لجان الدفعات

STATISTICS

MORPHINE ACADEMY

MORPHINE ACADEMY

الإحصاء الصيدلاني

Pharmaceutical Statistics

Lecture 1

Introduction to statistics

Basic concepts of statistics

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Branches of Statistics

- **Descriptive Statistics**: is a branch of statistics that involves the collections, organisation, summarisations, and display of data.

- ***Statistical Inferences* (Inferential Statistics)**: is *a branch of statistics that involves using a sample to draw conclusions (inferences) about (a population.)*

Pharmaceutical Statistics

- The pharmaceutical statistics is an application of statistics to matters concerning the pharmaceutical industry. This can be from issue of design the experiments, to analysis of drug trials, to issues of commercialisation of a medicine.

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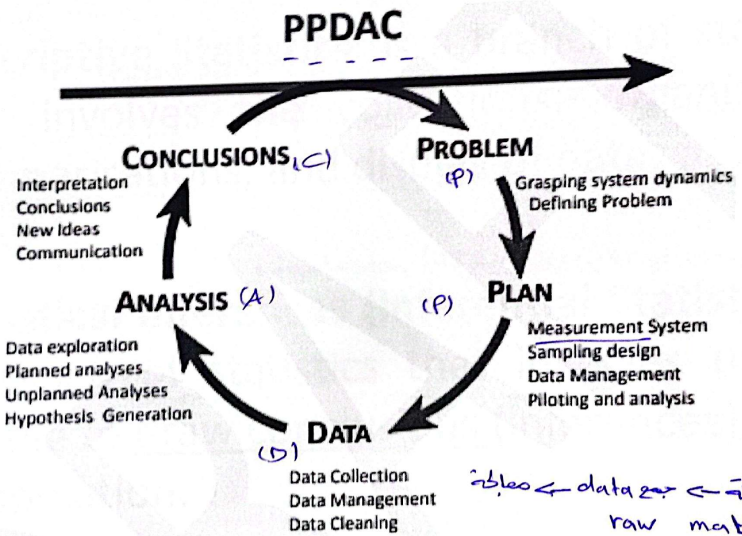
The Statistical Inquiry Cycle

احصائي استقصاء دورة

* مراحل دورة الإستقصاء الإحصائي البحثي :



الدورة كالآتي

* مشكلة ← خطة كل المشكلة ← جمع data ← معالجة
raw material

Conclusion ← Analysis ←

ex : كزيادة التوتر عند الطلبة في فترة انتشار فايروس كورونا

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شرح إضافي

* Stadard error ↓ → increasing no. of repetitions (replicates)

* كل ما زادت عدد التجارب قل الانحراف المعياري وبذلك زادة الدقة

* $\downarrow \sigma = \frac{\sqrt{\sum (x_i - \mu)^2}}{\uparrow N}$ حسب القانون الثاني

standard deviation

N ← no. of replicates

عدد التكرارات

* Dispersion bydefault in Sample

* النشتت خطأ عشوائي/تلقائي في اي عينة أو تجربة

لا يمكن حذفة لكن يمكن التقليل من تأثيره على البيانات.

الصيدلاني .

* معلومة :-

Median :- هي قيمة تتوسط قيم بحيث تكون القيم متوزعة على طرفيه بنسبة 50%

Basic concepts of statistics

* أسئلة على حسابات الإحصاء ← examples of statistics

Calculations :-
1. Average (Mean) المتوسط
2. Median الوسيط
3. Mode المنوال (التكرار)

ex : 6 3 4 5 5 2
Mode = (5)

What is statistics?

- Statistics is a field of study concerned with:
1. Collection, organisation, summarisation and analysis of data. * طريقة التعامل مع البيانات : جمع ← تنظيم ← تلخيص ثم تحليل
2. Drawing of inferences (conclusion) about a body of data when only part of data is observed (inferential statistics). ← conclusion استنتاج نهائي لما لا حظناه من خلال البيانات التي تم تحليلها observed
- Statistics provides a way of offering critical guidance in producing trustworthy analyses and predictions. أهمية الإحصاء في البحث العلمي

* معلومة عن المتوسط الحسابي :
* المتوسط لا يعبر عن تباين البيانات (Variance)
* standard deviation (sd) يعبر عن تباين البيانات (Variance).
sd الانحراف المعياري

4 سنة
Average ± standard deviation
25 ± 5

2 سنة
25 ± 10

* sd للسنة 2 أكبر من سنة 1 إذا قيم التشتت أكبر variance
sd (inc) → variance (increase)

