

# **Importance of Statistics**

# SESSION OBJECTIVES

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- ✘ To discuss the development and meaning of statistics
- ✘ To justify the importance of reliable and timely statistics
- ✘ To introduce some key statistical concepts and their definitions
- ✘ To highlight the role of the Uganda Bureau of Statistics

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**WHAT DO YOU UNDERSTAND BY THE TERM  
STATISTICS?**

# MEANING OF STATISTICS

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1. The word statistics is used in either two senses.

- × Commonly used to refer to data.
- × Principles and methods which have been developed for handling numerical data.

2. Statistics is defined as a branch of mathematics or science that deals with the collection, analysis and interpretation of numerical information.

# MEANING OF STATISTICS –CONT...

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3. Statistics changes numbers into information..
4. Statistics is the art and science of deciding:
  - ✗ what are the appropriate data to collect,
  - ✗ deciding how to collect them efficiently
  - ✗ and then using them to give information (answer questions and make decisions).
5. Statistics” are data obtained by collecting, processing, compiling, analyzing, publishing and disseminating results, gathered from respondents through statistical collections or from administrative data
6. Statistics is making decisions when there is uncertainty.
  - ✗ We have to make decisions all the time -in everyday life or as part of our work.

# MEANING OF STATISTICS CONT...

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7. Statistics is a mathematical science pertaining to the
  - × collection,
  - × analysis,
  - × interpretation or explanation
  - × and presentation of data.
8. Statistics is the science of learning from data.

# DEVELOPMENT OF STATISTICS

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- ✘ The word statistics is believed to have been derived from the word “states”. The administration of states required the collection and analysis of data of population and wealth for the purpose of war and finance.
- ✘ Mankind has used statistics for thousands of years. In the Old Testament of the Holy Bible, statistics were gathered for purposes such as; taxation, military services, distribution of resources, and priestly duties. (Numbers 1: 2-3, 3:15, 31:25-41).
- ✘ The Romans gathered statistics by conducting censuses. In Luke 2:3, all people were to be registered in their own cities. Mary and Joseph travelled also, and that is when Jesus was born.

# DEVELOPMENT OF STATISTICS -CONT..

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- ✘ Some concepts of statistics were developed by students of games of chance, such games lean on probability.
- ✘ The fertile grounds for application and development of statistical methods included; insurance, biology and other natural sciences.
- ✘ To date there is hardly any discipline which does not find statistics useful. Economics, sociology, business, agriculture, health and education; all lean heavily upon statistics.



# MAJOR SOURCES OF STATISTICS

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- ✘ Primary sources. Data may be collected for the purpose required. Such data are known as primary data. The collection of facts and figures relating to the population in the censuses and surveys provide primary data. The great advantage of such data is that the exact information wanted is obtained.
- ✘ Secondary Sources. Often data is picked from reports of other institutions and organizations, such data is referred to as secondary. For example, details of industrial production data is picked from reports of the industries.

# REASONS FOR PREFERRING A PRIMARY SOURCE

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- ✘ The secondary source may contain mistakes due to errors which may not be easy to detect.
- ✘ The primary source usually include definitions of terms and units used.
- ✘ The primary source often includes a copy of the schedule/ questionnaire and description of the procedures used in selecting the sample and in collecting the data.
- ✘ The primary source usually shows data in greater detail. The secondary source may omit some of the information.

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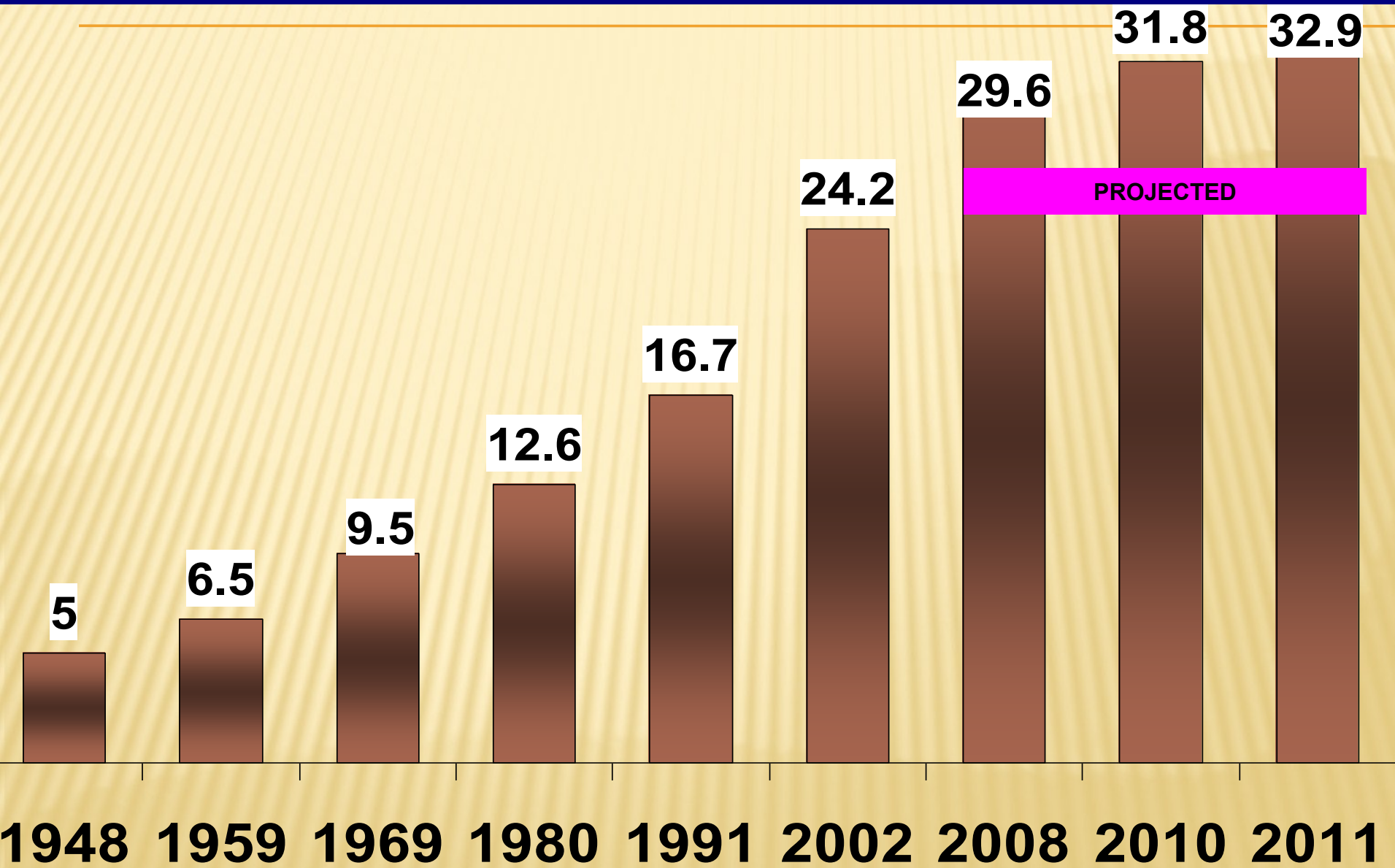
# WHAT ARE THE USES OF STATISTICS?

