian Statistical System

1. The user of statistics should be able to carry out the analysis of supplied data so as to bring out the understanding and quality of the data.
2. Suppliers of data should provide correct information about the statistical survey.
3. Provision of modern technological equipment to facilitate communication and transportation.
4. The role of multiple statistical agencies must be clearly defined such that duplication of work is avoided and proper coordination ensured.

Summary of study session 1

In this study session, you have learned that:

1. A National Statistical System can be described as a coordinated system of all legally supported agencies involved in developing and producing statistical information necessary to facilitate the fulfilment of a nation's objectives and goals.
2. Data may come from different sources, or different providers within the national statistical system. The National Bureau of Statistics (NBS) was, until recently, called the Federal Office of
3. The Nigerian National Statistics office started in 1978 with the establishment of a statistical unit in the office of the Colonial Secretary in the Cabinet secretariat of the British Colonial Administration.
4. There are two broad types of National Statistical System namely, centralised and decentralised.
5. A National Statistical System (NSS) comprises four main components namely, Data Producers, Data users, Data suppliers and Research and training institutions.
6. Nigerian Statistical Organisation and the functions
7. Different statistical systems and the Nigerian experience
8. Statistical agencies: NPC, NBS; their development and functions
9. Problems and suggested solutions

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

1. Describe National Statistical System
2. List and explain the types of National Statistical System

Study Session 2 : Statistical Coordination

Introduction

Statistics play an important role in policy development and in monitoring the achievement of policy objectives, nationally and internationally. Policy goals are often expressed in quantitative terms,

The major role of National Bureau of statistics (NBS) is the coordination of statistical activities of the federation. It directly coordinates at the federal level and indirectly at the state level. The state statistical agencies also coordinate the work of statistical divisions in the state ministries, parastatals and the units in the local government.

This study session will introduced you to statistical coordination, you will learn about machineries for statistical coordination, statistical standards definition, classification and methodology.

Learning Outcomes for Study Session 2

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

- 2.1 Discuss the process of statistical coordination:
- 2.2 Explain the essence and machineries for statistical coordination:
- 2.3 Explain statistical standards definition, classification and methodology.

2.1 Statistical Coordination

Coordination concerns both the statistical services and data produced. The purpose of coordination is to allow the component of a statistical system to act as a coherent system. It is necessary for obtaining an integrated system; achieve efficiency and uniformity in methods and results. A decentralized statistical system necessarily calls for coordination; however, it is more difficult to achieve coordination in a decentralized statistical system.

Through coordination there is:

1. Minimization of inefficient utilization of technique knowledge, duplication of work, gaps in information and costs
2. Certainty that the most useful set of statistical data is produced. The type of statistical system dictates the nature of coordination.

2.1.1 Reasons/Incentives for Coordination

- To create a national statistical system in which outcomes of various data collections engender comparability, harmonization of concepts, definitions, classifications and sampling frame
- To minimize duplication of efforts and forge agreement among agencies on effective and efficient data collection methods and schedules.
- Ensure international policies and best practices are employed.
- Sharing information that would improve the other agencies' ability for statistical response
- Providing access to statistical expertise that complements the expertise available
- Engaging in joint statistical activities so as to provide leverage for both budgets

2.1.2 Coordination of Nigeria National Statistical System

The national statistical system is coordinated by the governing board of the NBS. The Board takes policy decision and monitor coordination of the system while the national consultative committee on statistics is another mechanism for coordinating the system. The committee is headed by the Statistician General (who is the Chief Executive Officer of the NBS).

2.1.3 Functions of Coordinating Agencies

1. To examine the statistical programmes of the various agencies annually in order to achieve greater coordination and avoid unnecessary duplication of efforts and evolve a national statistical programme for the approval of the NBS board.
2. To examine the Statistics Act and recommend to the board any necessary changes as the need arises.
3. To develop strategies which shall ensure uniform standard and methodologies amongst the various agencies with a view to improving on the quality comparability and timeliness of their statistics output.

In-Text Question

_____ the purpose of coordination is to allow the component of a statistical system to act as a coherent system.

- A. Statistical Coordination
- B. Statistical Systems
- C. Official Statistics
- D. School statistics

In-Text Answer

- A. Statistical Coordination

2.2 Statistical Coordinating Committees

The essence of the statistical committee is to significantly contribute to the standardization of concepts, definitions and methodologies that will enhance statistical activities. In Nigeria, the coordinating committees are:

1. **State Statistical Coordination Committees and Local Government Statistical Advisory Committee:** This committee is made up of the heads of the state's statistical divisions in the ministries and parastatals. It is chaired by the state Director of statistics.
2. **The Federal Statistical Agencies Coordinating Committee:** This is made up of heads of statistical divisions in all federal ministries and agencies under the chairmanship of a

state Director of NBS. This committee looks at programmes and ensures an alignment of them while the statistical outputs are evaluated before publication.

3. **The National Consultative Committee on Statistics:** This committee is made up of the state's directors of statistics, heads of statistical division in some federal ministries including the director of national data bank. This committee handles all the statistical production issues and is chaired by the Director-General of the National Bureau of Statistics (NBS).
4. **The National Advisory Committee on Statistics:** This committee is made up of members drawn from among producers and users of statistics including universities and research institutions. This committee, chaired by the head of NBS, brings together users and producers of statistics for effective dialogue towards production of good quality and relevant statistics.
5. **The National Council on Statistics:** This comprise of state commissioners who are responsible for statistics and the head of federal agencies like the Central Bank of Nigeria, National Population Commission etc. This committee, chaired by the minister of National Planning, is responsible for statistical policy issues.

Coordination measures include:

1. Planning work programmes
2. Reviewing sheets
3. Establishing statistical standards
4. Selecting and exchanging personnel
5. Preparing and co-ordinating statistical publications e.g. "annual abstract of statistics".

2.2.1 Effectiveness of Coordination

This could be achieved through:

1. The nature of the plan for national statistical data.

2. The technical quality of methods.
3. Extent of duplication of work and expenditure.
4. Consistency and comparability of data.
5. Extent to which users' requirements are met.
6. Timeliness of release of statistics.

2.3 Statistical Standards

These are means for achieving uniformity in methods and results. The essence of standardization is to improve data quality. Subject fields and purpose of generating the data are major factors of standards defects. Three major areas of consensus are:

1. Standard definition like those of employment, industrial establishment, household and so on. International standards are available in different subject fields.
2. Standard classification for example in economic activities or health conditions.
3. Standard methodology like constructing index of industrial production or presenting sampling errors of estimates.

2.3.1 Legal Provision

The implementation of statistical policies as well as the organisation and development of statistical systems can be strengthened by legal provisions to back-up collation and publication of statistical data. Without adequate legal provision, statistical agencies will be at the mercy of the respondents especially in a society where every move of government at collecting information is viewed with suspicion.

Summary of Study Session 2

In this study session, you have learned that:

1. Coordination concerns both the statistical services and data produced. The purpose of coordination is to allow the component of a statistical system to act as a coherent system
2. The national statistical system is coordinated by the governing board of the NBS. The Board takes policy decision and monitor coordination of the system while the national consultative committee on statistics is another mechanism for coordinating the system
3. The essence of the statistical committee is to significantly contribute to the standardization of concepts, definitions and methodologies that will enhance statistical activities.

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

1. Explain the purpose of Statistical Coordination
2. State the functions of Coordinating Agencies

Study Session 3: Sources of Economic and Social Statistics

Introduction

There are two broad categories of data sources of economic and social statistics sources. These are published and unpublished sources. Each of these has the National and international components.

In this study session, you will be introduced to the meaning of Economic and Social statistics and its uses. This study session will also introduced you to the two broad categories of data source.

Learning Outcomes for Study Session 3

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

- 3.1 Defines Economic and Social statistics
- 3.2 Discuss various sources of published data in Nigeria
- 3.3 List the bodies that of published International data

3.1 Nature of Socio – Economic Statistics

Economic statistics may be defined as an historical record of economic activity which is capable of guiding the understanding of an economic system and at the same time capable of guiding the formulation of policy within the system. Quantitative information on manpower, production, distribution, transport, foreign trade, prices, employment, investments, national income and expenditures are examples of economic statistics.

Social statistics refers to data generated on the condition and quality of life of the people. Statistical information on household, education, health, public safety and population are examples of social statistics.

3.1.1 Uses of Economic and Social Statistics

The uses of economic and social statistics includes:

1. Planning for national development
2. Construction of systems of national accounts
3. Construction of Economic Models
4. Policy formulation and decision making

3.1.2 Problem of Collecting Economic and Social Statistics in Nigeria

The followings are some of the problem of collecting economic and social statistics in Nigeria

1. Conceptual problem
2. Problem in the statistical system
 - Shortage of well-qualified statistical manpower
 - Inadequate coordination, cooperation and collaboration among major producers of statistics in the country
 - Inadequate funding of the statistical agencies
 - Administrative bureaucracy and red tapism.
3. Problem in Society
 - Lack of statistical awareness
 - Illiteracy/ innumeracy
 - Cultural /religious problems
 - Language problem
 - Poor social facilities

In-Text Question

What is social statistics?

In-Text Answer

Social statistics refers to data generated on the condition and quality of life of the people. Statistical information on household, education, health, public safety and population are examples of social statistics.

3.2 Published National Sources

These relate to data published by the statistical offices of different countries. In Nigeria, sources of published data include:

1. Statistical Abstracts, bulletins and reports issued by government ministries, departments and agencies (MDAs) such as Ministries of Education, Finance, Economic Planning, Health etc.; National Bureau of Statistics (NBS), Central Bank of Nigeria (CBN), Nigerian National Population commission (NNPC), National Universities Commission (NUC), National Population Commission (NPC), Power Holding Corporation of Nigeria (PHCN) etc.
2. Miscellaneous report of government and non-government agencies. Examples include the Independent National Electoral Commission (INEC), National Agency for the Control of AIDS (NACA) etc.
3. Research Report and publications in learned journals by research organizations like the Nigerian Social and Economic Research (NISER), International Institute for Tropical Agriculture (IITA), Food Research Institute, Federal Institute of Industrial Research, Oshodi (FIIRO) etc.
4. Periodicals, magazines and daily newspapers

The above listed government organizations and many others including private organizations and individual researchers do publish data relating to different aspects of the economy. These organizations are saddled with the responsibility of periodically publishing statistical information as it relates to them.

The frequency of publication varies from one publication to the other. There are annual, quarterly, monthly or weekly publications as the case may be. The bulk of most publications by the government agencies are generally made up of tables with explanatory notes derived from data collected by the department itself or by other agencies. They can be described properly by data source publications.

These publications cover a wide range of topics about social and economic conditions, covering populations, health, crime, imports and exports, national accounts, housing and so on.

On the other hand, non-governmental agencies and private corporations also publish reports with summary tables in respect of their activities over a specified period for example, company quarterly and annual reports. There are also independent surveys and other research reports published by various research institutes.

Other published national sources are periodicals, magazines and daily newspapers. An example is the publication of stock exchange activities of the Nigerian Stock Exchange (NSE) on the pages of daily newspapers.

The National Bureau of Statistics in collaboration with the National Population Commission prepares and project population and household censuses. Household censuses will produce data on health-related conditions and services such as housing, water supply, toilet facilities, overcrowding and so on.

Also the NBS conducts surveys like price surveys, agricultural surveys, and community surveys and so on. The federal and state ministries of finance and planning do produce budget allocation data.

The publications of the National Bureau of Statistics include: Annual Abstract of Statistics, Nigeria Trade Summary, Review of External Trade, Report of building and construction, Distribution Survey of Nigeria, Industrial Survey of Nigeria, Consumer price index, National Accounts of Nigeria, Digest of statistics, the economic indicators, etc.

3.3 Published International Sources

International institutions publish useful and relevant data that has global coverage in their documents and publications. Examples of such bodies include United Nations Organisation (UNO) agencies like UNESCO, FAO, IBRD, IMF, ECA, AU, INHO, ILO, etc.

The Statistical abstracts, bulletins, reports and briefs are produced by these bodies. Other sources include the Internet i.e. www.nigerianstat.gov.ng www.npc.gov.ng www.population.gov.ng; www.cenbank.org.

The United Nations agencies publish information that give a summary of statistics by various government on yearly basis. The Economic Commission for Africa (ECA) frequently collects statistics from members African governments which it analyses and publishes; while the International Bank for Reconstruction and Development (IBRD, World Bank) uses experts to collect its reports from government organisations.

These organisations and others often carry out independent surveys in selected countries and the results are published. The frequency of publications by the international sources ranges from monthly to yearly for instance we have the monthly bulletin of statistics as well as statistical year book.

Unpublished Sources

This source of data refers to the raw data which exist in their original form but in the files, books, and documents, in government and non-governmental organisations (NGOs) and the private sector. Such data if obtained could be adequately used as checks on published data. The process of obtaining data from this source is normally hindered by poor storage of the data and partly because of bureaucratic bottlenecks and confidentiality attached to such documents and sources.

Summary of Study Session 3

In this Study Session, we have been able to learn about:

1. Economic statistics may be defined as an historical record of economic activity which is capable of guiding the understanding of an economic system and at the same time capable of guiding the formulation of policy within the system.
2. Social statistics refers to data generated on the condition and quality of life of the people.
3. International institutions publish useful and relevant data that has global coverage in their documents and publications

Self-Assessment Questions (SAQs) for Study Session 3

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

1. What is social statistics?
2. List source of Statistics Published in Nigeria

Study Session 4: Methods of Data Collection

Introduction

The statistician depends more on data to be able to function effectively and perform his role in the society. His thought is usually preoccupied with how to generate statistical information that will aid in properly evaluating the socioeconomic system and influence decision making. Inaccurate data collection can impact the results of a study negatively and render it invalid.

Learning Outcomes for Study Session 4

At the end of this Study Session, you should be able to:

- 4.1 Explain various types of data
- 4.2 Explain methods of data collection

4.1 Data Collection

Data collection can be defined as the gathering of essential information or facts.

Data is a numerical fact. The quality of a data affect the organization analysis and interpretation of the finished product. No nation thrives without reliable statistical information which often is an aggregate of information on individuals, subunits and units. Collection of reliable statistical data is premised on the following:

1. There is a well-defined statistical unit
2. There is an established standard of accuracy to be used
3. If questionnaire is to be used, the list of the questions must be uniform.
4. Collected data must be comprehensive enough to be representative of the sample.

There are two types of data namely primary and secondary data.

4.1.1 Primary Data

The researcher here collects the data directly from the source of information. This type of data is original in character and has a particular purpose for its collection. The field officer or investigator has set objectives to achieve objectives. The basic sources of primary data are censuses, sample surveys, and administrative processes. Primary data are collected where

- a. The needed information does not exist elsewhere
- b. The needed information exist but is not reliable
- c. Collecting the information at first hand is only way such information can be obtained

One of the advantages of this type of data is that the investigator is able to get what he wants and able to gain considerable insight into the issue he is seeking information about. Also the error rate is limited. There are six major methods of data collection namely Tests, Questionnaires, Interviews, Focus Groups, Observations and Secondary data.