جديدة / دقيقة

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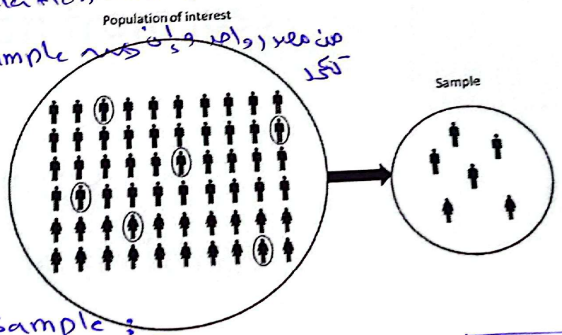
Vocabulary of Statistics

- **Population:** A population is an entire group, collection of all items or counts that are of interest of a particular study which we want to characterise. all / whole
- **Sample:** A sample is a collection of observations on which we measure one or more characteristics. Part of population * جزء من المجموعة التي سنقوم عليها الدراسة

parameter → population من نخرج معيار لـ
statistics → sample من معيار واحد ونأخذ



* Properties of Sample:

1. ➢ The sample should be selected to represent the whole population.
2. ➢ The sample should be **representative** of the population and **unbiased**.
3. ➢ When the sample does not represent the population, it is called **unrepresentative**.

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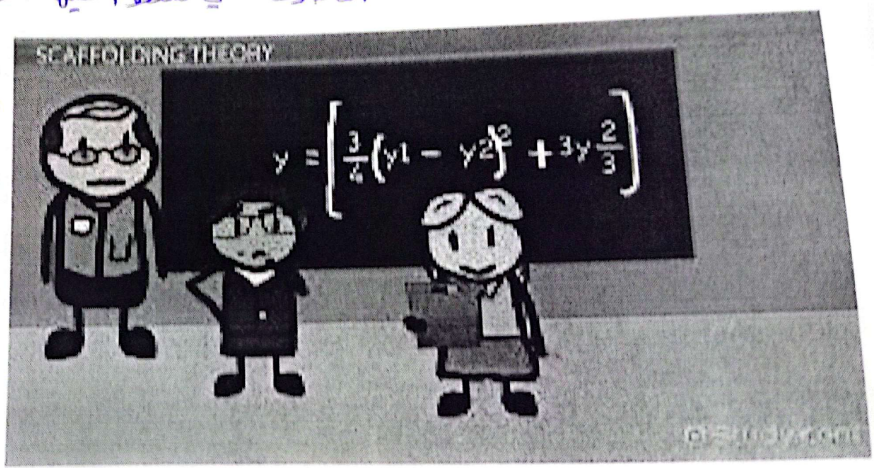
Vocabulary of Statistics

- **Population:** المجموعة التي ستقوم عليها الدراسة
- **Sample** population-sig
- **Data** المعلومات التي اجمعها
- **Variables** المتغيرات
- **Parameter**
- **Dependency**



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Biostatistics = biology + statistics

- The tools of statistics are employed in many fields: Business, Pharmacy, Medicine, Education, Psychology,....etc.

في مجالات تخصصاتنا

- When the analysed data are derived from the biological science, Pharmacy, and Medicine, we use the term Biostatistics to distinguish this particular application of statistical tools and concepts.

لتمييز استعمال الإحصاء في هذه المجالات.

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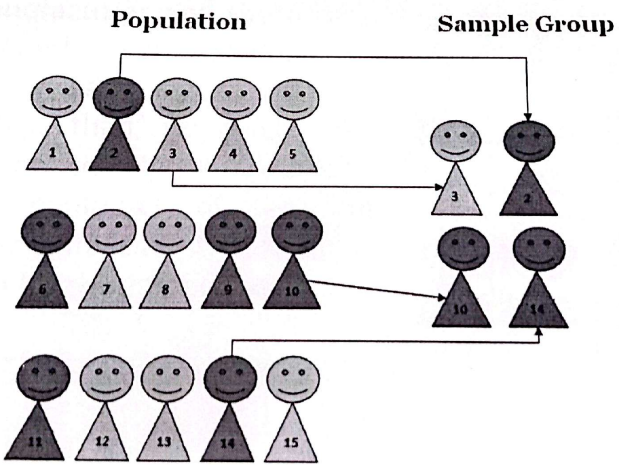
Choosing samples

- **Simple Random Sample (SRS):**
  - Simplest type of scientific samples.
  - Every individual in a sample is chosen randomly and entirely by chance.



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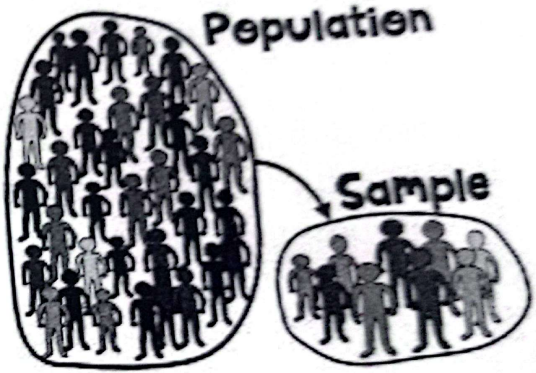
Why we study a sample rather than a population?