# USES OF STATISTICS

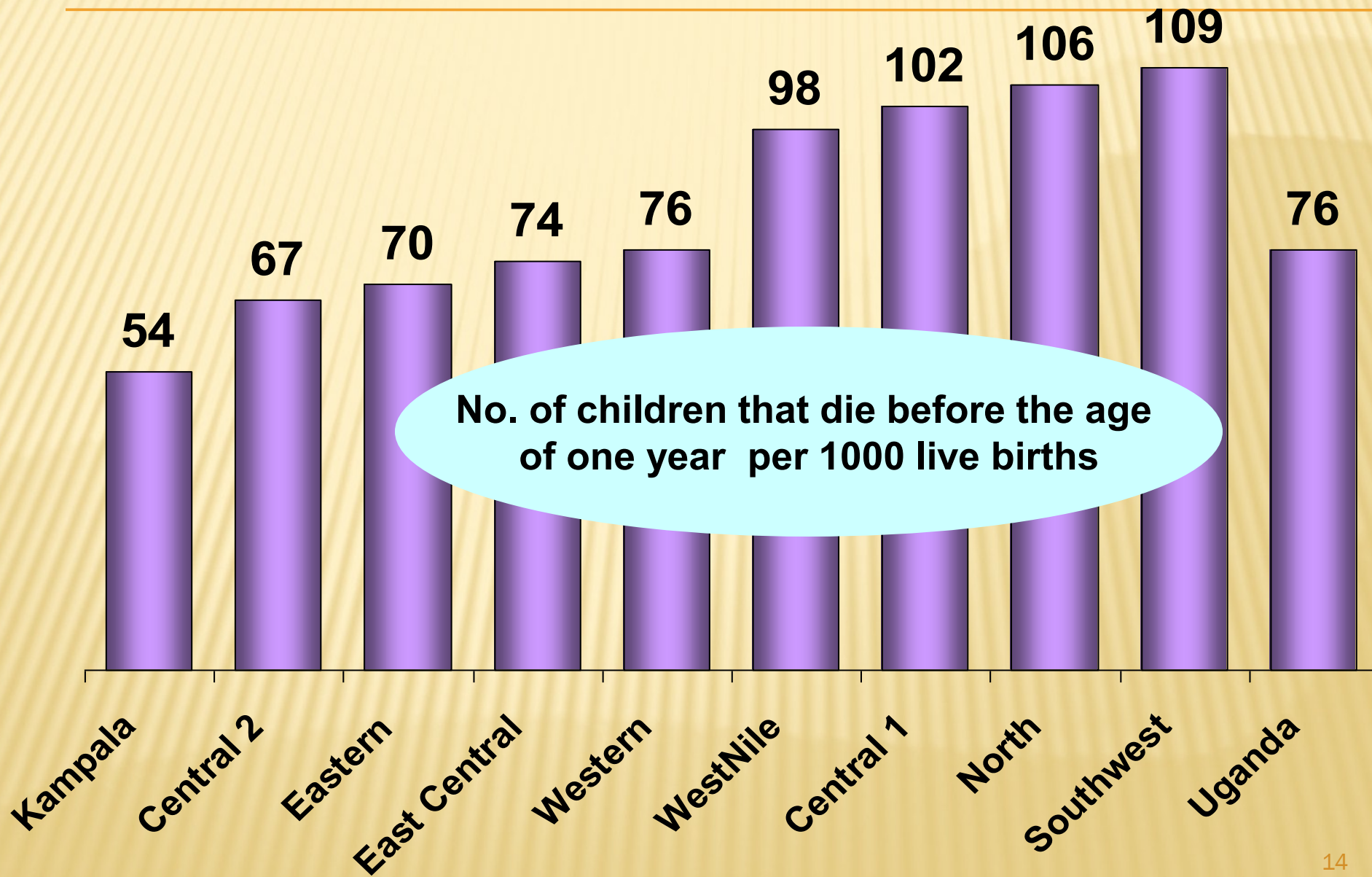
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- ✘ Statistics is a discipline which was developed to extract relevant facts from a large body of information and to help people make decisions when uncertainty exists concerning the information. Statistics form the basis for planning. Statistics provide information and data (facts and figures) as input for planning, monitoring and evaluation of programmes.
- ✘ In the face of dwindling resource and increased demand for services, statistics are becoming more crucial to provide the much needed information to help planning authorities come up with better informed decisions
- ✘ The distribution of public utilities, social services (piped water, training institutions, road infrastructure, electricity and others) require existence of clear analysed data.
- ✘ ***What you cannot measure, you cannot manage.***