- 1. Observation:** Here, the information is sought by way of investigator's own direct observation without asking from the respondent. This could be by participant's observation (events are observed without the participant knowing it e.g. study of bank queues) or mechanical observation (mechanical means are employed to gather more complex information e.g. weather forecast)

Advantages of Observation

- Elimination of subjective bias
- Elicited information is current
- The method is independent of respondents' willingness or otherwise to respond/

Limitations of Observation

- It could be expensive
- Information provided is very limited
- Unforeseen factors very interfere with the observation activities

2. **Interview:** this is coined as 'conversation with a purpose'. Purpose interviews are used in such areas as opinion polls to determine attitudes; to determine motives e.g. pattern of behaviour studies, employee selections, reporting as in mass media. Interviews may be formal whereby pre-prepared questions are asked or informal where questions vary in order and content in-between interviews.

3. **Questionnaire:** this contains list of questions to elicit certain information from the respondent. Questionnaires should be by post or by telephone. Questionnaires could be by post or by telephone. Questionnaires are relatively cheap to distribute to respondents, can get to a large number of people and answers can be carefully considered; however, the response rate is usually low and some difficult questions may not be answered-incomplete response.

a. Merits of Questionnaire Methods

- i. Low cost – even when the universe is large and is widespread
- ii. Free from interviewer bias
- iii. Respondents have adequate time to think through their answers
- iv. Respondents who are not easily approachable, can be reached conveniently
- v. Large samples can be used

b. Demerits of Questionnaire

- i. Low rate of return
- ii. Respondents need to be educated
- iii. In built inflexibility
- iv. Possibility of ambiguous replies or omission of items
- v. This method is slow

c. Qualities of a good Questionnaire

- i. It should be simple and clear
- ii. It should avoid complicated questions

- iii. It should not be too long but be as short as possible
- iv. It should be framed with right words so that they are well understood
 - v. It should have a logical sequence
- vi. It should not demand confidential matter of the respondents
- vii. It should be prepared as to draw out 'Yes' or 'No' answer
- viii. It should have a footnote and a brief explanatory notes
- ix. It should be made more attractive
 - x. Question should be certain e.g. what your age
 - xi. Question must not be ambiguous i.e. capable of specific answer

In-Text Question

_____ is a numerical fact

- A. Data
- B. Statistics
- C. Collections
- D. Observation

In-Text Question

- A. Data

4.1.2 Secondary Data

These are data which already exist and may be adapted for use in the current survey. Such data are collected originally for another purpose. Secondary data can be sourced from publications and records of governments and non-government organisations, journals of universities and research institutes, media, organization and administrative records. They are collected from an existing source such as hospital records.

There are agencies saddled with the responsibilities of collecting such statistical data on a regular basis and collated into a form that most users will find suitable. In this type of data, lesser degree of control is exercised by individual investigator or user as the initial collection is often

done for specific purpose that may be different from that of the secondary user. There is also the possibility of misinterpreting the data by the investigator.

The collections of data are mainly by sample or census methods. For secondary data to be used with reasonable degree of confidence, the validity of such data must be assessed. This involves checking for the following:

- a. The source of the data
- b. The purpose of which it was collected
- c. The method of data collection used
- d. Definition of terms used
- e. Coverage and changes overtime, if any
- f. Method of analysis

Uses of Secondary Data

Secondary data may be used in three ways by a researcher. First, some specific information from secondary sources may be used for reference purposes; second, secondary data may be used as bench marks against which the findings of a research may be tested; and third, secondary data may be used as the sole source of information for a research project.

Advantages of Secondary Data

- Secondary data, if available, can be secured quickly and cheaply.
- Wider geographical area and longer reference period may be covered without much cost.
- The use of secondary data broadens the database from which scientific generalizations can be made.
- The use of secondary data enables a researcher to verify the findings based on primary data.

Disadvantages/Limitations of Secondary Data

- The available data may not meet, our specific research needs.
- Available data may not be as accurate as desired.
- Secondary data are not up-to-date and might have become obsolete by the time they appear in print, because of time lag in producing them.
- Information about the whereabouts of sources may not be available to all researchers.

4.2 Methods of Data Collection

There are two categories of method of Data Collection. These are:

- Sample Method
- Census Method

1. **Sample Method:** this method involves taking a particular area as a representative of other areas or taking a particular people as representing other people. The collected data are treated as representative and a replica of the rest of the population. It is assumed that the sample will have all the attributes that can be found in the population.

Examples include the Nigerian National Integrated Survey of Household (NISH) which is patterned after the UN's National Household Survey of Establishments with the set objective of collecting data from institutions, organizations and establishments.

The National Bureau of Statistics (NBS) normally conduct a sample of 120 enumeration areas in each state of the federation every year based on the National Population Commission's design of enumeration areas. This method is quicker, cheaper and requires less labour force. However, it is less accurate and useful where there is a homogeneous population.

2. **Census Method:** this method goes the whole length of examining the entire population. It is more exhaustive and targets 100% coverage. Examples include the National Population and housing census, the census of production, census of schools, agricultural census etc. It is useful for a heterogeneous population and is more accurate.

However the capital outlay of population census is always very costly it is time consuming and requires large number of personnel and greater number of professionals and educated manpower, it is sensitive.

4.2.1 Problems of Data Collection in Nigeria

Problems of Data Collection in Nigeria includes:

1. Lack or inadequate funding of data collection by professionals on the field due to government's misperception of the role of statistics in national development
2. Problems of standardization of data collection procedure resulting in erosion of consistence and data integrity
3. Inadequate manpower as there are dearth of professionals in the field
4. Inadequate equipment and materials for data collection, processing and storage/retrieval and dissemination
5. Bureaucratic bottlenecks
6. Poor coordination and collaboration among relevant agencies
7. Excessive protection of organizational secret for fear of taxation

Summary of Study Session 4

In this study session, you have learned that:

1. Data collection can be defined as the gathering of essential information or facts.
2. Data is a numerical fact. The quality of a data affect the organization analysis and interpretation of the finished product
3. There are two types of data namely primary and secondary data.
4. There are two categories of method of Data Collection. These are:
 - Sample Method
 - Census Method
5. Sample method involves taking a particular area as a representative of other areas or taking a particular people as representing other people.
6. Census method goes the whole length of examining the entire population.

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

1. Explain the two categories of method of Data Collection
2. State the problems of Data Collection in Nigeria

Study Session 5 Social and Economic Statistics and Indicators

Introduction

The major users of social and economic data and statistics are policy makers, planners, scientists, students, and the general public. This study session will discuss the different types of social and economic statistics with their uses.

Learning Outcomes for Study Session 5

At the end of this Study Session, you should be able to:

- 5.1 Define socioeconomic indicators
- 5.2 List the different types
- 5.3 Explain the uses of social and economic statistics
- 5.4 Explain the criteria for selection of indicators

5.1 Socioeconomic Indicators

Socio economic indicators provide a measure of society's values that reflect allocation of scarce economic resources, they are efficient way of measuring the social and economic issues in a country. Properly derived indicators serve to describe and measure development achievements and target as well as to highlight changes in economic and social conditions that may require immediate or future investigations.

Indicators have the potential to signal the social conditions and economic health of the country and can assist in formulating policies or actions to serve the long term needs of the country. Indicators can tell whether things are getting better or worse, whether problems are increasing or current policies are achieving the desired goals.

Definition of Socioeconomic Indicators

An indicator is something that is measured regularly to show trends or changes in the state of a system. It is a quantitative measure against which certain aspects of policy performance can be assessed.

According to **Kpedkpo** and **Arya**, “indicators are surrogates for direct measurement, which approximate, represent or indicate the extent of the quality or property in question”. As the name implies socioeconomic indicators have to do with both the social and economic aspects of measuring developments, achievement of targets and evaluation of policies.

Socioeconomic indicators include employment, production, supply, disposition of goods and services, health, education etc. making them part of a multidimensional system reflecting the pattern of development.

5.2 Nature and types of Indicators

Some social and economic indicators consist of simple aggregations, ratios and proportions.

- A. **Ratio Indicator:** this is a single term indicating the relative size of two numbers. If x is a number, y another number the ratio is x/y e.g. Example: total number of male births registered in Igbo Ora between 1965 and 1972 inclusive was 4542 compared with 4322 female births. The sex ratio (male/female) at birth in Igbo Ora was $4542/4322 = 1.051$

- B. **Proportion Indicator:** this is obtained as the total number of subjects experiencing an event divided by the total number in the universe (the sum of those experiencing the event and those not experiencing the event). Thus in the Igbo Ora example, the proportion of male birth between 1965 and 1972 inclusive was $4,542/(4,542+4,322) = 0.512$

- C. **Rate Indicator:** this is a ratio indicator with temporal component in the definition. In other words, rate is a ratio with time reference. Examples include birth rates, death rates, etc.

Index Numbers: these generate indicators relating to output prices, wages etc. they can employ weights or just the simple index numbers

Central Tendency and measures of Dispersion: these types of indicators are used for relating the distribution of income and consumption. Examples of measures include the Gini or Pareto coefficients which are beyond the scope of this lecture.

Examples of Socioeconomic Indicators

➤ **Child Bearing:**

1. Total fertility rate
2. Estimated maternal mortality ratio
3. Contraceptive prevalence among married women of childbearing age, any method and modern methods

➤ **Education**

- a. School life expectancy (expected number of years of formal schooling) total and by sex
- b. School enrolment by sex

➤ **Health**

- a. life expectancy at birth by sex (years)
- b. infant mortality rate
- c. child mortality rate by sex

➤ **Housing**

- a. average number of persons per room for total, urban and rural area

➤ **Illiteracy**

- a. estimated adult illiteracy by sex
- b. illiterate rate by sex for aged 15 – 24 and 25+

➤ **Income and Economic Activity**

- a. per capita GDP (US \$)
- b. Adult economic activity rate by sex

➤ **Population**

- a. Estimated population, by sex
- b. Sex ratio (male per 100 females)
- c. Average annual rate of change of population

➤ **Others Include**

- a. Gross national or domestic product
- b. Income distribution
- c. Work conditions
- d. Adult literacy rate by sex
- e. Food availability
- f. Housing
- g. School enrolment by sex
- h. Etc.

5.3 Uses of Socioeconomic Indicators

There are various uses of socioeconomic indicators both in the short run and on the long run. Some of the uses are as follows:

1. To provide relevant information about social and economic conditions so as to measure changes in these conditions
2. To analyse and diagnose the conditions
3. To formulate policies and assess their impacts on the social and economic well-being of the people.

5.4 Selection of Socioeconomic Indicators

The intended use of an indicator determines its selection. An indicator can be used for planning purpose and for analysing situation. There are theoretical and statistical criteria. They include the following criteria which generally defines the usefulness of an indicator

Policy Relevant: A good indicator:

1. Monitors the key outcomes of socioeconomic policy and legislation, and informs progress towards policy goals
2. Measures socioeconomic processes that affects economy and lifestyles
3. Provides appropriate information to aid policy decision making

Measurable: A good indicator:

1. Measures changes on an appropriate temporal scale. It must furnish measures of absolute levels or trends that conform to the aspect of living conditions or the social service in question.
2. Is representative of the system being assessed, and is reliable over time
3. Has predictive capabilities

Cost Effective: A good indicator:

1. Requires limited number of parameters to be established
2. Uses existing data and information where possible
3. Is simple to monitor

Analytically Valid: to possess this attribute a good indicator must be such that:

1. It is developed with consistent analytical framework
2. The data is clearly defined, verifiable and scientifically acceptable
3. The data collection must use standard methodologies with known accuracy and precision (statistical integrity)

Simple and easy to understand: a good indicator must:

1. Be simple to interpret, accessible and publicly appealing
2. Clearly inform about the issues it represents

Techniques for Construction of Socioeconomic Indicators

This basically deals with the rearrangement of statistics and the adoption of suitable techniques for converting basic statistic into indicators. Indicators relate the numbers in a given state or experiencing a given event to the total population.

Summary of Study Session 5

In this study session, you have learned that:

1. Socio economic indicators provide a measure of society's values that reflect allocation of scarce economic resources, they are efficient way of measuring the social and economic issues in a country
2. An indicator is something that is measured regularly to show trends or changes in the state of a system
3. Socioeconomic indicators include employment, production, supply, disposition of goods and services, health, education etc. making them part of a multidimensional system reflecting the pattern of development.
4. Some social and economic indicators consist of simple aggregations, rations and proportions.

Self-Assessment Questions (SAQs) for Study Session 5

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

1. Explain the uses of Socioeconomic Indictors

Study Session 6 Official Statistics

Introduction

Statistical data are produced by various agencies at various levels and scales. Producers of statistical data create them primarily for their own use but are often useful for others as well. Government is the greatest producer of statistical data in any country. These data produced by government relate to the national economy and the country's welfare. Such data are often referred to as official statistics.

This study session will introduced you to Official Statistic

Learning Outcomes for Study Session 6

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

- 6.1 Discuss the principles of official statistics as enunciated by the joint conference of African Planners, Statistician and Demographers
- 6.2 Explain the framework for official statistics
- 6.3 Discuss various uses of official statistics.

6.1 Fundamental Principles Official of Statistics

At its eighth session, held at Addis Ababa in March 1994, the Joint Conference of African Planners, Statisticians and Demographers, considered that the Fundamental Principles of Official Statistics are of universal significance and adopted the principles of official statistics as listed below:

1. Official statistics provide an indispensable element in the information system of a democratic society, serving the Government, the economy and the public with data about the economic, demographic, social and environmental situation. To this end, official statistics that meet the test of practical utility are to be compiled and made available on an impartial basis by official statistical agencies to honour citizens' entitlement to public information.
2. To retain trust in official statistics, the statistical agencies need to decide according to strictly professional considerations, including scientific principles and professional ethics, on the methods and procedures for the collection, processing, storage and presentation of statistical data.
3. To facilitate a correct interpretation of the data, the statistical agencies are to present information according to scientific standards on the sources, methods and procedures of the statistics.
4. The statistical agencies are entitled to comment on erroneous interpretation and misuse of statistics.
5. Data for statistical purposes may be drawn from all types of sources, be they statistical surveys or administrative records. Statistical agencies are to choose the source with regard to quality, timeliness, costs and the burden on respondents.
6. Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes.
7. The laws, regulations and measures under which the statistical systems operate are to be made public.
8. Coordination among statistical agencies in each country of international concepts, classifications and methods promotes the consistency and efficiency of statistical systems at all official levels.
9. The use by statistical agencies in each country of international concepts, classifications and methods promotes the consistency and efficiency of statistical systems at all official levels.

10. Bilateral and multilateral cooperation in statistics contributes to the improvement of systems of official statistics in all countries.

Sources of Official Statistics include:

1. Records which accumulate in day to day administration
2. Statistical returns from other sources established by law
3. Surveys and censuses

These statistics are published in administrative reports, statistical bulletins, statistical abstracts, statistical year books, census reports and similar publications.

