



VME 104/ BIOSTATISTICS

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COURSE CONTENT

- Week 1. Introduction to biostatistics
- Week 2. Summarizing data: Tables and Diagrams
- Week 3. Summarizing data: Numerical Measures (Measures of Central Tendency & Dispersion)
- Week 4. Probability Distributions: Discrete Distributions
- Week 5. Probability Distributions: Continuous Distributions
- Week 6. Population and Sample
- Week 7. Introduction to SPSS
- Week 8. Introduction to Hypothesis Testing
- Week 9. Comparing two independent means: Student t test
- Week 10. Comparing two dependent means: Paired sample t test
- Week 11. Comparing Several Means: One-way ANOVA
- Week 12. Comparing Proportions: The Chi-Squared Test
- Week 13. Simple Linear Correlation Analysis
- Week 14. Simple Regression Analysis

EVALUATION SCHEME

- Mid – Term exam %40
- Final exam %60

Dates of exams will be announced later...

REFERENCES

- Jerrold Zar (2010). Biostatistical Analysis, Fifth Edition, Pearson Education
- Andy Field (2009). Discovering Statistics Using SPSS, Third Edition, Sage Publications
- Paul Newbold, William L. Varlson, Betty Thorne (2007). Statistics for Business and Economics, Sixth Edition, Pearson Education.
- Harvey Motulsky (2010). Intuitive Biostatistics: A non mathematical guide to statistical thinking. Second Edition, Oxford University Press.
- Aviva Petrie & Paul Watson (2013). Statistics for Veterinary and Animal Science, Third Edition, Wiley-Blackwell.

BEFORE WE START...

- We will emphasize the methods of data analysis.
 - You need to know some mathematical notation and techniques
- We will study what to do and how to do it. It is also important to understand why these methods are appropriate.

MAIN GOALS OF THIS LECTURE:

To learn:

- How to organize, summarize and describe data
 - How to reach decisions about a large body of data by examining only a small part of data (Inferential)
- Understanding and interpreting the results of statistical analysis in a scientific study

WHY DO I NEED STATISTICS IN VETERINARY MEDICINE

It generates new ways of thinking about questions and effective tools for answering them !

- As a medical student, you always need to follow scientific literature to stay up to date. The Published scientific literature is full of studies in which statistical procedures are employed.
 - It is virtually impossible to read research articles and keep up with new developments without an understanding of elementary statistics.
- Concept of epidemiology is gaining prominence in veterinary and animal science, and the concept of evidence-based veterinary medicine are being explicitly introduced in clinical practice.
- In animal health sciences, there are an increasing number of independent diagnostic services that will analyze samples for the benefit of health monitoring and maintenance.
- The pharmaceutical industry is required to demonstrate both safety and the efficiency of their products. Such data invariably require a statistical approach.

INTRODUCTION TO BIOSTATISTICS

- The word “statistics” comes from Latin status, which is the root of modern term “state”.

Gradually the meaning of the term expanded to include any type of data.

Today, depending on the context, the word statistics has the following meanings:

- Data,
- Functions of data,
- Techniques for collecting, analyzing and interpreting data,
- The science of creating and applying such techniques

- The field of statistics: The study and use of theory and methods for the analysis of data.
 - Statistics provide:
 - Forming hypotheses
 - Designing experiments,
 - Gathering + Summarizing data
 - Drawing inferences from data (such as testing hypothesis)

WHAT IS BIOSTATISTICS?

- It is a branch of applied statistics directed toward applications in health sciences (such as Veterinary Medicine)

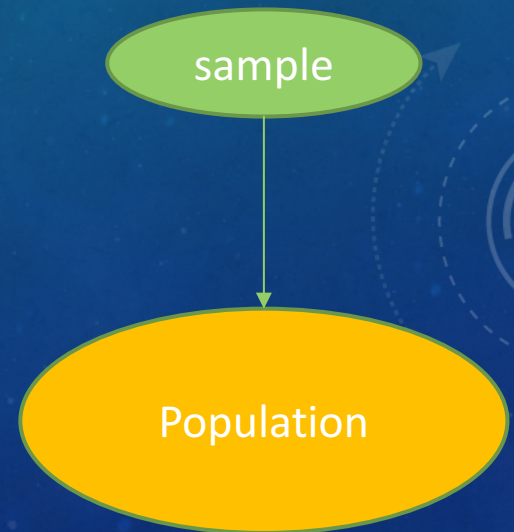


It is all about processing and summarizing raw data to make sense of it !

Statistics:

-Descriptive statistics organizing, summarizing, describing data

-Inferential statistics making decisions from small samples



SOME BASIC CONCEPTS

- Data: raw material of statistics. It is the observations of random variables made on the elements of a population or sample.
- Data set: a collection of data.
- Population: collection of all people, objects, or events having one or more specified characteristics.
- Sample: a representative subset of the population
- Parameter: any numerical quantity that characterizes a given population (a numerical summary of population)
- Variable: a characteristic that can take values which vary from individual or group to group. E.g. height, weight, litter size...
- Measurement: the process of assigning numbers or labels to characteristics of people, objects, or events according to a set of rules

Considering the following data set;

Subject	Age	Sex	WBC
1	3	male	8,4
2	2	male	7,5
3	2	female	12,2
4	1	male	5,8



What are the variables in the data set?