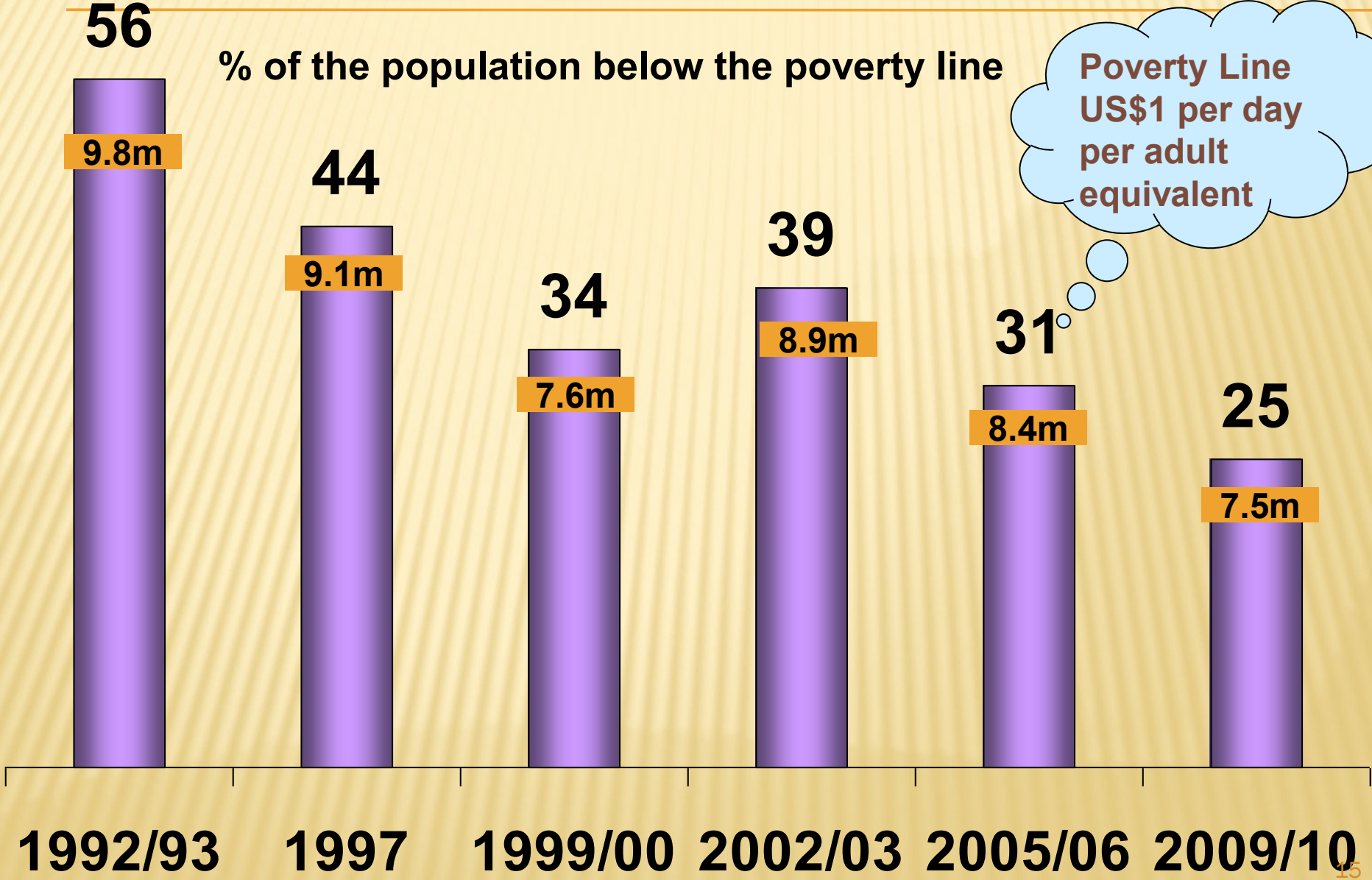
# POPULATION OF UGANDA (1948 - 2011)- MILLION