6.2 Framework for Official Statistics

In this framework there are two major fields namely: the principal and the secondary field.

1. Principal Fields as Suggested By United Nations Statistical Office

- **Population**

- a. Size, structure and changes in population.
- b. Geographical distribution of population and changes in distribution.

- **Learning and Education Services**

- a. Station of the population (i.e. attainment and achievement)
- b. Use and distribution of services
- c. Input, output and performance of the educational system

- **Earning activities and the inactive**

- a. Labour force participation
- b. Employment opportunity and mobility
- c. Employment compensation
- d. Working condition

- **Distribution of Income Consumption and Accumulation**
 - a. Level and growth of household income and accumulation
 - b. Level and growth of consumption
 - c. Inequality and redistribution of income and consumption.

- **Health, Health Services and Nutrition**
 - a. State of health
 - b. Nutrition
 - c. Availability, use and performance of health services

- **Housing and Its Environments**

2. Secondary Fields

1. Family formulation, families and households
2. Leisure and culture
3. Social security and welfare services
4. Public order and safety.

Major Issues for any Social Services is Status of the Population which can be summarize in the following points:

1. Use of facilities
2. Inputs in the services
3. Outputs of the services

6.3 Uses of Official Statistics

Government which is the producer of official statistics is understandably the largest user. Official statistics lend themselves to the following uses:

1. **Routine Administrative Control:** Government's goal in compiling statistical data is to describe the system in numerical data. In other words it is to describe the nation as a whole or its component sectors or in terms of characteristics.

This is to enable comparisons where needed for instance, between south and north or between east and west. Indicators are constructed to show differences in progress. These indicators reveal the extent of policy impact and also serve as checks on administrative actions.

2. **Policy Making:** Government functions as a controlling body thus it formulates legislative, executive and economic policies which are normally oriented towards better living standard or people's welfare. Policies can be in the area of education, health, taxation, trade, industry etc. the role of statistics is to summarize the experience of the past, establish current trends and predict the future. Statistics does this by:
 - a. Analysing statistical data in the sectors related or affected by the policies
 - b. Giving opportunity to the policy maker to select from the limited alternative policies for consideration
 - c. Carrying out further analysis of related statistical data that show up from the different policies if adopted
 - d. Guiding in the choice of one optimal policy out of several alternatives under consideration
3. **Planning for Development:** Growth is a legitimate pursuit of many countries of the world especially economic, technological and industrial growth. It is necessary to have a development plan where targets are set to be achieved within a given period say five, ten, fifteen or thirty years etc.

This process involves framing a planned policy for achieving each target like production targets, financing policies, execution and monitoring projects. Adequate statistical data of different forms are required for different levels and sectors of the economy

4. **Construction of Systems of National Account:**
5. **Construction of Economic Models:** Models are essential
6. **Other Users:** Business men who use statistics to monitor the likely problems and prospects of their business
7. Researchers who need statistical information to support or verify facts.

Summary of Study Session 6

In this study session, you have learned that:

1. Official statistics provide an indispensable element in the information system of a democratic society, serving the Government, the economy and the public with data about the economic, demographic, social and environmental situation.
2. To retain trust in official statistics, the statistical agencies need to decide according to strictly professional considerations, including scientific principles and professional ethics, on the methods and procedures for the collection, processing, storage and presentation of statistical data.
3. To facilitate a correct interpretation of the data, the statistical agencies are to present information according to scientific standards on the sources, methods and procedures of the statistics.
4. There are two major field for Official Statistics namely: the principal and the secondary field.
5. Government which is the producer of official statistics is the largest user of official statistics.

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

1. State the sources of Official Statistics

Study Session 7 : Index Numbers

Introduction

Every human make use of Index numbers whenever we are trying to measure average change or differences in groups of variables as well as to compare series of numbers of vastly different sizes. It is a way to standardize the measurement of numbers so that they are directly comparable.

In other words, the primary purposes of index numbers are to provide a value useful for comparing magnitudes of aggregates of related variables to each other, and to measure the changes in these magnitudes over time.

This study session will focus on Index Number and the types of Index number comparison.

Learning Outcomes for Study Session 7

At the end of this Study Session, you should be able to:

- 7.1 Explain the basic principles of construction of index numbers
- 7.2 Explain types of index numbers comparison
- 7.3 Construct price relative and simple aggregate price index number.

7.1 Definitions of Index numbers

Index numbers can be defined and described in different ways and according to subject areas.

In **Economics** it is define as a device employed in an attempt to measure the magnitude of economic changes overtime. It is also used for international comparison of economic data.

In **Statistics** it is defined as a statistical measure designed to show changes in price, quantity or value of a group of related items over a period of time.

The most familiar type of index number is the *price index*. The consumer price index (CPI) traces the period movement of retail prices. It is the most widely quoted and used of all the index numbers. This is because it is a measure of change in prices of whole range of goods and services regularly consumed. It is accounted as the cost of living index. It is mostly employed in the measurement of price in inflation and changes in cost or standard of living.

The quantity index, on the other hand, measures changes in the amount of goods produced. The National Bureau of Statistics (NBS) normally releases data on the CPI and the quantity index for production of some industries. The essence of these indexes is to provide average measures of changing output as related to industries.

Moreover, a value index reflects the combined movement of prices and quantity of goods and services. This is however considered of less importance in practice since the price and quantity indexes can be obtained separately with necessary conclusions drawn.

Index number can be constructed also for geographical location, income, profession etc. Index number is mainly used in business and economics, it can however be applied in many other fields.

There are various other specialized indexes such as wholesale index, production index, Nigerian Stock Exchange (NSE) index, CTSI index, Dow-Jones industrial average's stock performance. We also have indexes such as the wages index, unemployment index and so on. Also private research organisations publish indexes of interest to the business community that measure consumers' attitude or economic trends.

7.2 Types of Index Comparison

Since one of the major uses of index numbers is for comparisons, below are some types of comparisons.

1. Comparison Across Time Periods

The most popular price index numbers measure average prices in succeeding time periods. For instance, the National Bureau of Statistics (NBS) publishes the consumer

price index on monthly basis. As an example, the CPI for the month of June will compare with the previous month May to establish a one month price change, it will also compare with June the previous year to establish a one-year (or 12 month) price change. The same comparison for three-month, six-month changes can also be made.

2. Comparison of Geographic Locations

A comparison can be made between the South-West and the North or between Lagos and Abuja or Ibadan and Kaduna. Such index could compare energy consumption between Lagos and Abuja. Also an index of wages could assist in comparing the cost of locating an automobile factory either in Ibadan or Kaduna.

3. Comparison of Population Group

In this case, retail prices could be computed on how they affect individuals and families.

Construction of Index Numbers

It is important to consider the following points when constructing an index number:

- a. The definition of the purpose for which the index is being compiled must be clearly stated for data to be collected.
- b. The choice of the base period.
- c. The choice of the weight.

Summary of Study Session 7

In this Study Session we have been able to learn the:

1. The index number as a way to standardize the measurement of numbers so that they are directly comparable.
2. Index numbers can be defined and described in different ways and according to subject areas.
3. In Economics it is define as a device employed in an attempt to measure the magnitude of economic changes overtime. It is also used for international comparison of economic data.

4. In Statistics it is define as a statistical measure designed to show changes in price, quantity or value of a group of related items over a period of time.

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

1. What is Index numbers?
2. List the types of Index comparison?

Study Session 8: Price Index

Introduction

So far our focus has been on a single product. However with more than one product, we must take into consideration the economic importance of each product in measuring the average price change. In a price index, a product's importance is determined by the total value of consumption of that product. Value is measured by multiplying the unit price (p) of the product with the quantity (q) consumed.

Learning Outcomes for Study Session 8

At the end of this Study Session, you should be able to:

- 8.1 Construct price indexes using different method; and
- 8.2 Differentiate between different methods of index number construction
- 8.3 Explain the various uses of the CPI;
- 8.4 Discuss problems associated with the CPI; and
- 8.5 Adjust for inflationary rates in the economy.

8.1 The Price Index

A price index is a weighted sum of prices in on time period expressed as a percentage of prices in another time period.

A price relative for two periods is the ratio of the unit price of a single commodity written as a percentage. One of the periods is designated as the base period (period 0) while the other denoted current period (period n). The unit price in period 0 denoted by the symbol p_0 while that of period n is denoted p_n .

Generally it is defined as $\frac{P_{ni}}{P_{ni}} \times 100$ where P is; the price of the commodity in the base period

while P_{ni} is the price of the commodity in the current period.

Example 1: suppose a car cost N280,000 in 2000 and N350,000 in 2005, if we want to say how much its price has increased, we express the 2005 price as a percentage of 2000 price:

$$\text{Price relative} = \frac{35000}{28000} \times 100\% = 125\%$$

This translates to a 25% rise in price within five years.

Example 2:

The table below shows a supermarket selling different commodities out of which we pick three namely apple, ice cream and bread.

Product	1990	1991	1993
Apple	30	36	45
Ice Cram	18	21	24
Bread	35	35	50

We take 1990 as the base period.

For Apple we have

$$\text{PR 1990} = \frac{30}{30} \times 100 = 100$$

$$\text{PR 1991} = \frac{P_{nij}}{P_{oi}} \times 100 = \frac{36}{30} \times 100 = 120$$

$$\text{PR 1992} = \frac{P_{sa}}{P_{oi}} \times 100 = \frac{45}{30} \times 100 = 150$$

$$\text{Ice Cream 1991} = \frac{P_{ib}}{P_{oi}} \times 100 = \frac{21}{18} \times 100 = 116.7$$

$$\text{Bread 1991} = \frac{32}{38} \times 100 = 84$$

$$\text{Ice Cream 1992} = \frac{24}{18} \times 100 = 133.3$$

$$\text{Bread 1992} = \frac{50}{35} \times 100 = 142.86$$

Where the addition of relative index is greater than 100, it means there is increase in the price. A lower value than 100 indicates a decrease. The price of Apple, for example, increased by 50% between 1990 and 1992 unless the economic power of the consumers follow the same trend of spiral increase a drop in sale of apple would likely have been experienced over the period.

Simple Aggregate Price Index Number

This is the ratio of prices of several different commodity combined into a single summary figure in a given period to the prices of these several commodity in a base period. It is defined as:

$$\text{SAP} = \frac{\sum P_{ni}}{\sum P_{oi}} \times 100$$

1990	1991	1992
30	36	45
18	21	24
35	35	50
83	92	119

$$\text{SAP 1990} = \frac{\sum P_{oi}}{\sum P_{oi}} \times 100 = \frac{83}{83} \times 100 = 100$$

$$\text{SAP 1991} = \frac{\sum P_{1i}}{\sum P_{oi}} \times 100 = \frac{92}{83} \times 100 = 110.84$$

$$\text{SAP } 1992 = \frac{\sum P_{2i}}{\sum P_{0i}} \times 100 = \frac{119}{83} \times 100 = 143.37$$

The aggregate price increase by 10.84% between 1990 and 1991 but by 1992, the increase is 43.37% above the 1990 price.

8.2 The Weighted Index Numbers

Value measure the economic impact of on the consumers' budget of one product relative to other products. Given p as the unit price and q as the quantity consumed we express value as:

$$\text{Value} = q \times p$$

Example: the table below shows the cost incurred by a university staff on official duty.

Table 11.1

Expenditure head	2007		2012	
	P	Q	P	Q
Car	N8/km	2500km	N10/km	3000
Lodging	5000/day	5	7500/day	6
	N35/min	40	N20/min	45
Telephone	N35/min	40	N20/min	45

In 2007,

The value of transport is $2500 \times 8 = \text{N}20,000$

The value of lodgings is $5000 \times 5 = \text{N}25,000$

The value of telephone is $20 \times 40 = \text{N}1,400$

The total cost of the staff travelling expenses for 2007 is $\text{N}46,400$. The relative importance of each item is obvious. Lodgings take a lion share of over 50% of the total cost. Now, a price index compares the total value of a group of products in the current period with that of the base period. To ensure that only the change in prices is measured, we make use of the same quantities to compute values for both periods.

The weighted price index is the ratio of the total value of products in the current year/period to total value of the same products in the base year. In other words we use the respective quantities of the item consumed in the base or current year as weights.

The following are the important weighted index numbers under weighted aggregative method:

1. Laspeyres' index number
2. Paasche's index number
3. Fisher's index number
4. Dorbish-Bowley's index number
5. Marshall-Edgeworth's index number
6. Kelly's index number

For fixed quantities,

$$I_n = \frac{\sum q_n p_0}{\sum q_0 p_0} \times 100\%$$

There are two approaches to the choice of quantities either the quantity for the base period would be used or that for the current year/period

Laspeyres Index: This index uses the base period quantity denoted as q_0

$$WPI_L = \frac{\sum P_n q_0}{\sum P_0 q_0} \times 100 \quad \text{Laspeyres' method}$$

Where

P_n = Current year prices

p_0 = Base year prices

q_0 = Base year quantities

Paasche Index: this index makes use of the quantity in the current period. It is also known as current year weighting system.

$$WPI_p = \frac{\sum P_n q_n}{\sum P_0 q_n} \times 100 \quad \text{Paasches' method}$$

Paasche's index number: Paasche has taken year quantities as weights in the construction of price index number. Paasche's formula is given as follows:

$$P_{01} = \frac{\sum p_1 q_1}{\sum p_0 q_0} \times 100$$

Where

P_n = Current year prices

P_0 = Base year prices

q_n = Current year quantities

q_0 = Base year quantities

Fisher's index number: Fisher has taken both current year and base year prices and quantities as weights in the construction of price index number. Fisher's formula is given as below:

$$P_{01} = \sqrt{\frac{\sum P_1 q_0}{\sum P_0 q_0} \times \frac{\sum P_1 q_1}{\sum P_0 q_1}} \times 100$$

Where

P_1 = Current year prices

P_0 = Base year prices

q_1 = Current year quantities

q_0 = Base year quantities

Dorbish-Bowley's index number: Dorbish-Bowley's index number can be constructed by using the following formula:

$$P_{01} = \frac{\frac{\{\sum P_1 q_0\}}{\{\sum P_0 q_0\}} \times \frac{\{\sum P_1 q_1\}}{\{\sum P_0 q_1\}}}{2} \times 100$$

For example, construct price index number from the data given below Dorbish-Bowley's

method.