ليه بندرس sample بدل ما ندرس population ؟!

1. Less cost
2. Preservation from loss
3. Save time
4. More accuracy
5. Population is so huge



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Vocabulary of Statistics

- Descriptive measures that describe a **population** are called a parameter.
- Descriptive measures that describe a **sample** are called a statistics.
- Parameters: Quantities (numerical measurement) describing some characteristic of a population.
- This means the parameter tells us something about the whole population.
- In statistics, we draw a conclusion about a population on the basis of information contained in the sample that have been drawn from the population

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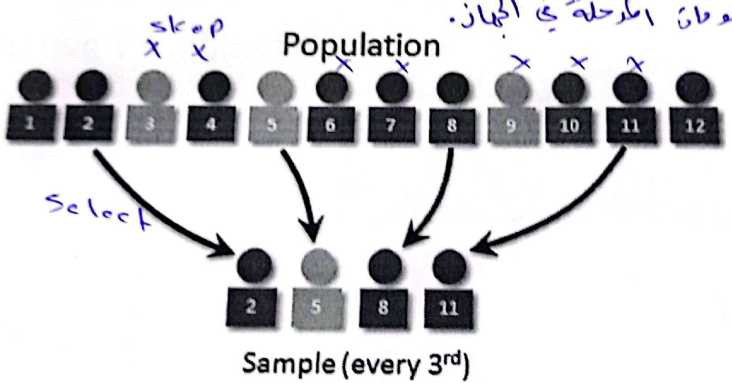
Choosing samples

- **Systematic sampling (SYS)**: a sample is selected by listing a population sequentially and choosing members at regular intervals or according to a set schedule or plan.

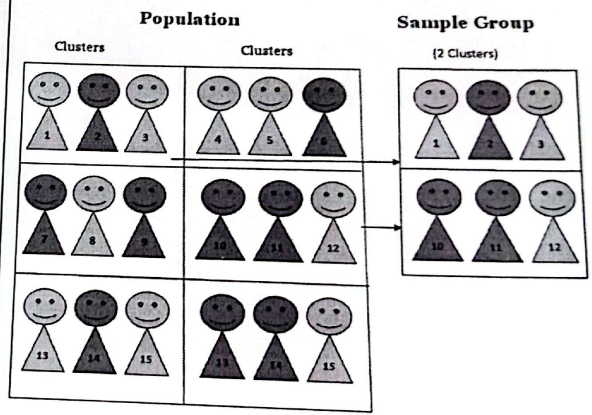


In this case, every third person is systematically selected

Choosing samples

- ***Cluster* sampling "multistage" sampling**
  - *Is* employed when there are many individual "primary" units that are clustered together in "secondary", larger units that can be subsampled.

For example, assume that 150 containers of a bulk powder chemical arrive at a pharmaceutical manufacturer and the quality control laboratory needs to sample these for the accuracy of the chemical or lack of contaminants. Rather than sampling each container we randomly select ten containers. Then within each container of the ten containers we further extract random samples (from the top, middle bottom) to be assayed.



لتقريب

* أخذ عينات صغيرة من أماكن مختلفة Sample

• Population من الكمية الكاملة

Choosing samples

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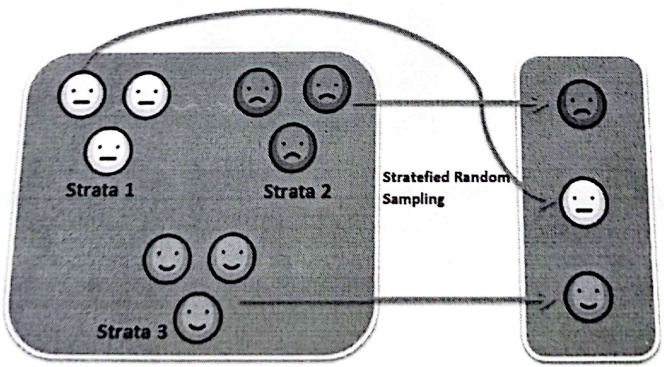
Choosing samples

التعريف
عمل عدة مجموعات مرتبة من المجتمع
ومن كل مجموعة نأخذ sample.

- **Stratified sampling** أخذ عينات طبقية

➢ *The population is divided into separate groups (strata) with similar characteristics and then individuals or objects can be randomly selected from each group according to its % in the whole population.*

➢ *For example, in a study we may wish to ensure a certain percentage of smokers (25%) are represented in both the control and experimental groups in a clinical trial (n=100 per group).*



ex: تقسيم وأخذ عينات خلوية من اعضاء جسم كائن حي.