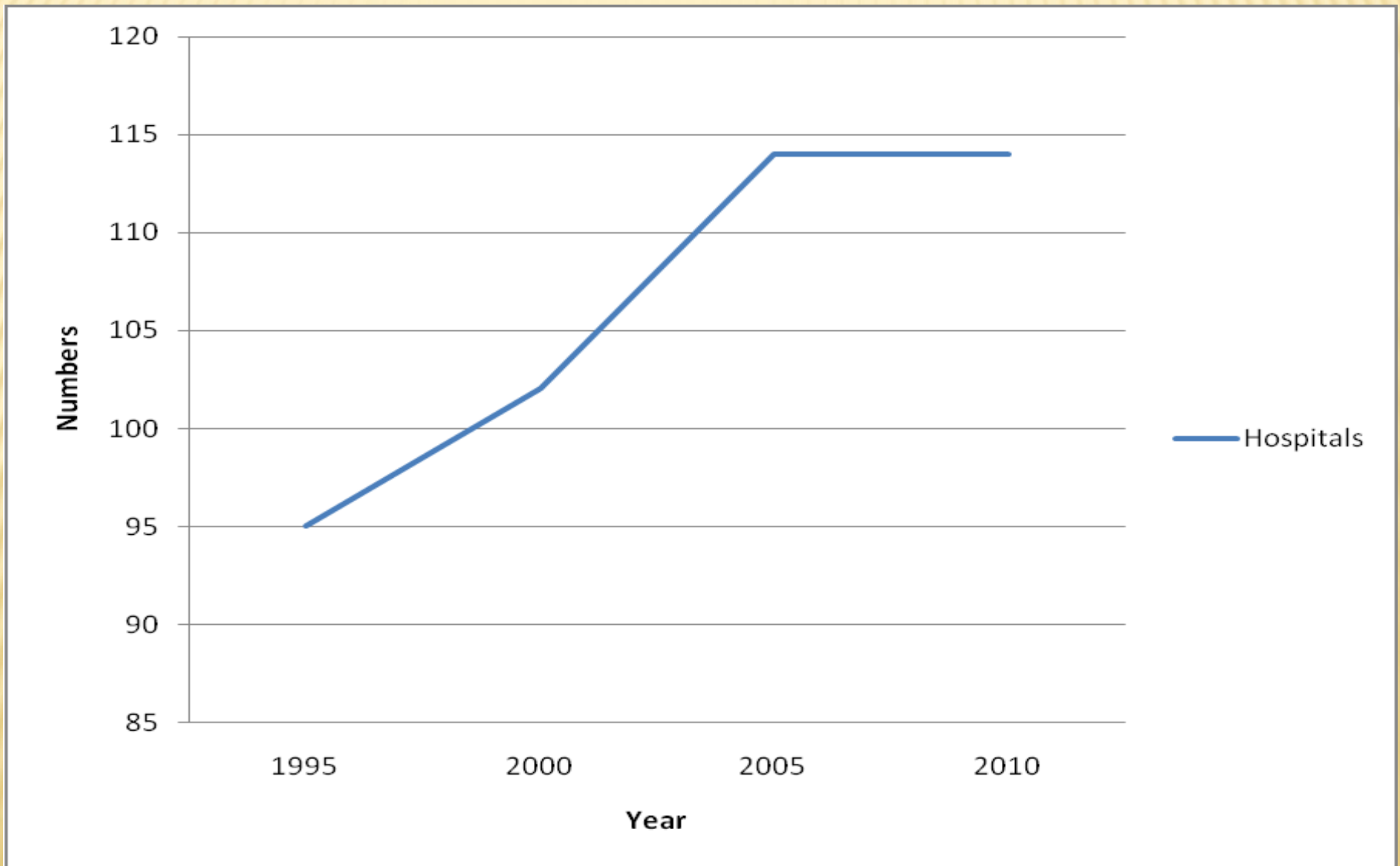
# INFANT MORTALITY RATE – UDHS 2006



# POVERTY LEVELS PO (%)

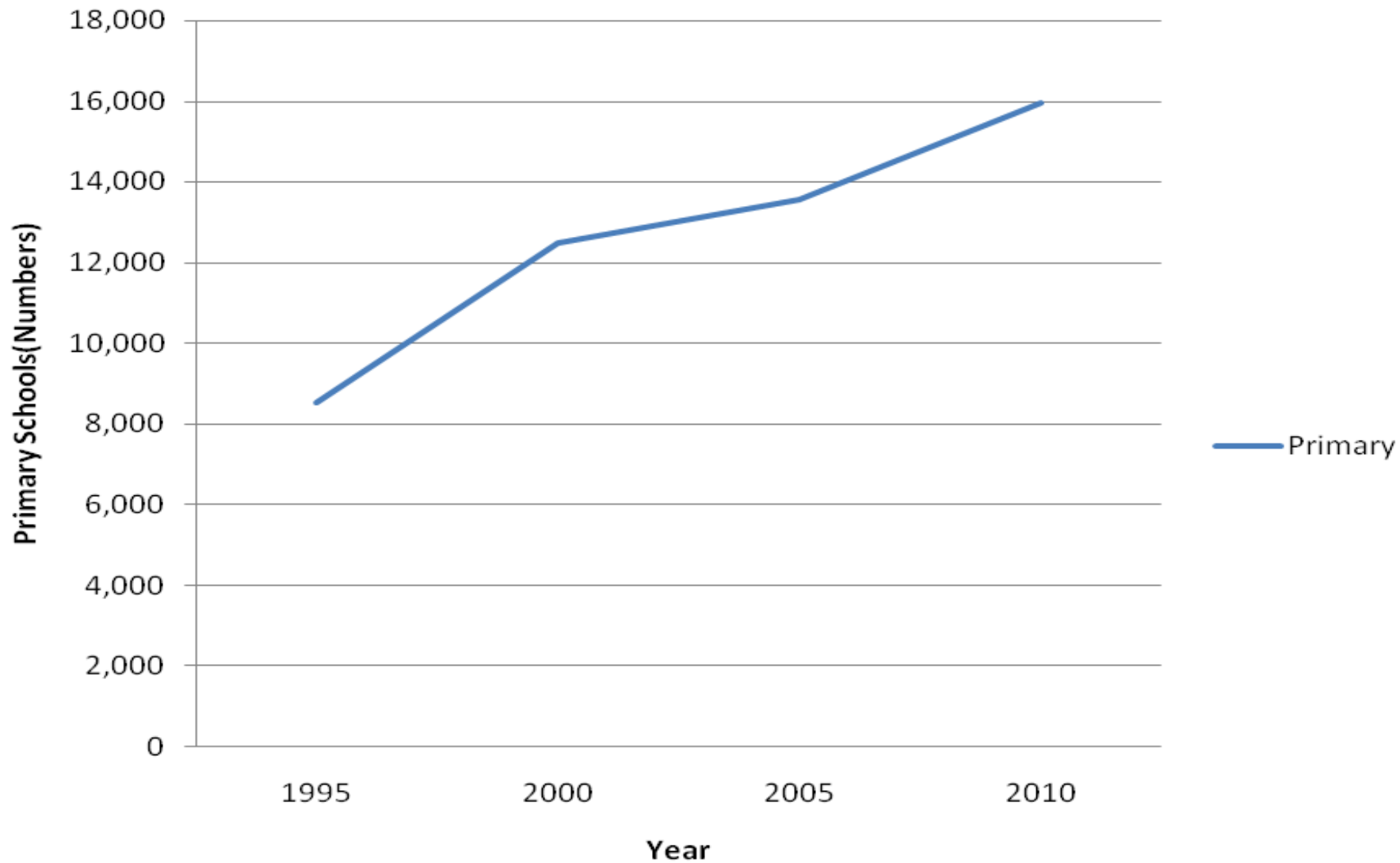


# NUMBER OF HOSPITALS: 1995 - 2010

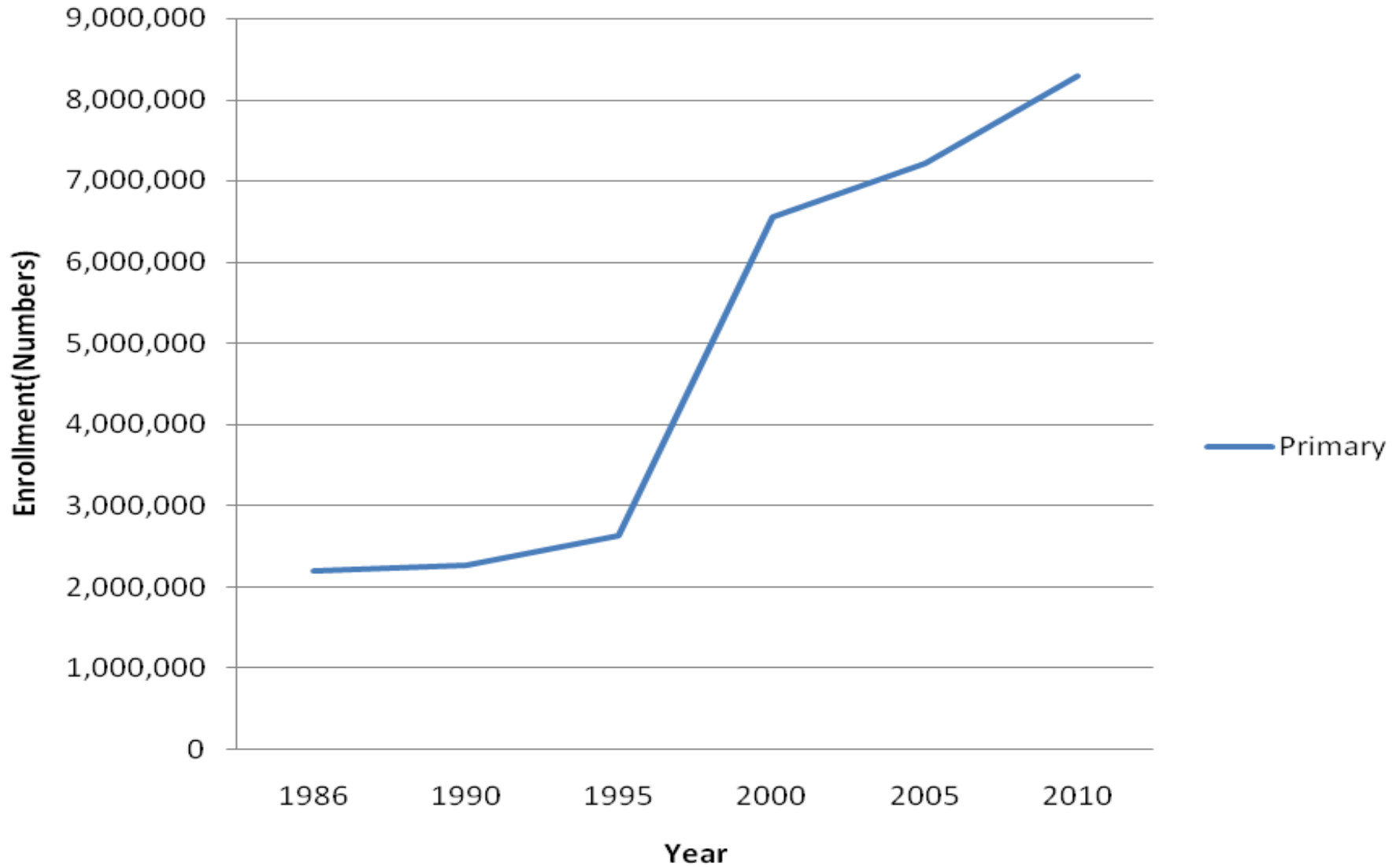




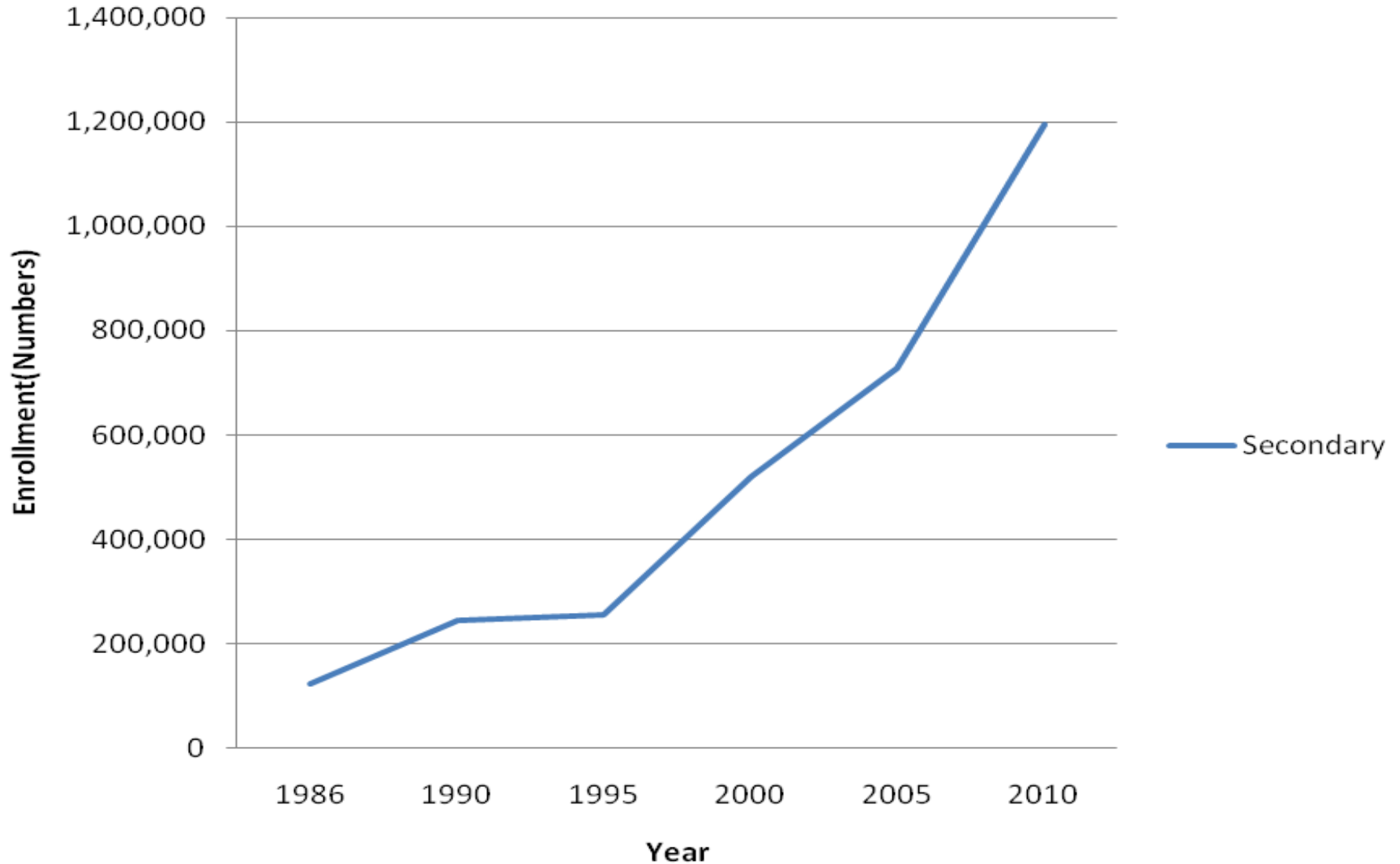
# NUMBER OF PRIMARY SCHOOLS: 1995-2010



# PRIMARY ENROLLMENT: 1986 - 2010



# SECONDARY SCHOOL ENROLMENT: 1986-2010



# BASIS FOR UNREALIBLE STATISTICS

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- ✘ Bias - the presence of bias on part of the investigator is obviously sufficient to discredit the findings.
- ✘ Omissions of important factors during data collection.
- ✘ Errors during data collection and analysis
- ✘ Non comparable data due to failure to use standard definitions of concepts.
- ✘ Insufficient data not providing any meaningful conclusions.
- ✘ Unrepresentative data – Conclusions should not be based on data which is numerically sufficient but not representative.
- + *Reaching a valid conclusion concerning a population from the sample is based on two general laws, namely, the law of statistical regularity, and the law of inertia of large numbers.*