Commodity	2001		1991	
	Price	Quantity	Price	Quantity
A	5	10	3	30
B	4	15	5	15
C	3	20	7	10
D	2	30	9	5

Solution

Commodity	p_1	q_1	p_0	q_0	p_0q_0	p_1q_1	p_0q_1	p_1q_0
A	5	10	3	30	90	50	30	150
B	4	15	5	15	75	60	75	60
C	3	20	7	10	70	60	140	30
D	2	30	9	5	45	60	270	10
					$\sum p_0q_0$ = 280	$\sum p_1q_1$ = 230	$\sum p_0q_1$ = 515	$\sum p_1q_0$ = 250

$$P_{01} = \frac{\frac{\sum p_1q_0}{\sum p_0q_0} + \frac{\sum p_1q_1}{\sum p_0q_1}}{2} \times 100$$

$$P_{01} = \frac{\frac{250}{280} + \frac{230}{515}}{2} \times 100$$

$$P_{01} = \frac{0.89 + 0.45}{2} \times 100$$

$$P_{01} = \frac{1.34}{2} \times 100$$

$$P_{01} = \frac{134}{2}$$

$$\sim P_{01} = 67$$

Marshall-Edgeworth's index number: Marshall-Edgeworth's index number can be constructed by using the following formula:

$$P_{01} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$$

For example, construct price index number from the data given below Marshall-Edgeworth's method.

Commodity	Base year		Current year	
	Price	Quantity	Price	Quantity
A	7	4	10	9
B	6	3	5	5
C	5	4	8	6
D	8	2	7	4

Solution

Commodity	p_1	q_1	p_0	q_0	$p_0 q_0$	$p_1 q_1$	$p_0 q_1$	$p_1 q_0$
A	7	4	10	9	28	90	63	40
B	6	3	5	5	18	25	30	15
C	5	4	8	6	20	48	30	32
D	8	2	7	4	16	28	32	14
					$\sum p_0 q_0$ = 82	$\sum p_1 q_1$ = 191	$\sum p_0 q_1$ = 155	$\sum p_1 q_0$ = 101

$$P_{01} = \frac{\sum p_1 q_0}{\sum p_0 q_0} + \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$$

$$P_{01} = \frac{101 + 191}{2} \times 100$$

$$P_{01} = \frac{292}{237} \times 100$$

$$P_{01} = \frac{29200}{237}$$

$$\sim P_{01} = 123.21$$

Kelly's index number: Kelly's index number can be constructed when we are given current year price, base year price and raw quantities. The following formula is used by Kelly to construct price index number:

$$P_{01} = \frac{\sum p_1q}{\sum p_0q} \times 100$$

Community	Price		Quantity
	Base year	Current year	
A	6	10	50
B	2	2	100
C	4	6	60
D	10	12	40

Solution

$$P_{01} = \frac{\sum p_1q}{\sum p_0q} \times 100$$

Community	p_0	p_1	q	p_0q	p_1q
A	6	10	50	300	50
B	2	2	100	200	200
C	4	100	200	240	360
D	10	12	40	400	480
				$\sum p_0q = 1140$	$\sum p_1q = 1090$

$$P_{01} = \frac{\sum p_1q}{\sum p_0q} \times 100$$

$$P_{01} = \frac{1090}{1140} \times 100$$

$$P_{01} = \frac{109000}{1140} \times 100$$

$$\sim P_{01} = 95.61$$

In-Text Question

Which of the following is NOT weighted index numbers under weighted aggregative method

- A. Nellys' index number
- B. Paasche's index number
- C. Fisher's index number
- D. Dorbish-Bowley's index number

In-Text Answer

- A. Nellys' index number

8.3 Theoretical Tests for Consistency of Index Numbers

The following are the tests of adequacy of index number formulae:

- Unit test
- Time reversal test
- Factor reversal test
- Circular test

1. Unit Test

The unit test needs that the formula for constructing an index number should be independent of the units for which prices and quantities are quoted. All formulae used, except under the simple aggregative method, satisfy the unit test.

2. Time reversal test

Prof. Irving fisher suggested the time reversal test implies that the index numbers based in the base year to the current year and current year to the base year should be reciprocal to each other.

In symbol,

$$P_{01} \times P_{10} = 1 \text{ (Omitting the factor 100)}$$

Where

P_{01} = Price index number for the current year based on the base year.

P_{10} = Price index number for the base year based on the current year.

Fisher's index number formula satisfies the time reversal test:

$$P_{01} \times P_{10} = \sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_1} \times \frac{\sum p_0 q_1}{\sum p_1 q_1} \times \frac{\sum p_0 q_0}{\sum p_1 q_0}}$$

$$P_{01} \times P_{10} = \sqrt{1}$$

$$\sim P_{01} \times P_{10} = 1$$

3. Factor reversal test

Prof. Irving fisher suggested the factor reversal test. According to him, the factor reversal test implies that the product of the price index and the quantity index should be equal to the corresponding value.

In symbol,

$$P_{01} \times Q_{01} = \frac{\sum p_1 q_1}{\sum p_0 q_0} \text{ (Omitting the factor 100)}$$

Where

P_{01} = Price index number for the current year based on the base year.

Q_{01} = Quantity index number for the current year based on the base year.

Fisher's index number formula satisfies the factor reversal test:

$$P_{01} \times Q_{01} = \sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_1} \times \frac{\sum p_0 q_1}{\sum p_1 q_1} \times \frac{\sum p_0 q_0}{\sum p_1 q_0}}$$

$$P_{01} \times Q_{01} = \sqrt{\frac{\sum p_1 q_1}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_0}}$$

$$P_{01} \times Q_{01} = \sqrt{\frac{(\sum p_1 q_1)^2}{(\sum p_0 q_0)^2}}$$

$$P_{01} \times Q_{01} = \frac{\sum p_1 q_1}{\sum p_0 q_0}$$

4. Circular test

Circular test is a kind of extension of the time reversal test.

If there are three indices P_{01} , P_{20} and P_{21} , the circular test will be satisfied if

$$P_{01} \times P_{20} \times P_{21} = 1$$

Where

P_{01} = Price change of the current year on the base year.

P_{20} = Price change of the base year on some other base year.

P_{20} = Price change of the base year on the other second base year.

For example, construct Fisher's index number from the following data and show how it satisfies time reversal test and factor reversal test.

Commodity	Base year		Current year	
	Price	Quantity	Price	Quantity
A	10	12	12	15
B	7	14	5	20
C	5	24	9	20
D	16	5	14	5

$$P_{01} = \sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_1}} \times 100$$

Time reversal test

$$P_{01} \times P_{10} = 1$$

Factor reversal test

$$P_{01} \times Q_{01} = \frac{\sum p_1 q_1}{\sum p_0 q_0}$$

Commodity	p_1	q_1	p_0	q_0	p_0q_0	p_1q_1	p_0q_1	p_1q_0
A	10	12	12	15	120	180	150	144
B	7	14	5	20	98	100	140	70
C	5	24	9	20	120	180	100	126
D	16	5	14	5	80	70	80	70
					$\sum p_0q_0$ = 418	$\sum p_1q_1$ = 530	$\sum p_0q_1$ = 470	$\sum p_1q_0$ = 500

Fisher's index number

$$P_{01} = \sqrt{\frac{\sum p_1q_0}{\sum p_0q_0} \times \frac{\sum p_1q_1}{\sum p_0q_1}}$$

$$P_{01} = \sqrt{\frac{500}{418} \times \frac{530}{470}}$$

$$P_{01} = \sqrt{1.19 \times 1.13 \times 100}$$

$$P_{01} = \sqrt{1.34 \times 100}$$

$$P_{01} = 1.16 \times 100$$

$$\sim P_{01} = 116$$

Time reversal test

$$P_{01} \times P_{10} = 1$$

$$P_{01} \times P_{10} = \sqrt{\frac{\sum p_1q_0}{\sum p_0q_0} \times \frac{\sum p_1q_1}{\sum p_0q_1} \times \frac{\sum p_0q_1}{\sum p_1q_1} \times \frac{\sum p_0q_0}{\sum p_1q_0}}$$

$$P_{01} \times P_{10} = \sqrt{\frac{500}{418} \times \frac{530}{470} \times \frac{470}{530} \times \frac{418}{500}}$$

$$P_{01} \times P_{10} = \sqrt{1}$$

$$\sim P_{01} \times P_{10} = 1$$

Factor reversal test

$$P_{01} \times Q_{01} = \frac{\sum p_1 q_1}{\sum p_0 q_0}$$

$$P_{01} \times Q_{10} = \sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_1} \times \frac{\sum p_0 q_1}{\sum p_1 q_1} \times \frac{\sum p_0 q_0}{\sum p_1 q_0}}$$

$$P_{01} \times Q_{10} = \sqrt{\frac{500}{418} \times \frac{530}{470} \times \frac{470}{418} \times \frac{530}{500}}$$

$$P_{01} \times Q_{10} = \sqrt{\frac{530}{418} \times \frac{530}{418}}$$

$$P_{01} \times Q_{10} = \sqrt{\frac{(530)^2}{(418)^2}}$$

$$P_{01} \times Q_{10} = \frac{530}{418}$$

Thus Fisher's index number satisfies both the time reversal test and the factor reversal test.

Example

A company produces three items of goods in three consecutive years as follows and sold them as the indicated prices.

Item	1995		1997		1999	
	P	Q	P	Q	P	Q
A	48	85	55	80	58	64
B	18	60	19	65	22	81
C	38	40	32	45	46	32

Taking 1995 as the base year;

$$1995 \text{ WPI}_L = \frac{\sum P_n q_o}{\sum P_o q_o} \times 100\%$$

$$\frac{48 \times 85 + 18 \times 60 + 38 \times 40}{48 \times 85 + 18 \times 60 + 38 \times 40} \times 100$$

$$1995 \text{ VI} = \frac{\sum p_{oi} q_{oi}}{\sum p_{oi} q_{oi}} \times 100$$

$$\frac{6680}{6680} \times 100 = 100$$

$$1997 = \frac{\sum p_{1i} q_{1i}}{\sum p_{oi} q_{oi}} \times 100$$

$$\frac{7025}{6680} \times 100 = 105.9$$

$$1999 \text{ VI} = \frac{\sum p_{2i} q_{2i}}{\sum p_{oi} q_{oi}} \times 100$$

$$= \frac{6966}{6680} \times 100 = 104.3$$

Interpretation: there is a fall of 5.9 and 4.3 in the standard of living in 1997 and 1999 respectively when compared to the base period, 1995, which is 100.

Problems of Index Number

1. Determination of the base period.
2. The data may be out of date and often incomplete.

3. The method of data collection either by sample survey or total coverage may affect result obtained from the construction of index.
4. Selection of the base year, such a normal year is very rare to come by therefore the indexes continued as further element of approximation.
5. Indexes contain errors when they are not revised and if they are, it is strictly not correct to compare one series with another.
6. Indexes are measures of average with the advantages and disadvantages of averages.
7. The unit of measurement for quantity of item may not be the same; therefore there should be conversion to uniform unit.

8.4 The Consumer Price Index

The consumer price index is the most familiar and popular of all the indexes used all over the world. It has a lot of important applications and lends itself to wide interpretations. As a result of these, we are focusing this Study Session on the consumer price index as index of indexes.

The history of the consumer price index dates back to the First World War when it was decided that workers in shipbuilding yards should receive wage adjustments commensurate with 'cost of living' increases. Today, the consumer price index continues to serve its original purpose which is to measure changes in the prices of a basic 'market basket of goods and services'

8.4.1 Uses of the Consumer Price Index

1. **Measure of Price change:** The CPI is employed in gauging the success of government economic policies. Since it is a highly publicized index number, politicians and bureaucrats are especially sensitive to changes in the consumer price index that point to high inflation. This underscores the need for accuracy and objectivity in the CPI.
2. **Income Escalation:** The CPI has not lost its *raison d'être* as a measure of change in the cost of living. In advanced countries, adjustment of salaries and wages of workers are tied to the CPI. Also, adjustments in federal allocations to military and civilian pensions are based on the CPI. It measures the consumer purchasing power or purchasing power of currency.

$$\frac{I}{PPC} = CPI \times 100$$

3. To deflate a time and other economic series: there are economic or time series that involve income; these can be deflated by adjusting for inflationary rates existing in the economy.

	N/WK	CPI	Deflated = $\frac{T}{CPI} \times 100$
1990	200	100	200
1991	250	112	223.2
1992	300	120	250
1993	360	128	281.3
1994	400	90	444.4

This is an example of a worker who collects N200 per week in the base year 1990 and the market value is 200.

In 1991, there is an increment of 50 and the market value is 223.2 (while the income increases by N50, the market value only increases by 23.2, more than half of the increase has been swallowed by the high CPI – a measure of inflation).

In 1992, 1993 and 1994 the increments in salary are 100,160 and 200 respectively to N300, N360 and N400 with correspondent market values of 250, 281.3 and 444.4. It is only in 1994 that the increment is favourable because the CPI is lower. Further uses of index numbers include:

- a. To access the past trend of economic activities and the current status and projection of the future economic activities made on the basis of appropriate index number.
- b. To know the key changes in the selling prices of items.
- c. It is used as a basis for taking decisions of national importance.

8.4.2 Problems with Consumer Price Index

There are some problems associated with the use of the consumer price index, both statistical and otherwise. They include:

Population Coverage: a major concern here is the issue of the choice of population for CPI coverage. It is expected that the population should be large enough for the index to have wide application and narrow enough to make purchasing experience of the population members homogenous. In practice however, this is not really so. Statisticians run into problems of where to draw the line. The economic class distinction is not always clear in practice.

Quality Changes: Naturally, quality of goods and services are constantly in a state of flux; but the CPI aims at measuring the price change in a fixed market basket of products hence the inability to account for these changes in quality. Theoretically, the naira value of the consumer of changes in quality should be measured but this is practically impossible to measure, thus it is readily agreed that the CPI tends to be upwardly biased.

Home Ownership: Houses are durable goods and are not usually infrequent purchases, thus at any sampling period, those who own their own houses are not directly affected by changes in prices of houses but the cost of houses is expected to be a major component of the family budget. Invariably this factor is not adequately accounted for in the CPI.

Summary of Study Session 8

In this study session, you have learned that:

1. A price index is a weighted sum of prices in one time period expressed as a percentage of prices in another time period.
2. A price relative for two periods is the ratio of the unit price of a single commodity written as a percentage
3. Simple Aggregate Price Index Number is the ratio of prices of several different commodity combined into a single summary figure in a given period to the prices of these several commodity in a base period. It is defined as:

$$SAP = \frac{\sum P_{ni}}{\sum P_{oi}} \times 100$$

4. The consumer price index CPI because of its importance as a measure of inflation and evaluator of government policies.

5. The history of the consumer price index dates back to the First World War when it was decided that workers in shipbuilding yards should receive wage adjustments commensurate with 'cost of living' increases.
6. Today, the consumer price index continues to serve its original purpose which is to measure changes in the prices of a basic 'market basket of goods and services'

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

1. Explain Consumer Price Index
2. State and explain the problems of Consumer Price Index

Study Session 9 Vital Statistics

Introduction

Vital statistics are statistics on principal events in the life of an individual. They usually are gathered at the time of an event such as birth, marriage, the dissolution of a marriage, and death. Vital statistics are commonly compiled from records of vital events registered through offices that are organized as part of a vital registration system.