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Variables

- **Qualitative variables**
  - Variables that can be placed into distinct categories (non-numerical), according to some characteristic or attributes.
  - Not measurable, categorical characteristics
  - Examples: Sex (male or female), Blood groups (A, B, O, AB)...etc.

- **Quantitative variables**
  - Variables that are numerical in nature and can be ordered or ranked, which generated usually from counting or measuring something.
  - Measurable.
  - For examples the variable age is numerical and the people can be ranked in order according to their age.

Vocabulary of Statistics

متغيرات

- **Variables**: a characteristic monitored, capable of taking different values (diastolic BP, height of students,...etc).

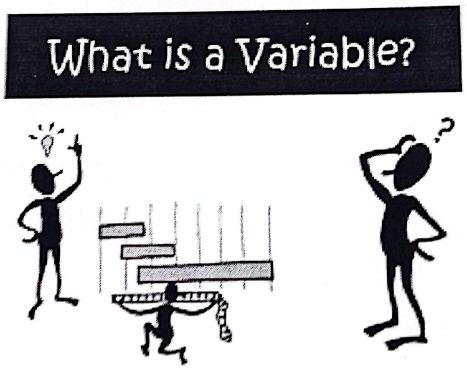
خاصية يمكن قياسها ومراقبتها وتأخذ قيم مختلفة

- Type of variables according to their measurability:

1. Qualitative variables
2. Quantitative variables

ex: فصائل دم / لون عيون ← متغير نوعي

ex: أطوال / أوزان ← متغير كمي يمكن قياسه



لو أردنا في الامتحان يأتي كالآتي: ميز الكميات هل هي نوعي أم كمي.

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Vocabulary of Statistics

- **Data**: the raw material of statistics. They are derived from observations or measurements. We may define data as a numbers.

  - There are two kinds of numbers that we used in statistics:
  - Numbers generated from measurements (e.g. temperature)
  - Numbers generated from a process of counting (e.g. # of patient discharged from hospital).
  - Data may be generated or obtained by one or more of the following sources:

✓ Surveys

✓ Experiments

✓ Routinely kept records

✓ External resources

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Computer and Calculators

- In the past, statistical calculations were done with pencil and paper, but now computers and calculators do all numerical calculations.
- The most commonly used statistical package are:

➢ GraphPad prism

➢ SPSS -> statistical Package for social science

➢ STATA

➢ SAS -> Statistical Analysis System.

➢ MINITAB

* إدخال المعلومات جزء مهم من كيفية الحصول على نتائج دقيقة في الأبحاث على الأنظمة المستخدمة.

- As students, you should know that even the computer and calculators can do perfectly all the numerical calculations in effectively time-manner. But you are still responsible for understanding and interpreting each statistical concept.

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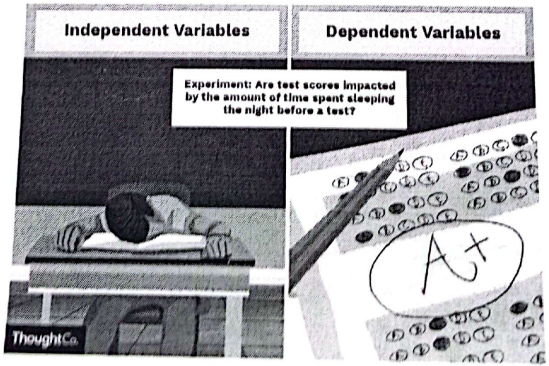
Vocabulary of Statistics

- **Dependency**: An independent variable, sometimes called an experimental or predictor variable, is a variable that is being manipulated (controllable and can be specified in advance before conducting the experiment) in an experiment in order to observe the effect on a dependent variable, sometimes called an outcome variable.
- For examples: for the effect of the concentration of amylase inhibitor on enzyme activity, inhibitor concentration is the independent variable and enzyme activity is the dependent variable.



Statistical Studies and Variables

- There are different approaches to classify statistical studies, examples of these studies are:

أكيد تفاصيل في مادة الإحصاء
عبارة عن تجميع بيانات لدراستها

- ***Observational study***: In which the researcher is merely observes the effect pf a risk factor, diagnostic test or what is happening or what has happened in the past and tries to draw a conclusion based on these observations (e.g. cohort studies, and case control studies). No intervention to the sample (non-intervention)

- ***Experimental study***: In which the researcher manipulates one of variables (or introduce an intervention) and tries to determine how the manipulation (or intervention) influences other variables. Example is Randomized Control Trials (RCT).

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