The data table has four observations, three variables and 12 data values

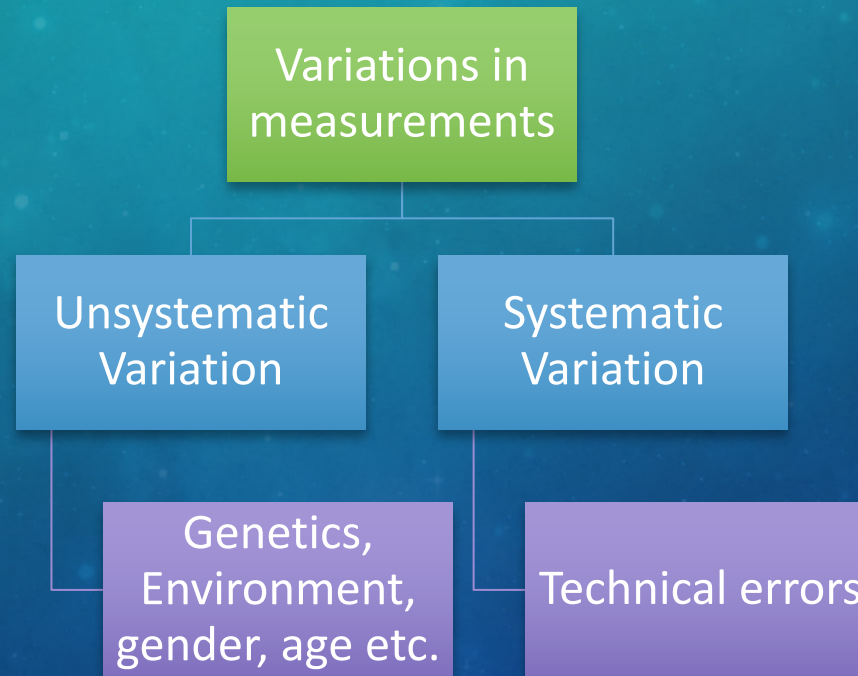
TYPES OF VARIABLE

In particular, the variable may be one of the following:



VARIATIONS IN MEASUREMENTS

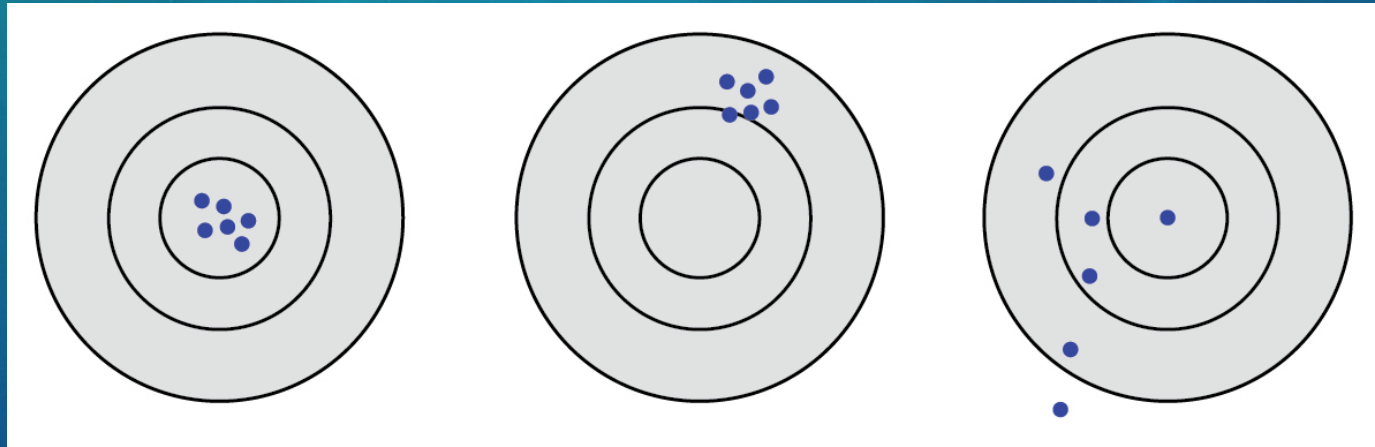
- If we repeatedly observe and quantify a particular biological phenomenon, the measurements will rarely be identical



MEASUREMENT QUALITY

- Precision: how well repeated observations agree with one another
- Accuracy: how well the observed value agrees with the true value

What can you say about the precision and accuracy for the following scenarios?



High Accuracy &
High Precision

Low Accuracy &
High Precision

Low Accuracy &
Low Precision