It involves compiling, processing, analyzing, evaluating, presenting and disseminating these data in statistical form. The vital events of interest are: live births, adoptions, recognitions; deaths and foetal deaths; and marriages, divorces and so on.

In this study session, you will be introduced to the meaning of Vital Statistics and how to calculate vital events statistics.

Learning Outcomes for Study Session 9

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

9.1 Define vital statistics

9.2 Calculate vital events statistics

9.1 Vital Statistics

B. Benjamin defines Vital statistics as “conventionally numerical records of marriages, births, sickness and deaths by which the health and growth of a community may be studied”. **Arthur Newsholme** defines it as “that branch of biometry which deals with data and laws of human mortality, morbidity and demography”.

A vital statistics system is defined as the total process of collecting information by civil registration or enumeration on the frequency of occurrence of specified and defined vital events,

as well as relevant characteristics of the events themselves and of the person or persons concerned.

In a broad sense, it refers to all types of population statistics collected by whatever mode while in a narrow sense, it refers only to the statistics derived from the registration of births, deaths and marriages.

9.1.1 Uses of Vital Statistics

The uses of vital statistics are as follows:

1. In recording birth, death, marriage and divorce of an individual during his or her life time.
2. To government agencies for administrative purposes. For example, disease control programmes and public health programmes of the government can be effectively planned and implemented through the help of death registration records.
3. They are indispensable in demographic research. The demographers are interested in the measurement of population, population growth, and distribution of the population by industry, occupation, area, and so on.
4. They are very useful in medical research. Medical officials make use of the mortality and natality statistics.
5. They are of great use in planning and evaluation of economic and social development of a country. Public Administrators make use of vital statistics in this respect.
6. Vital statistics are also of great use at the international point of view.

Thus it is observed that vital statistics are widely used in all spheres of human activity. But, they are not ends in themselves but only the means to the study of other related phenomena.

9.1.2 Methods of Collecting Vital Statistics

The following are the three methods followed in the collection of vital statistics:

1. Registration method
2. Census enumeration method
3. Analytical method.

1. Registration Method

Under this method, vital events such as births, marriages, deaths, etc., are continuously recorded. For birth, the information regarding the date of birth, name of parents, sex of the new-born baby, nationality, tribe, religion, etc., has to be reported to the authority concerned. For death, the information regarding the date of death, name of the deceased, his/her parents'/husband's or wife's name, address and cause of death has also to be reported to the authority concerned.

2. Census Enumeration Method

Here a complete and comprehensive profile of a country's population is recorded. A census is an enumeration of every individual carried out at a specific time. Census enumeration covers data regarding sex, age, marital status, educational status, occupational status, religion, etc. The above information is available for the census year only. Census data do not produce vital statistics for intercensal years. Moreover, the data obtained regarding births and deaths are not complete even for the census year. Therefore, this method is not suitable to provide data suitable for vital statistics.

3. Analytical Method

This is an algebraic method which makes use of available data without requiring any new survey. Under this method, estimates are based on the assumption that population grows at a constant ratio during the intercensal years. Population for any intercensal year can be estimated if accurate records of births, deaths and migration (immigration and emigration) are available. The population P_t at time t is obtained thus:

$$P_t = P_o + (B - D) + (I - E)$$

P_t = Estimated population at intercensal year t.

P_0 = Population in the previous census.

B = Total number of births during the given period

D = Total number of deaths during the given period

I = Total number of immigrants during the given period

E = Total number of emigrants during the given period

9.1.3 Rate

Rate is a proportion with a defined denomination termed as population. The numerator is the occurrence of an event which is counted in the same population we multiply by 100, 1000, 10000 etc. depending on the magnification desired. There is a difference between rate and proportion with respect to time. Rate involves the time factor which proportion deals with.

We have generally two types of rate namely crude and specific.

- a. Crude rates do not pay attention to any specific section of the population. It is a measure of the proportion of total events to total population over a period of time.
- b. Specific rates relate to specific group of the population such as for a particular age group, sex, marital status, occupation etc.

In-Text Question

True or False B. Benjamin defines it as “that branch of biometry which deals with data and laws of human mortality, morbidity and demography”.

In-Text Answer

False

B. Benjamin defines Vital statistics as “conventionally numerical records of marriages, births, sickness and deaths by which the health and growth of a community may be studied”. While **Arthur Newsholme** defines it as “that branch of biometry which deals with data and laws of human mortality, morbidity and demography”.

9.2 Calculation of Vital Statistics

Listed and defined below are the important measures of fertility and mortality in the calculation of vital statistics

Measures of Fertility

The important measures of fertility are:

1. Crude birth rate (CBR)
2. General fertility rate (GFR)
3. Specific fertility rate (SFR)
4. Total fertility rate (TFR)
5. Gross reproduction rate (GRR)
6. Net reproduction rate (NRR)

Measures of Mortality

The important measures of mortality are:

1. Crude death rate (CDR)
2. Specific death rate (SDR)
3. Standardized death rate (SDR)
4. Infant mortality rate (IMR)

9.2.1 Important Measures of Fertility

Fertility refers to the actual reproductive performance applied to an individual or a group. Fertility can be measured through birth rate. According to United Nations, “**Natural fertility is the fertility which exists in the absence of deliberate birth control whereas Controlled fertility is the fertility which involves a deliberate use of birth control**”.

1. Crude birth rate (CBR)

The CBR is the ratio of the total registered live births in a specified year in a particular area to the total mid-year population of this area, multiplied by 1000

$$\text{CBR} = \frac{\text{B}}{\text{P}} \times k$$

Where

CBR = Crude birth rate

B = Total registered live births in a year

P = Total mid-year population

k = 1000

For example, the crude birth rate for a sample area of Ibadan for 2010 may be calculated as follows:

Total number registered live births during 2010 = 598

P = Total mid-year population during 2010 = 4800

~ The crude birth rate during 2010 is thus:

$$\text{CBR} = \frac{\text{B}}{\text{P}} \times K$$
$$\text{CBR} = \frac{598}{4800} \times 1000$$
$$\text{CBR} = \frac{598000}{4800}$$
$$\text{CBR} = 124.58$$

The crude birth rate of 124.58 indicates that in the sample area of Ibadan city there had been approximately 125 live births per 1000 population in 2010.

2. General fertility rate (GFR)

The general fertility rate (GFR) is the ratio of total live births in some specified year in a particular area to the number of women in the child-rearing age multiplied by 1000. The general fertility rate is defined thus:

$$\text{GFR} = \frac{\text{B}}{\text{P}} \times K$$

$$P$$

Where

GFR = General fertility rate

B = Number of live births during a year

P = Number of women in the child-bearing age

K = 1000

For example, the general fertility rate in the sample area of Ibadan city during 2010 may be calculated as follows:

Number of live births during 2010 = 598

Number of women in the child-bearing age during 2010 = 1960

~ The general fertility rate during 2010 is thus:

$$GFR = \frac{B}{P} \times K$$

$$GFR = \frac{598}{1960} \times 1000$$

$$GFR = \frac{598000}{1960}$$

$$\sim GFR = 305.1$$

The general fertility rate of 305.10 indicates that in 2010, there were 305.10 live births per 1000 women in the child-bearing age in the sample area of the city.

3. Specific fertility rate

The specific fertility rate (SFR) is the ratio of the number of live births to women of a specified age group during a year to mid-year women population in the same age group, multiplied by 1000.

The specific fertility rate is defined thus:

$$SFR = \frac{\text{Number of live births to women during a year}}{\text{Mid-year women population in the same age group}} \times 1000$$

i.e. $SFR = \frac{B}{P} \times k$

Where P

B = Number of live births to women of a specified age group during a year

P = the mid-year women population in the same age group

K = 1000

For example, the specific fertility rate for women in the child-bearing age group in a village during 2008-09 may be calculated as follows:

Number of live births to women in the child-bearing age group in 2010 = 80

Number of women in the same age group during 2010 = 850

~ The specific fertility rate in 2010 is thus:

$$\text{SFR} = \frac{\text{B}}{\text{P}} \times \text{K}$$

$$\text{SFR} = \frac{80}{850} \times 1000$$

$$\text{SFR} = \frac{80000}{850}$$

$$\sim \text{SFR} = 94.12$$

4. Total fertility rate

The total fertility rate (TER) is the sum of the specific fertility rates of women belonging to different age groups.

The total fertility rate is defined thus:

$$\text{TRF} = \text{Sum of specific fertility rates} \times \text{Age class interval} \div 1000$$

$$\text{I.e. TER} = \text{ESFR} \times \text{C} \div 1000$$

For example, the total fertility rate for a sample area of Ibadan city in 2010 may be calculated as follows:

The sum of specific fertility rates = 2250

Age class interval = 5

By using the above formula, we get

$$\text{TFR} = 2250 \times 5 \div 1000$$

$$\text{TFR} = 11250 \div 1000$$

$$\sim \text{TFR} = 11.25$$

This implies that there have been 11.25 live births per 1000 population in year 2010 in the sampled area of the city.

Total fertility rate is particularly useful for comparisons between the reproductive performance of two groups of woman in two countries or in the same country. The total fertility rate per woman may be interpreted as the average number of children produced by a woman in her entire child-bearing span of life.

5. Gross reproduction rate (GRR)

Gross reproduction rate (GRR) simply refers to total number of female children a group of women is expected to have. Gross reproduction rate is calculated by using the following formula:

$$GRR = TFR \div \frac{\text{No. of female births}}{\text{Total number of births}}$$

For example, the gross reproduction rate will be calculated as follows:

$$\text{Total fertility rate} = 5.33$$

$$\text{Number of female births} = 7865$$

$$\text{Total number of births} = 13242$$

$$GRR = 5.33 \times \frac{7865}{13242}$$

$$GRR = 5.33 \times .59$$

$$\sim GRR = 3.166$$

6. Net reproduction rate

The net reproduction rate (NRR) is the average number of female children produced by women throughout their lifetime. The net reproduction rate measures the extent to which the female children, who continue to survive their maximum reproductive age, can reproduce children of the same sex.

The net reproduction rate is obtained by multiplying the female specific fertility rates of each age by the production of female survivors to that age in a life table and sum up the products.

The following formula is used to calculate net reproduction rate:

$$NRR = \frac{\sum \text{No. of female births} \times \text{survival rate}}{1000}$$

9.2.2 Measures of Mortality

According to United Nations, mortality is the percentages of death in the population. The World Health Organization (WHO) defined Death as “the permanent disappearance of all evidence of life at any time after birth has taken place, cessation of vital functions without capacity of resuscitation.”

This definition postulates that death can occur only after live birth. Therefore, mortality is closely associated with live birth. The following are the important measures of mortality.

1. Crude Death Rate (CDR)

The crude death rate is the number of death per 1000 population, this is simply put

$$\text{CDR} = \frac{\text{Deaths}}{\text{Population}} \times 1000$$

This gives an indication of the general mortality level.

In a given town, the total number of deaths in 2010 = 14,900

Total mid-year population (July1, 2010) = 3,345,000

$$\begin{aligned}\text{CDR} &= \frac{D}{P} \times k \\ \text{CDR} &= \frac{14,900}{3,345,000} \times 1000 \\ \sim \text{CDR} &= 4.45\end{aligned}$$

Thus the CDR for this town was 4.45. It means that 4.45 deaths occurred per 1000 population.

Advantages of Crude Death Rate

- a. It shows at a glance the level of mortality in an entire population.
- b. Its meaning is easily understood and it can be easily and quickly computed.
- c. Its calculation required minimum data.
- d. Its accuracy does not depend on the accuracy of age reporting or of correct cause of death.

Limitation of crude death rate

- a. It mixes together many population group whose mortality level varies widely.
- b. It is affected by the distribution of people of differing mortality.
- c. Because of (b) CDR is unsuitable for comparing mortality experience of two populations with markedly different structure in respect of factor such as age occupation over which mortality naturally varies.

2. Sex specific death rate

Male death rate = $\frac{\text{male death}}{\text{Mid-year population of males}} \times 100$

$$\text{Mid-year population of males} \times 100$$

Age Specific death rate

Death rate of women in reproduction age

$$= \frac{\text{female death in age group 15 – 49}}{\text{Female population of age group 15-49}} \times 100$$

Female population of age group 15-49

Mature mortality rate = $\frac{\text{Mature death}}{\text{Mature population}} \times 100$

Example: in a certain country having a population of 430 in 1978, 500,000 died of tuberculosis, 50,000 of small pox, 86,000 of tetanus, 300,000 of cancer and 610,000 of CAD. Calculate the cause specific mortality rate per 100,000?

3. Infant mortality rate

Infant mortality rate (IMR) is the number of deaths among the thousand born children before they reach their first birthday.

Infant mortality rate is defined thus:

$$\text{IMR} = \frac{D}{B} \times K$$

Where

IMR = Infant mortality rate

D = Number of deaths below age one during a year.

B = number of live births during the same year.

K = 1000

For example, the infant mortality rate for Wazobia local government are for 2010 was calculated as follows:

Total number of registered infant deaths = 3,207

Total number of registered live births = 62, 418

IMR for Wazobia LGA during 2010 = $\frac{3207}{62418} \times 1000$

IMR = 51.38

It shows that in 2010, the number of deaths of 51.38 infants per 1000 live born babies during the first year of their live in Wazobia LGA.

Life Table

A life table is a simple and clear way of expressing the conditions of mortality under which population of a particular geographical area lived in a certain year. A life table also reveals the expectation of life at age. It is essentially a more detailed expression of mortality rates.

The following are the uses of life table:

1. It presents a clear picture of mortality prevailing in a given population group.
2. It clearly depicts the distribution of people according to age and sex composition of population.
3. It helps to evaluate the impact of family planning on population growth.
4. It helps to assess the accuracy of census figures, death and birth registrations.
5. It helps life insurance companies to determine rates of premium for policies of persons of different ages.

Vital Index

Vital index is an index which takes into account two vital events, namely births and deaths. The vital index for a specified period and region is defined thus:

$$VI = \frac{B}{D}$$

Where

VI = Vital index

B = Total births

D = Total deaths

The vital index ranges between may be greater than 1 or less than 1 or equal to 1.

If $VI > 1$, an indication of an increase in population growth.

If $VI < 1$ an indication of a decrease in population growth.

If $VI = 1$ an indication of stagnation in population growth.