  - ✘ *The law of statistical regularity states that a reasonably large number of items selected at random from a large group of items will on average be representative of the characteristics of the population.*
  - ✘ *The law of inertia of large numbers states that large groups or aggregate of data show a higher degree of stability than small ones.*

# SOME KEY STATISTICAL CONCEPTS

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## *A – Measures of Central Tendency*

- ✘ The term measure of central tendency is used to identify the values which may be computed to in an attempt to characterize the central part of the frequency distribution.
- ✘ The arithmetic mean, median and mode are frequently used.

**EXAMPLE 1 -MEAN**

Consider five (5) villages in a parish:

Administrative Units	Households
Village 1	204
Village 2	300
Village 3	105
Village 4	460
Village 5	82

In this example, the Arithmetic Mean is :  $(204+300+105+460+82)/5$ . This gives the average number of households in this parish as 230.

**EXAMPLE 2 -MEDIAN**

Consider 10 villages (A,B,C,D,E,F,G,H,I and J)

Village	A	B	C	D	E	F
Households	157	42	475	505	123	952
	345	872	173	224		

$$\text{Mean} = (157+42+475+505+123+952+345+872+173+224)/10 = 386.8$$

Computation of the Median

Step 1: Arrange the households in order of magnitude as shown below;

42, 123, 157, 173, 224, 345, 475, 505, 872, 952

Step 2: Pick the middle mark, i.e.  $(224+345)/2 = 284.5$

**EXAMPLE 3 –MODE**

A – ages of 6 people: 25 30 36 25 18 22 . The mode is 25

B – Packaging for herbicides

Measures in litres

	1	2	5	10	20
Sales	500	120	850	80	35

The mode is 5 litres

# KEY STATISTICAL CONCEPTS-CONT..

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## *B. Measures of Dispersion*

- ✘ Variance - the mean of all squared deviations from the mean. Deviations are the amount that each score varies from the mean of the distribution, that is, how far each score is away from the mean.
- ✘ Standard Deviation - a measure of the dispersion or variation in a distribution, equal to the square root of the arithmetic mean of the squares of the deviations from the arithmetic mean. The greater the degree of difference of a value from the average, the larger the standard deviation.
- ✘ Range -difference between the lowest and highest values. The range tells you something about how spread out the data are. Data with large ranges tend to be more spread out.