Exercise: Calculate general fertility rate, specific fertility rate and total fertility rate from the following data:

Age (years)	No. of women	No. of births
15 - 19	25	800
20 - 24	20	2400
25 - 29	18	2000
30 - 34	15	1500
35 - 39	12	500
40 - 44	6	120
45 - 49	4	10

Solution

$$GFR = \frac{\text{No. of live births in a year}}{\text{No. of women of child-bearing ages}} \times 1000$$

$$\text{GFR} = \frac{\text{No. of births to women of a specified age}}{\text{No. of women in the same age group}} \times 1000$$

$$\text{TRF} = \text{Sum of specific fertility rates} \times \text{Age class interval}/1000$$

Age (years)	<u>No. of women</u> P	<u>No. of births</u> B	<u>Specific fertility</u> rate B/P
15 - 19	25	800	32.00
20 - 24	20	2400	120.00
25 - 29	18	2000	111.11
30 - 34	15	1500	100.00
35 - 39	12	500	41.67
40 - 44	6	120	20.00
45 - 49	4	10	2.50
	100	7330	427.28

$$\text{GFR} = \frac{7330}{100} \times 1000 = 73300 = 73.3 \text{ per thousand}$$

$$\text{SFR} = 427.28 \times 1000 = 0.42728 \text{ per thousand}$$

$$\text{TFR} = 427.28 \times 5 \setminus 1000$$

$$\text{TFR} = 2136.4 / 1000$$

$$\text{TFR} = 2.1364 \text{ per thousand}$$

Summary of Study Session 9

In this study session, you have learned that:

1. **B. Benjamin** defines Vital statistics as conventionally numerical records of marriages, births, sickness and deaths by which the health and growth of a community may be studied.
2. **Arthur Newsholme** defines it as that branch of biometry which deals with data and laws of human mortality, morbidity and demography
3. A vital statistics system is defined as the total process of collecting information by civil registration or enumeration on the frequency of occurrence of specified and defined vital events, as well as relevant characteristics of the events themselves and of the person or persons concerned.

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

1. Explain the uses of vital statistics

Study Session 10: Standardized Rates

Introduction

Standardization refers to procedures for facilitating the comparison of summary measures across the board. Standardization is done through a procedure called adjustment. These adjusted rates are statistically contrasted summary rates that account for the difference between populations with respect to other relevant variables.

Learning Outcomes for Study Session 10

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

- 10.1 Define standardized rates and explain reasons for standardization
- 10.2 Compute death rates by direct and indirect methods of standardization

10.1 Standardized Rates

Standardization refers to the procedure for facilitating the comparison of summary measures across the board. It refers to the method of adjustment based on weighted averages in which the weights are chosen to provide an “appropriate” basis for the comparison (i.e. a standard).

Such comparisons are often complicated by differences between the groups and factors that influence the measures of interest but which are not the focus of attention. This adjustment attempts to remove the effects of such “extraneous” factors that might prevent a ‘fair’ comparison.

“Adjustment”, the more general term, encompasses both standardization and other procedures for removing the effects of factors that *distort or confound* a comparison.

10.1.1 Need for Standardization

Standardization seeks:

- i. The removal of the confounding effect of different age structures to yield a single standardized or adjusted rate by which the mortality experience can be compared directly and
- ii. To enable the comparison of the experience of a group with another using single value while reflecting its composition in terms of important factors.
- iii. to provide numbers and comparisons that minimizes the influence of age and/or other extraneous factors.

10.1.2 Limitations for Standardization

1. The selection of a standard is arbitrary. Different results may be obtained if a different standard is adopted.
2. At times, it distorts the facts and sometimes leads to unimportant result or conclusion.
3. At times the choice of standards looks vague when data re-presented.
4. To provide numbers and comparisons that minimizes the influence of age and/or other extraneous factors.
5. The adjustment can be made for age, sex, race, etc. thus, we can generate age, sex, and race-adjusted rates. The principle of standardization is to determine the effect due to the difference in population structure.

10.2 Standardization of Death Rates

Standardized death rates are rates in which allowance has been made for the composition of the population. They are used to compare the mortality experience of two or more populations of different compositions. Standardized death rates may be computed by

1. Direct method
2. Indirect method

10.2.1 The Direct Method

The two populations are assumed to have the same structure as an arbitrary chosen standard population and the observed age specific death rate (ASDR). Each population is applied in turn to the population. The following steps/procedures can be adopted.

- a. Select a standard population structure
- b. Apply the ASDR in each age group of population say to the corresponding standard population to obtain the expected deaths in each group of the standard population.
- c. Add up all the expected deaths
- d. Divide the total number of expected deaths by the total standard population and multiply by K to get the standard death rate (SDR) for the population.

Example: consider the following data for two towns A and B

Age Group	Population A	Death Rate	Population B	Death Rate	Standard Population	Per Death
0 – 4	9222	27.11	6473	24.10	1569.5	26.00
5 – 14	19576	2.25	13740	1.97	33316	2.01
15 – 49	39056	3.00	22458	2.89	61514	2.94
50 – 59	4156	12.03	6164	11.52	10390	11.63
60 – 69	2588	29.76	4165	32.17	6853	30.06
70 – 79	1489	76.56	2795	55.10	4284	60.00
80+	334	137.72	972	110.08	1306	123.28

Standard population and expected deaths: direct method of standard

Age group (years)	Standard Population	Town A		Town B	
		Death rate Per' 000	Expected Deaths	Death Per' 000	Expected deaths
0 – 4	1569.5	27.11	425	24.10	378
5 – 14	33316	2.25	75	1.97	66
15 – 49	61514	3.00	185	2.89	178
50 – 59	10390	12.03	124	11.52	119
60 – 69	6853	29.76	204	32.17	220
70 – 79	4284	76.56	328	55.10	236
80+	1306	137.72	180	110.08	144
	133288		1521		1341

Calculation of the standardized death rate (SDR)

$$\text{SDR} = \frac{\text{total number of expected death}}{\text{Standard population}} \times 100$$

$$\text{For town A it is SDR (A)} = \frac{1521}{133288} \times \frac{1000}{1} = 11.41$$

$$\text{For town B it is SDR (B)} = \frac{1341}{133288} \times \frac{1000}{1} = 10.06$$

Comments

This result shows us that although the crude death rate is higher in town B than in Town A, the standardized death rate for Town B is lower than that for Town A. A careful study of the age compositions of these two towns will show that the proportion of the elderly population in Town B is higher than that in Town A, this being the reason for the higher crude death rate, when we standardized the populations of the two towns by age, we compared the two towns on the basis of similar age compositions and the effects of age on the crude death rates were, therefore, cancelled.

It may be concluded that the mortality risks in the population of Town A are higher than those in Town B. In other words, from the mortality conditions, it may be inferred that people of Town A have poorer health than those of Town B.

10.2.2 Indirect Standardization

This involves applying a standard set of rates to different populations by age, that is,

- Given the set of standard age specific death rates of a standard population.
- The population by age of two areas A, B.
- Crude death rate of standard population
- Total number of deaths in areas A and B.

Procedure

- a. Multiply the standard ASDR, by the population in areas A by age, this gives the expected deaths for population A.
- b. Get the total expected deaths if the area A experienced the standard ASDRs.

$$\frac{\text{Actual deaths in A}}{\text{Expected deaths in A}} \times \text{CDR of standard population}$$

- c. Then standardized rates =

- d. Repeat the procedure for popular B

Remarks

We have different result per different standard values

See the example below:

Also note that:

- a. Indirect method produces rates with lower standard errors and that
- b. The adjusted rates are fictitious, they occur under specified or certain assumptions.

Examples of indirect method of standardization

The death rates of Town C are taken as the standard death rates to be applied to the populations of Town A and Town B. Standard death rates and expected deaths are indirect method.

Age group (years)	Standard Death rates	Town A		Town B	
		Population	Expected Deaths	Population	Expected deaths
0 – 4	0.0260	9222	240	6473	168
5 – 14	0.0020	19576	39	13740	28
15 – 49	0.0029	39056	115	22458	66
50 – 59	0.0116	4156	48	6164	72
60 – 69	0.0301	2588	81	4165	125
70 – 79	0.0600	1489	89	2795	168
80+	0.1233	334	41	972	120
		76521	653	56.767	747

- a. Obtain the expected deaths by multiplying the standard death rate by population of each age group in each town, separately. The results are shown above in the table.
- b. Calculate the index death rate by dividing the total expected number of deaths in each town by the total population of the same town separately

$$\text{Index death rate} = \frac{\text{Total number of expected deaths} \times 1000}{\text{population}}$$

$$\text{For Town A} = \frac{653}{76521} \times 1000 = 8.53$$

$$\text{For Town B} = \frac{747}{56767} \times 1000 = 13.16$$

Divide the crude death rate of the standard population by the index death to obtain the standardizing factor.

$$\text{For Town A, the standardizing factor is } \frac{10.50}{8.53} = 1.231$$

$$\text{For Town B, the standardizing factor is } \frac{10.50}{13.16} = 0.798$$

Multiply the crude death rates of Town A & B by their standardizing factors to obtain the standardized death rates.

$$\text{For Town A, the standardized death rate is } 9.15 \times 1.231 = 11.276$$

$$\text{For Town B, the standardized death rate is } 12.58 \times 0.798 = 10.039.$$

Comments

The crude death rates of Towns A and B are 9.16 ;and 12.58 per 1000, respectively. The standardized death rates are 11.28 for Town A and 10.04 for Town B. The indirect method of standardization gave similar results to the direct method for the same towns and so the same inference and generalization.

Choice of the Standard Population

1. The choice of the standard population is not crucial because the ratio of the standard death rates (SDR) remain the same whenever standard population is selected.
2. In practice the standard population may be the population structure or an average of the two given population or addition of the two given populations.

Another Approach to Indirect Method of Standardization

- a. Select a set of standard ASDRS. Here again the choice is so crucial. It may be natural rates in a set calculated from combining the two populations.

For example

Age	Population size		Total	Deaths		Total	asdr
	A	B	A+B	A	B	A+B	
0 –	Pa ₁	Pb ₁	Pa ₁ + Pb ₁	Da ₁	Db ₁	Da ₁ + db ₁	$\frac{Da_1 + db}{Pa_1 + Pa}$
15 -	Pa ₂	Pb ₂	Pa ₂ + Pb ₂	Da ₂	Db ₂	Da ₂ + db ₂	$\frac{Da_1 + db}{Pa_1 + Pa}$

- b. Apply the standard rates to each of the population to get the expected deaths in each age group.
- c. Add up all the expected deaths
- d. Calculate the standardized mortality ratio (SMR) by the formula

$$\text{SMR} = \frac{\text{Actual death in study population}}{\text{expected death in study population}}$$

e. $SDR = SMR \times CDR$ of standard population.

Thus we also need to know the CDR of the standard population.

Example

Consider the mortality experience of two populations A and B.

Age Group	Population	A Death	ASDR per 100	Population	B deaths	ASDR per 100
0	500	2	4	400	1	2.5
25	2000	8	4	300	1	3.3
32	2000	12	6	1000	5	5.
45	1000	10	10	2000	18	0
50	500	20	40	2000	70	35
75+	100	15	150	400	50	125
TOTAL	6100	67	11.0	6100	145	23.8-cdr

Age Group	Population	A Death	ASDR per 100	Population	B deaths	ASDR per 100
0-	450	4				
15-	1150	4				
30-	1500	6				
45-	1250	10				
60-	250	40				
150075+		150				
TOTAL	6100					

For direct method

$$SDR_A = \frac{\text{Total Expected Death}}{\text{Total standard pop}} \times K = \frac{117.9}{6100} \times 1000 = 19.3$$

$$SDR_B = 16.5$$

For indirect method

Age	Ratio	Standard ASDR	Expected Death	Actual Death
0	500	3.33	1.6	2
15	2000	3.91	7.82	8
30	2000	3.67	7.34	12
45	1000	9.33	9.33	10
60	500	36.0	18.00	20
75	100	130.0	13.00	15
Total			61.16	67

$$SMRA = \frac{67}{61.16} = 1.10$$

$$SDRA = CDR \times SMRA = 17.39 \times 1.10 = 19.04$$

$$SMRA = 16.71$$

$$\text{Crude death rate} = \frac{212}{12200} \times 1000 = 17.38$$

Comment: The results show that mortality risks in the population is higher than that of Town B. It shows that people in Town A have poor health condition than those in Town B.

In-Text Question

How can Standardized death rates be computed

In-Text Answer

Standardized death rates be computed by

1. Direct method
2. Indirect method

10.2.3 Direct Versus Indirect Methods

- a. The direct method requires that age specific death rate of the population to be compared be known. If data are not available to that detailed extent, the indirect method has to be used.

- b. The indirect method relied more on the standard population (its ASDR and CDR) than choosing the direct method. Thus if the choice of the standard population is going to matter at all, than its effect is likely to be more felt with the indirect method.
- c. On theoretical grounds, the standard error of the indirect method is usually less than that for the direct.

Summary of Study session 10

In this study session, you have learned that:

1. Standardization refers to the procedure for facilitating the comparison of summary measures across the board. It refers to the method of adjustment based on weighted averages in which the weights are chosen to provide an “appropriate” basis for the comparison (i.e. a standard).
2. Adjustment”, the more general term, encompasses both standardization and other procedures for removing the effects of factors that distort or confound a comparison
3. Standardization seeks The removal of the confounding effect of different age structures to yield a single standardized or adjusted rate by which the mortality experience can be compared directly and
4. Standardized death rates may be computed by Direct method and Indirect method
5. Indirect Standardization involves applying a standard set of rates to different populations by age

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

1. Explain the limitations for Standardization

Study Session 11 Population Statistics

Introduction

In study session five, reference was made to population statistics and other sources of socio-economic data. This Study Session will focus on population statistics. The study of population generally requires accurate and extensive statistics and it is obvious no country can do without a serious statistical study of its population.

Learning Outcomes for Study Session 11

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

- 11.1 Explain of population statistics
- 11.2 Describe sources of population data

11.1 Population statistics

Population statistics is the use of statistics to analyse characteristics or changes to a population. It is related to social demography and demography.

Population statistics can analyse anything from global demographic changes to local small scale changes. For example, an analysis of global change shows that population growth has slowed, infant mortality rates have declined and there have been small increases in the aged.

11.2 Sources of Population Data

There are various sources of population data both national and international. These are

1. Population Census
2. Vital Registration System
3. Sample Survey
4. Population Registers
5. Non-Traditional Sources
6. International Sources

In-Text Question

What is Population statistics?

In-Text Answer

Population statistics is the use of statistics to analyse characteristics or changes to a population. It is related to social demography and demography

11.2.1 Population Census

This is defined as ‘the total process of collecting, compiling and publishing demographic, economic, and social data pertaining at a specified time or times to all person in a country or delineated territory’ (United Nations). It is the main source of demographic statistics in most countries of the world. It helps to locate changes in characteristics of the population that may trigger off a readjustment of national development plans.

Uses: Major uses of population data are planning, administration, economic and social research. For Educational and Manpower Planning: we require information on school age population by sex, the number of teachers available and that may be needed, the student/teacher ratio and the student/classroom ratios.

Projecting enrolment and planning for the educational system as well as the nation’s manpower requirements demand relevant information from population statistics. For Agricultural planning, it is important to obtain information from population and agricultural census so as to know how many people work in agriculture, age-sex distribution, their dependants as well as income per head of agricultural workers.

For Housing planning, population data serve to generate information on rate of household formation and dissolution, migration and population redistribution. For health planning, number of professional like doctors, nurses and other health workers are needed, number and location of hospitals and hospital beds.

Population data are therefore essential for projecting future population sizes and distribution, and make adequate plans, for measuring levels and trends in standard of living, for allocation of resources and investigating relationship between demographic and socioeconomic processes.

Limitations: Some of the limitations are well pronounced. They are very expensive, time consuming, can have problems of data content, geographical coverage and manpower. There is also the problem of memory recall by respondents and error of recording. Other limitations include slow processing, tabulation and publication of census results.

11.2.2 Vital Registration System

This is made up of registration of births, death, marriages etc.

Uses: These have various uses as listed below

- a. It is used for individual documentation records of vital events which are of paramount use to individuals. The basic registration document or a certified copy thereof has legal significance for the person concerned, which is equaled by a few of the other documents a man may acquire in his lifetime.
- b. For legal and civil purposes: the records of vital statistics are useful to government agencies for a variety of administrative purpose.
- c. For planning: to study pattern of changes in the population public health programmes of post-natal care for the mother and child. These usually have their starting point at the birth register and the corresponding birth indexes, public safety, accident prevention, and crime eradication programme. All these are used in planning health care delivery.
- d. It is used to study the pattern of change in fertility, mortality.
- e. It is used to check on census data and estimation of population total.
- f. It is used in research.

Vital statistics are indispensable in demographic research. The study of changes in population and of the inter-relationships of demographic with economic and social factors is of fundamental importance to society.

International Use of Vital Statistics

Vital statistics are useful from the international view point. The required norms could only be established by a sufficiently wide survey of human facts. It should be noted that vital statistics, like all other statistics and multiple vital records, are not ends in themselves but tools for the study and understanding of other phenomena.

1. **Statistical uses:** Vital statistics provides data on measures of fertility and mortality. To study trends and pattern of fecundity and mortality. Sex ratio at birth is useful in population projection. In populous countries. It is used for formulating control program and evaluating effectiveness of such programmes.
2. **Medical uses:** It serves as denominator for most of the epidemiological uses. It is used to forecast the future cause of age specific mortality. It is also being used for planning health/medical intervention programmes.

Limitations: Registration is a major limitation as some people may not record deaths and the number of births may be under reported. Some may prefer to record a male birth and play down on female births, late reporting of events, problems of data quality, are some factors which can complicate the analysis of measures of fertility and mortality.

Other limitations include: Lack of uniformity in definitions of events and criteria for reporting, incomplete data/not uniform/inaccurate, lack of accuracy, particularly with respect to age at, and cause of death, cultural problem, lack of motivation among the public to register events, ignorance, registration system may not be available or lack of registration centres.

11.2.3 Sample Survey

This source seeks to elicit information from a proportion of the population so as to be able to estimate the size, distribution, migration, fertility and mortality in the population.

Uses: Sample surveys are employed in the estimation of total population and its geographic distribution, cross-checking the accuracy of the census through post-census enumeration survey,

estimation of the components of population change such as fertility, mortality and migration, and estimation of number of demographic characteristics of the existing population.

Limitations: We have limitations due to coverage and distribution of population, sampling procedure and conceptual problems. There are also possible errors which may include observational error, non-response errors, errors in estimate construction, interpretation and publication errors, poor organization and control.

11.2.4 Population Registers

This register is mostly available in developed countries. It contains details of sex, marital status, date of birth etc.

Uses: These are useful administratively for identification of persons, indication of each person's status, control of electoral rolls etc. Statistically, it can be used to generate size and characteristics of the population, population changes, migration statistics (both internal and external), educational statistics, income distribution and so on.

11.2.5 Non-Traditional Sources

Registers of marriages, baptisms, births and burial in parishes and other administrative data belong to this source.

All the sources listed above are referred to as national sources as they exist within the country.

Uses: It is useful for getting information on the size and distribution of the population by age, sex, professional and occupational groups. It can also be used to verify or match data obtained from a survey with records of schools register or baptism; furthermore, it is useful for the provision of historical view of demographic phenomena over time. Moreover, they can be more accurate than statistical returns, complete than the sample without imposing additional burden on the public.

Limitations: The record may not be in the form that is generally acceptable, there may be missing information or selective recording.

11.2.6 International Sources

The major reference here is to the United Nation's publication *Demographic Yearbook*. This book was first published in 1984 and has since been on the shelf on regular basis. This book publishes comparable and comprehensive annual statistics on population with characteristics such as size, fertility, mortality, urbanization, migration etc. Information in the year book are obtained from national statistical offices of the various countries and/or their publications.

Uses: This is useful for international comparisons and research investigations.

Limitations: The international body relies more on the information provided by the national coordinating body, the best it does is to conduct independent survey and that is also in collaboration with local agencies.

Summary of Study Session 11

In this study session, you have learned that:

1. Population statistics is the use of statistics to analyse characteristics or changes to a population. It is related to social demography and demography.
2. Population statistics can analyse anything from global demographic changes to local small scale changes.
3. There are various sources of population data both national and international. These are
 - a. Population Census
 - b. Vital Registration System
 - c. Sample Survey
 - d. Population Registers
 - e. Non-Traditional Sources
 - f. International Sources
4. Population Census is defined as 'the total process of collecting, compiling and publishing demographic, economic, and social data pertaining at a specified time or times to all person in a country or delineated territory' (United Nations)
5. Vital Registration System is made up of registration of births, death, marriages etc.

6. Vital statistics are useful from the international view point.
7. Sample Survey are source seeks to elicit information from a proportion of the population so as to be able to estimate the size, distribution, migration, fertility and mortality in the population.
8. Population Registers is register is mostly available in developed countries. It contains details of sex, marital status, date of birth etc.

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

1. What is Population statistics?
2. State the sources of Population Data

Study Session 12 Educational Statistics

Introduction

For any country to compete favourably in the present world market, it is imperative that its educational system be well planned and administered. However, there cannot be any meaningful educational planning and administration without accurate, reliable, timely and quality educational statistics.

The purpose of the Education Statistics is to provide basic statistical information on education. The statistical information includes data on schools, enrolment, teachers, educational outcomes and finances.

In this study session, you will be introduced to the various source of education data and the uses of the educational data

Learning Outcomes for Study Session 12

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

- 12.1 Identify various sources of educational data;
- 12.2 Explain uses of educational data and

12.1 Educational Statistics

Education statistics in Nigeria came from variety of sources. The main sources of educational statistics are records of:

1. Schools-primary, secondary and tertiary institutions
2. **National Universities Commission (NUC):** this is the coordinating body of the universities in Nigeria. The NUC requests for routine data from all the universities – private, state and federal and publishes data on them reflecting enrolments by sex, level and state of origin as well as graduations by sex and class of degrees.

3. Other statistics include that of staff – academic, non-teaching by gender, grade and so on. It also collects information on universities income and expenditure, equipment, bed spaces, classrooms and so on.
4. **Federal State Ministries of Education:** there are departments within the state and federal ministry of education that collects, compile and publish educational statistics.
5. Individual institutions where we can obtain the age and sex distribution of students, number of teachers and other staff and their qualification, age and sex, number of classrooms to obtain student/teacher ratio and student/classroom ratios.
6. **Education boards:** there are special education boards and bodies like the Joint Admission and Matriculation Board JAMB, State Primary Education Board SPEB now SUBED, Nigerian Board for Technical Education which caters for technical education, NCE and Polytechnics, etc. all these bodies have various forms of collecting statistical data within their jurisdiction of operations.
7. **Local governments** – the local governments are expected to have information on primary schools as this is under their jurisdiction. Moreover, each local government is empowered to conduct school census in the local government
8. **The National Bureau of Statistics (NBS):** this agency conducts census and surveys and collects and publishes educational data periodically.
9. **International sources:** the UNESCO publishes educational statistics that are often used for international comparisons.

12.2 Uses of Educational Statistics

Broadly speaking educational statistics lends itself to the following:

1. **For administration purpose:** education is a large scale operation and normally accounts for a lion share of annual government budget, detailed statistics are therefore required. Also, ministries of education and their boards or commissions are responsible for generating

information on number of enrolments, number of teachers, other personnel, equipment, buildings and finance.

2. **For evaluation of the system:** educational data serve to provide a clear statistical picture of the operations of the system. Some of the questions that educational statistics seek to answer are: how large is the system? what type of education is the system providing?, what is the growth rate, available equipment, student/teachers ratio?

And so on. Available statistics helps to generate indicators for monitoring and evaluating the growth and performance of the system. These indices help to justify or otherwise, the budgeting, the expenditure and make future projections in terms of enrolment, employment, expenditures, and future development.

In summary, educational statistics are used as listed below:

1. It provides an overall picture of the extend and working of the educational system
2. To evaluate the performance of the educational system
3. For planning and projections into the future of enrolment, teachers supply, classrooms library and other equipment's
4. For planning the manpower requirement for the country
5. To make provision for the physically challenged and educationally handicapped
6. To expand access especially in higher education
7. For international comparison

Limitations: Like other system, educational statistics has its limitations. There is the problem of index for international comparisons. There are conceptual definitions that vary from country to country e.g. number of years spent in primary schools. If for example Nigerian pupils spend six year in school and those of Ghana spend seven years the primary school enrolment ratio may not be statistically comparable.

There are delays in the publications of these statistics such that some are no longer needed as at the time of publication. There is the problem of secrecy especially when it comes to financial aspect of educational statistics.

Summary of Study Session 12

In this study session, you have learned that:

1. The purpose of the Education Statistics is to provide basic statistical information on education. The statistical information includes data on schools, enrolment, teachers, educational outcomes and finances.
2. The need for educational planning and the importance of educational statistics to the planning and implementation of educational policies
3. National Universities Commission (NUC) is the coordinating body of the universities in Nigeria.
4. Education boards are special education boards and bodies like the Joint Admission and Matriculation Board JAMB, State Primary Education Board SPEB now SUBED, Nigerian Board for Technical Education which caters for technical education, NCE and Polytechnics, etc.
5. The local governments are expected to have information on primary schools as this is under their jurisdiction
6. The National Bureau of Statistics (NBS) conducts census and surveys and collects and publishes educational data periodically
7. The UNESCO publishes educational statistics that are often used for international comparisons.

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

1. Identify various sources of educational data
2. Explain uses of educational data and

Study Session 13 Health Statistics

Introduction

The collection of meaningful statistics is an important function of a hospital or clinic. Health records are the primary source of data used in compiling health care statistics. The medical record department staff, therefore, may be responsible for the collection, analysis, interpretation and presentation of statistical data wherever possible. Today, computerized systems automatically collect and calculate many of the statistics that were once previously done manually.

Learning Outcomes for Study Session 13

At the end of this Study Session, you should be able to:

- 13.1 Explain the nature of health statistics
- 13.2 Identify various sources and characteristics of health statistics

13.1 Health Statistics

Health statistics serve as the basis upon which government can plan and health managers can assess health trends and situations as well as monitor the progress of various health/health-related interventions.

Statistics are only as accurate as the original sources from which they are taken. The health information management/health record professional should see that medical records and other source documents are complete and readily available to meet the requirements for the production of useful statistics.

Health Statistics includes information on the following:

- a. Generally morbidity survey
- b. Nutritional status

- c. Distribution of various level of some quantitative attribute e.g. blood pressures, weight and cholesterol level.
- d. Medical records e.g. hospital in-patient enquiry.
- e. Clinical and drug trials.
- f. Aetiological studies – investigation of factors influencing health. Emphasis is in comparison of different groups.
- g. Studies on the administration of health services. There are needs for availability, utilization, deficiencies, cost, and manpower requirement.
- h. Evaluation of health progress-prophylactic measures e.g. measles, immunization, malaria education programme, health education programme.

13.1.1 Some Available Hospital Statistics

1. In-patient data – these are data from patients who are staying in the hospitals. The information here are more detailed and accurate. These include patients name, sex, date of birth, place of origin, residence, occupation, religion, marital condition, date of admission, causes of admission, type of care and date of disposal (discharge or death).
2. Out-patient data from patients who came to the hospital by appointments. This can be in the form of:
 - a. General outpatient (G.O.P.D) data on name, sex, date of birth, residence, and complaint is not generally recorded.
 - b. Regular specialist clinic – all the socio demographic data for in-patients complaints i.e. symptoms
 - c. Emergency and casualty cases e.g. accidents.

13.1.2 Uses of Health Statistics

Health statistics is essential for:

- a. Planning and budgeting health care delivery.
- b. Making judicious decisions in health care delivery when available evidence is properly assessed for decision-making.
- c. Monitoring and evaluation of health policies.

- d. Interpretation of vital statistics such as births, deaths, mortality, and morbidity rates etc.
- e. Planning, conducting, analysing, interpreting and reporting of medical research.
- f. Evaluating medical literature e.g. study design-descriptive, case reporting, preventive study.
- g. Awareness of possible risks associated with medical decisions.
- h. Handling of variation.
- i. Diagnosis of patients' ailments and community health problems.
- j. Prediction of likely outcome of an intervention programme in a community or of treatment of individual patients.
- k. Selection of appropriate intervention for a patient or a community.
- l. Public health, health administration and planning.

Limitations

- a. It might not meet some specific needs because they are often incomplete.
- b. It is insufficient and might not be suitable.
- c. Unsuitable format of records.
- d. Variation in diagnostic criteria.
- e. Absence of record of the attributes of individuals.
- f. Inconsistency in data presentation.
- g. Problems of international comparisons.

13.2 Sources of Health Data

There are two main sources of health data: regular or routine systems and ad-hoc systems.

Regular or routine data collection systems

This usually consists of established procedures for collecting data as they become available.

Data from this source include:

- a. Hospital registration procedure e.g. birth, deaths etc.
- b. A national vital statistics registration system of births, deaths, marriages and divorces.
- c. A disease notification system to collect information under international health regulations on cholera plague and yellow fever.
- d. A reporting system for cancer cases (cancer registry) and aids.

- e. Registration systems in health care facilities, to collect information on patients attending various clinics (in-patient and out-patient).
- f. Census
- g. Institutional data

An advantage of this source is the availability of health data. A major difficulty is that such a system may not exist. Even where it exists, there may be deficiencies. The records may be uniform, or they may be unreliable because they are incomplete or inaccurate.

Examples:

- a. A national survey of health personnel i.e. professional survey.
- b. A survey to estimate the proportion of children with malnutrition in a defined population.
- c. A study to investigate whether the use of hormonal contraceptive affects nutritional status of the users.
- d. An investigation of breast feeding practices among women who registered a birth in the previous year.
- e. Hospital – in – patient enquiry, social survey, epidemiological survey, demographic and other health survey.