#### **EXAMPLE 4: -VARIANCE**

In the data set 3, 5, 7, 6, 8, 5, 9, 4, 6, 7, the mean of these ten observations is 6.0, which is calculated by adding the observations (60) and dividing by the number of observations (10). Subtracting the mean (6.0) from each of the observations will result in some negative numbers and some positive numbers, indicating the deviations from the mean (-3, -1, 1, 0, 2, -1, 3, -2, 0, 1). Adding the deviations will result in zero.

Thus, deviations from the mean is not a very useful measure of variability. To get around the problem, the deviations need to be squared, making them all positive. The squared deviations for the data set are 9, 1, 1, 0, 4, 1, 9, 4, 0, 1.

To get the variance, the squared deviations are summed (30) and then divided by the number of observations (10) to give the mean of all squared deviations from the mean. The variance is therefore  $30 \div 10 = 3$ .

#### **EXAMPLE 5: -STANDARD DEVIATION**

Refer to Example 1.4. The standard deviation is the square root of variance, hence square root of 3. This will equal to 1.73.

#### **EXAMPLE 6: RANGE**

Consider the set of numbers 80, 90, 90, 100, 85, 90. These could be marks for 6 students. In this case  $100 - 80 = 20$ , so the range is 20.



# OTHER KEY CONCEPTS

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- ✘ Population – All the conceivable members of a group under investigation constitute a population or universe. In statistics the words population and universe do not carry the usual dictionary meanings but refer simply to the totality of observations relevant to a given discussion. The groups to make a population depends on what the researcher is interested in investigating. Examples – people, cattle, houses, etc.
- ✘ Sample – Sub-collection of items drawn from population under study.

# OTHER KEY CONCEPTS –CONT...

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- ✘ Data (raw information) are facts that become useful information when organized in a meaningful way or when entered into a computer.
- ✘ Data is also defined as information organized for analysis.
- ✘ Data could be of qualitative or quantitative nature

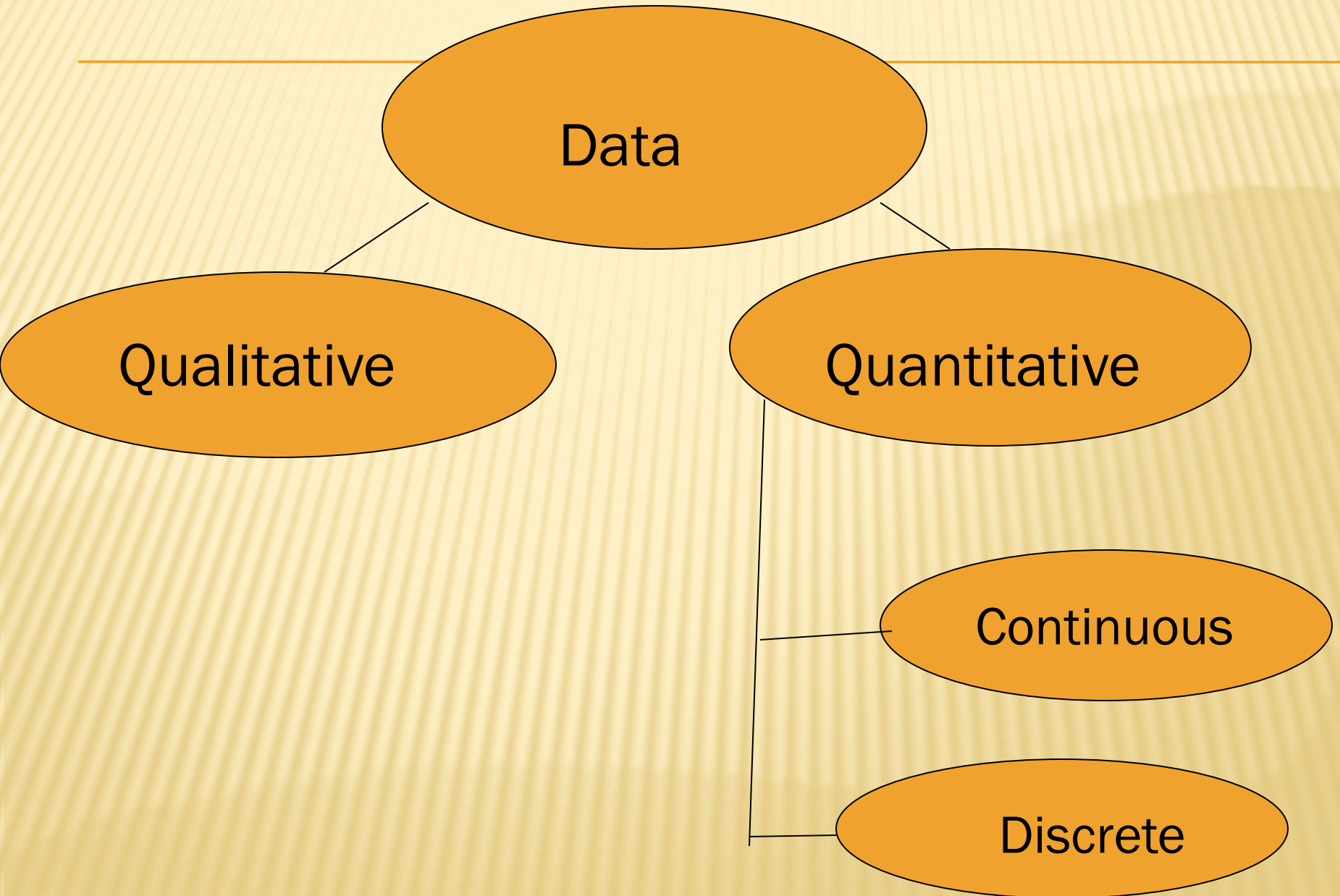
# OTHER KEY CONCEPTS-CONT..

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- ✘ Variable – Characteristic being studied. Examples; ages of people; heights of children, educational level, etc. There are two type of variables, namely, qualitative and quantitative.
  - + Qualitative variable – Identifiable simply by noting its presence. For example; the color of an object; sex of an individual; etc.
  - + Quantitative variable – if it consists numerical values. For example; weight of coffee, height of individuals, volume of sales, etc.
    - ✘ Continuous variable – if there are no breaks in the possible values. For example; distance; weight, height, etc.
    - ✘ Discrete variable – Possible values consist of breaks between successive values. For example; number of cows, number of people, number of bags of coffee; etc.

# DATA VARIABLE TYPES

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# TECHNIQUES OF DATA COLLECTION

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- Data collection techniques allow us to systematically collect information about our objects of study, and about the setting in which they occur.
- Data collection techniques generate both qualitative and quantitative data.
- Qualitative techniques of data collection involve the identification and exploration of a number of related variables for in-depth understanding of the phenomena. Qualitative data is often recorded in a narrative form.
- Quantitative techniques of data collection are used to generate quantifiable data.

# TECHNIQUES OF DATA COLLECTION –CONT...

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Quantitative approach uses methods that are designed to ensure objectivity, generalisation and reliability. The quantitative data could be generated through;

- Observation
- Conducting surveys
- Conducting censuses
- Exploring secondary sources
- Administrative sources/ registration exercises
- Administering written questionnaires (interview, mailing, gathering respondents together, one to one, self administered, hand delivered and picked later, etc)
- Experimental designs
- Telephone interviews

# TECHNIQUES OF DATA COLLECTION –CONT...

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Qualitative research methodologies are designed to provide the researcher with the perspective of target audience members through immersion in a culture or situation and direct interaction with the people under study. The qualitative data collection techniques include;

- Observation
- Document Review
- Key informant interviews
- Semi-structured interviews
- Time Trend Analysis
- Ranking –preference and pairwise
- Mapping –Community and resource
- Diagramming -Venn

# ROLE OF UGANDA BUREAU OF STATISTICS

- ✘ The Uganda Bureau of Statistics (UBOS) is a semi-autonomous body within the Ministry of Finance, Planning and Economic Development (MFPED). The Bureau was established by an Act of Parliament in 1998. The mandate of UBOS is to develop and maintain a National Statistical System (NSS) so as to ensure collection, analysis and publication of integrated; relevant, reliable and timely statistical information; to constitute a coordinating, monitoring and supervisory body for the NSS. The mandate is fulfilled through the corporate plan.
- ✘ The Bureau is responsible for:
  - + Providing reliable and timely official statistics to support planning at the various levels of administration
  - + Providing high quality central statistical information services on social, environmental, and economic conditions in the country.
  - + Promoting standardization in the collection, analysis and publication of statistics to ensure uniformity in quality, adequacy of coverage and reliability of statistical information.
  - + Providing guidance, training and other assistance as may be required to other users and providers of statistics.
  - + Promoting co-operation, coordination and rationalization among users and providers of statistics at national and local level so as to avoid duplication of effort and ensure optimal utilization of scarce resources.
  - + Promoting and being the focal point of co-operation with statistics users and providers at regional and international levels.



## MAJOR SOURCES OF STATISTICS AT NATIONAL LEVEL

<b>Major Sources of Data</b>	<b>Implementing Agency</b>	<b>Frequency of Collection</b>	<b>Data Obtained</b>
<b>Uganda National Household Survey (UNHS)</b>	Uganda Bureau Of Statistics (UBOS)	Every 3 years	<ul style="list-style-type: none"> <li>-Socio-demographic characteristics of household members</li> <li>-Household consumption expenditure including poverty incidence</li> <li>-Household and housing conditions.</li> </ul>
<b>National Service Delivery Survey (NSDS)</b>	UBOS	Every 4 year	<ul style="list-style-type: none"> <li>-Performance and impact of selected public services</li> <li>-Changes in service delivery</li> <li>-Constraints and gaps in delivery of Government services</li> </ul>
<b>Uganda Demographic and Health Survey (UDHS)</b>	UBOS	Every 5 years	<ul style="list-style-type: none"> <li>_Demographic characteristics</li> <li>-Family planning and reproductive health</li> <li>-Fertility and mortality</li> <li>-nutritional status of the population</li> <li>-HIV/AIDS</li> </ul>

## MAJOR SOURCES OF STATISTICS AT NATIONAL LEVEL –CONT..

### Major Sources of Data

### Implementing Agency

### Frequency of Collection

### Data Obtained

**Population and Housing Census (PHC)**

UBOS

Every 10 years

- Size, composition and distribution of population
- Fertility and Mortality
- Household and housing conditions

**Livestock and Agricultural Census**

UBOS

Every 10 years

- Land acreage, land cultivated, land under fallow
- Crops grown, production, and sales
- Livestock kept, production and sales

**Annual Educational Census**

Ministry of Education and Sports (MOES)

Annual

- Enrolment by class
- Educational facilities
- Teachers and other staff

**Labor Force Survey (LFS)**

UBOS

Every 3 years

Levels and trends of employment, unemployment and underemployment

**THANK YOU**