Other sources of data for health statistics include:

1. Individual persons by examination.
2. Medical records for retrospective studies.
3. Individual persons by interview.

Summary of Study Session 13

In this study session, you have learnt that:

1. The concern for the health of the citizen and the need for adequate health plans and interventions
2. The necessity for health statistics as a vehicle for scientific health care planning

3. Health statistics serve as the basis upon which government can plan and health managers can assess health trends and situations as well as monitor the progress of various health/health-related interventions.
4. Health statistics is essential for:
 - Planning and budgeting health care delivery.
 - Making judicious decisions in health care delivery when available evidence is properly assessed for decision-making.
 - Monitoring and evaluation of health policies.
5. There are two main sources of health data: regular or routine systems and ad-hoc systems

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

1. State Ten 5 uses of Health Statistics
2. Describe the Limitations of Health statistics

Study Session 14 Agricultural Statistics

Introduction

Nigerian agriculture is characterised by considerable regional and crop diversity. Analysis of this sector, particularly the food sub-sector, is fraught with serious data problems. However, the available statistics provide a broad overview of development in agriculture upon which we can make some broad generalisations about its role in economic development and structural change in Nigeria.

In this study session, you will be introduced to agricultural statistics

Learning Outcomes for Study Session 14

At the end of this Study Session, you should be able to:

- 14.1 explain nature of agricultural data
- 14.2 identify various sources and problems of agricultural statistics
- 14.3 Explain the uses of agricultural statistics.
- 14.4 Explain the limitations of agricultural data

14.1 Nature of Agricultural Data

Agriculture is of vital economic importance to Nigeria. It is a sector of economic activity which provides the community with some of its most basic needs. Next to oil, it also makes the greatest contributions to the national output and income.

Agricultural statistics involve sets of data collected and processed for the purpose of planning agricultural activities and implementation of such plans. Agricultural data can both be primary and secondary. They are essential to provide adequate insight into the performance of agricultural production and marketing of a given system.

Availability of such data at regular intervals provide a sound basis for long and short term planning in rural development at national, regional and local levels. Such data must be reliable and accurate and useful for economic analysis to meet specified objectives.

For example, a farmer needs data on root crop variety in order to cultivate/plant the most profitable crop on a particular plot. He needs information on varieties, and types of land, the weather, pest or disease the crop is prone to.

Agricultural activities can be segregated into four main areas namely crop production, livestock farming, fishing and forestry. Some of the data that can be generated are listed as follow:

1. Acreage of tree/food crop acquired
2. Data on the \tree crop: number planted (mature/immature), number harvested, type of tree crop e.g. cocoa, oil palm, rubber etc. The yield, sales and price. The same set of data can be collected on food crop
3. Livestock: location, number of chicks, layers, broilers, rabbit, cattle, eggs, sheep and so on
4. Forestry: Forest reserve/games, parks, tree by type, timber, production and sales
5. Fisheries: reserve/industry, species production e.g. catfish, salmon etc., sales and prices
6. Veterinary services: personnel, treatments, quarantine, animal diseases reported, animal mortality
7. General: supply of fertilizer and other materials to farmers, loans to farmers, agricultural equipment
8. Farm input: labour use, land use, implements and other input owned or hired
9. Farm output: crops, livestock

14.2 Sources of Agricultural Statistics

The main source of agricultural information in the various units engaged in agricultural activities such as extension officers of the ministry of agriculture (states and federal) and the department of planning research and statistics of the ministry. These offices and officers compile information on regular basis for most of their internal use and repository.

Other sources include agricultural establishment boards who compile and maintain their data in form of reports; research institutions like IITA, NIFOR, CRIN, NIHORT etc.

A more comprehensive and up to date source of agricultural data is the rural economic survey called Agricultural Sample Survey, Agricultural Census. This is an annual sample/census on agriculture being carried out by the National Bureau of Statistics.

For international comparison, data on world agriculture can be collected from the Food and Agricultural Organisation (FAO)

In-Text Question

What is Agricultural statistics?

In-Text Answer

Agricultural statistics involve sets of data collected and processed for the purpose of planning agricultural activities and implementation of such plans.

14.3 Uses of Agricultural Data

Agricultural statistics are useful for planning, monitoring and evaluation purposes as well as research and development. Various uses of agricultural data include:

1. Planning and plan implementation
2. Feasibility studies
3. Estimating cost and benefit of farm enterprises
4. Estimating capital investment needs
5. Determining insurance coverage needs
6. Forecasting future outputs, price trends and possible droughts
7. Estimating input needs and time of need
8. Working out government support and subsidy programmes
9. Planning strategic reserves for grains and other commodities
10. Estimating seasonal variation in labour needs and availability
11. Investigating productivity changes and the impact of technological innovations
12. Planning export of agricultural commodities and input procurement

13. Comparing agricultural productivity and costs of operation at the inter-farm, intra-farm, interstate, intrastate, inter-intra-regional and international levels
14. Establishing land use pattern over time/planning self-sufficiency in agricultural products.

14.4 Limitations of Agricultural Data

Limitations of agricultural data include:

1. Farmers, traders and many organisations who have anything to do with agriculture have no documented records of their activities. Information are only recalled and this is subject to memory recall failure leading to either understatement or overstatement.
2. Some respondents are reluctant to give information as they may view the investigator with suspect. Some will not reveal the records thinking government may use it to impose tax on them
3. Problems of definition may crop up, for example an acre may have different dimension to the rural farmer as against the standard definition
4. Other problems include that of timeliness, coverage and comparability.

Summary of Study Session 14

In this study session, you have learned that:

1. Agriculture is of vital economic importance to Nigeria. It is a sector of economic activity which provides the community with some of its most basic needs. Next to oil, it also makes the greatest contributions to the national output and income.
2. Agricultural statistics involve sets of data collected and processed for the purpose of planning agricultural activities and implementation of such plans. Agricultural data can both be primary and secondary.
3. Problems militating against accurate and reliable agricultural data

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

1. What is Agricultural statistics?
2. Explain uses of Agricultural Data

Notes on Study Session 1

- 1 A National Statistical System can be described as a coordinated system of all legally supported agencies involved in developing and producing statistical information necessary to facilitate the fulfilment of a nation's objectives and goals.

- 2 There are two broad types of namely: centralised and decentralised.
A centralised national statistical system is one where the whole process of data production and dissemination to the governments and other users of statistics is carried out by an organ of the government. The central agency is in charge of the entire survey infrastructure, with responsibility for some integrating functions. It also controls all the statistical activities of the nation.
The decentralised system gives other agencies legal authority and control over their resources for collecting needed data. It employs a division of responsibility between the various data collection agencies at different tiers of government and the different agencies are free to collect data to satisfy their respective needs.

Notes on Study Session 2

1. The purpose of coordination is to allow the component of a statistical system to act as a coherent system. It is necessary for obtaining an integrated system; achieve efficiency and uniformity in methods and results.
2. Functions of Coordinating Agencies includes:
 - To examine the statistical programmes of the various agencies annually in order to achieve greater coordination and avoid unnecessary duplication of efforts and evolve a national statistical programme for the approval of the NBS board.
 - To examine the Statistics Act and recommend to the board any necessary changes as the need arises.
 - To develop strategies which shall ensure uniform standard and methodologies amongst the various agencies with a view to improving on the quality comparability and timeliness of their statistics output.

Notes on Study Session 3

1. Social statistics refers to data generated on the condition and quality of life of the people. Statistical information on household, education, health, public safety and population are examples of social statistics.
2. List source of Statistics Published in Nigeria are:
 - A. Statistical Abstracts, bulletins and reports issued by government ministries, departments and agencies (MDAs) such as Ministries of Education, Finance, Economic Planning, Health etc.; National Bureau of Statistics (NBS), Central Bank of Nigeria (CBN), Nigerian National Population commission (NNPC), National Universities Commission (NUC), National Population Commission (NPC), Power Holding Corporation of Nigeria (PHCN) etc.
 - B. Miscellaneous report of government and non-government agencies. Examples include the Independent National Electoral Commission (INEC), National Agency for the Control of AIDS (NACA) etc.
 - C. Research Report and publications in learned journals by research organizations like the Nigerian Social and Economic Research (NISER), International Institute for Tropical Agriculture (IITA), Food Research Institute, Federal Institute of Industrial Research, Oshodi (FIIRO) etc.
 - D. Periodicals, magazines and daily newspapers

Notes on Study Session 4

1. Methods of Data Collection
 - A. **Sample Method:** this method involves taking a particular area as a representative of other areas or taking a particular people as representing other people. The collected data are treated as representative and a replica of the rest of the population. It is assumed that the sample will have all the attributes that can be found in the population.

B. Census Method: this method goes the whole length of examining the entire population. It is more exhaustive and targets 100% coverage. Examples include the National Population and housing census, the census of production, census of schools, agricultural census etc. It is useful for a heterogeneous population and is more accurate.

2. Problems of Data Collection in Nigeria includes:

- A. Lack or inadequate funding of data collection by professionals on the field due to government's misperception of the role of statistics in national development
- B. Problems of standardization of data collection procedure resulting in erosion of consistence and data integrity
- C. Inadequate manpower as there are dearth of professionals in the field
- D. Inadequate equipment and materials for data collection, processing and storage/retrieval and dissemination
- E. Bureaucratic bottlenecks
- F. Poor coordination and collaboration among relevant agencies
- G. Excessive protection of organizational secret for fear of taxation

Notes on Study Session 5

The various uses of socioeconomic indicators both in the short run and on the long run. Some of the uses are as follows:

1. To provide relevant information about social and economic conditions so as to measure changes in these conditions
2. To analyse and diagnose the conditions
3. To formulate policies and assess their impacts on the social and economic well-being of the people

Notes on Study Session 6

Sources of Official Statistics include:

1. Records which accumulate in day to day administration
2. Statistical returns from other sources established by law
3. Surveys and censuses

These statistics are published in administrative reports, statistical bulletins, statistical abstracts, statistical year books, census reports and similar publications.

Notes on Study Session 7

1. Index numbers can be defined and described in different ways and according to subject areas.

In **Economics** it is define as a device employed in an attempt to measure the magnitude of economic changes overtime. It is also used for international comparison of economic data.

In **Statistics** it is define as a statistical measure designed to show changes in price, quantity or value of a group of related items over a period of time.

2. Types of Index Comparison are:
 - A. Comparison Across Time Periods
 - B. Comparison of Geographic Locations
 - C. Comparison of Population Group

Notes on Study Session 8

1. The consumer price index is the most familiar and popular of all the indexes used all over the world. It has a lot of important applications and lends itself to wide interpretations. As a

result of these, we are focusing this Study Session on the consumer price index as index of indexes.

The history of the consumer price index dates back to the First World War when it was decided that workers in shipbuilding yards should receive wage adjustments commensurate with 'cost of living' increases. Today, the consumer price index continues to serve its original purpose which is to measure changes in the prices of a basic 'market basket of goods and services'

2. Problems with Consumer Price Index includes:

- A. **Population Coverage:** a major concern here is the issue of the choice of population for CPI coverage. It is expected that the population should be large enough for the index to have wide application and narrow enough to make purchasing experience of the population members homogenous. In practice however, this is not really so. Statisticians run into problems of where to draw the line.
- B. **Quality Changes:** Naturally, quality of goods and services are constantly in a state of flux; but the CPI aims at measuring the price change in a fixed market basket of products hence the inability to account for these changes in quality.
- C. **Home Ownership:** Houses are durable goods and are not usually infrequent purchases, thus at any sampling period, those who own their own houses are not directly affected by changes in prices of houses but the cost of houses is expected to be a major component of the family budget.

Notes on Study Session 9

The uses of vital statistics are as follows:

1. In recording birth, death, marriage and divorce of an individual during his or her life time.
2. To government agencies for administrative purposes. For example, disease control programmes and public health programmes of the government can be effectively planned and implemented through the help of death registration records.

3. They are indispensable in demographic research. The demographers are interested in the measurement of population, population growth, and distribution of the population by industry, occupation, area, and so on.
4. They are very useful in medical research. Medical officials make use of the mortality and natality statistics.
5. They are of great use in planning and evaluation of economic and social development of a country. Public Administrators make use of vital statistics in this respect.
6. Vital statistics are also of great use at the international point of view.

Notes on Study Session 10

Limitations for Standardization

1. The selection of a standard is arbitrary. Different results may be obtained if a different standard is adopted.
2. At times, it distorts the facts and sometimes leads to unimportant result or conclusion.
3. At times the choice of standards looks vague when data re-presented.
4. To provide numbers and comparisons that minimizes the influence of age and/or other extraneous factors.
5. The adjustment can be made for age, sex, race, etc. thus, we can generate age, sex, and race-adjusted rates. The principle of standardization is to determine the effect due to the difference in population structure.

Notes on Study Session 11

1. Population statistics is the use of statistics to analyse characteristics or changes to a population. It is related to social demography and demography.
Population statistics can analyse anything from global demographic changes to local small scale changes. For example, an analysis of global change shows that population growth has slowed, infant mortality rates have declined and there have been small increases in the aged.

2. There are various sources of population data both national and international. These are
 - A. Population Census
 - B. Vital Registration System
 - C. Sample Survey
 - D. Population Registers
 - E. Non-Traditional Sources
 - F. International Sources

Notes on Study Session 12

The main sources of educational statistics are records of:

- A. Schools-primary, secondary and tertiary institutions
- B. National Universities Commission (NUC)
- C. Federal State Ministries of Education
- D. Education boards
- E. Local governments
- F. The National Bureau of Statistics (NBS)
- G. International sources

Notes on Study Session 13

1. Health statistics is useful for:
 - a. Planning and budgeting health care delivery.
 - b. Making judicious decisions in health care delivery when available evidence is properly assessed for decision-making.
 - c. Monitoring and evaluation of health policies.
 - d. Interpretation of vital statistics such as births, deaths, mortality, and morbidity rates etc.
 - e. Planning, conducting, analysing, interpreting and reporting of medical research.
2. Limitations of Health statistics
 - a. It might not meet some specific needs because they are often incomplete.

- b. It is insufficient and might not be suitable.
- c. Unsuitable format of records.
- d. Variation in diagnostic criteria.
- e. Absence of record of the attributes of individuals.
- f. Inconsistency in data presentation.
- g. Problems of international comparisons.

Notes on Study Session 14

1. Agricultural statistics involve sets of data collected and processed for the purpose of planning agricultural activities and implementation of such plans. Agricultural data can both be primary and secondary. They are essential to provide adequate insight into the performance of agricultural production and marketing of a given system.

2. Agricultural statistics are useful for planning, monitoring and evaluation purposes as well as research and development. Various uses of agricultural data include:
 - A. Planning and plan implementation
 - B. Feasibility studies
 - C. Estimating cost and benefit of farm enterprises
 - D. Estimating capital investment needs
 - E. Determining insurance coverage needs
 - F. Forecasting future outputs, price trends and possible droughts
 - G. Estimating input needs and time of need
 - H. Working out government support and subsidy programmes
 - I. Planning strategic reserves for grains and other commodities
 - J. Estimating seasonal variation in labour needs and availability
 - K. Investigating productivity changes and the impact of technological innovations
 - L. Planning export of agricultural commodities and input procurement
 - M. Comparing agricultural productivity and costs of operation at the inter-farm, intra-farm, interstate, intrastate, inter-intra-regional and international levels

N. Establishing land use pattern over time/planning self-sufficiency in agricultural products.

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