○ what is Biostatics?

The application of the mathematical tools used in statistics to the fields of biological sciences and medicine.

اذا انا استخدم الرياضات كاداة للاحصاءات
في المجالات الطبية

○ **It is a growing field with applications in many areas of biology including :**

- ○ epidemiology
- ○ medical sciences
- ○ health sciences
- ○ educational research
- ○ environmental sciences.

اللهم صل وسلم على نبينا محمد

○ Biostatistics is concerned with

الاحصاء الحيوي مختص بـ :

- ○ collection
- ○ organization
- ○ summarization
- ○ analysis

→ **data**

- ○ interpretation of the data and the communication of information about the data.

تفسير البيانات ونقل المعلومات حول البيانات

○ We seek to draw inferences about a body of data when only a part of the data is observed.نسعى إلى استخلاص استنتاجات حول مجموعة من البيانات عندما يتم ملاحظة جزء فقط من البيانات.

○ Why we need Statistics ?

علاقات، اختلافات ✓
تنبؤات، تعميم ✓

○ 1) To describe and summarize information thereby reducing it to smaller, more meaningful sets of data. وصف المعلومات وتلخيصها وبالتالي تقليلها إلى مجموعات بيانات اصغر واكثر جدوى.

○ 2) To make predictions or to generalize about occurrences based on observations. لعمل تنبؤات او لتعميم الاحداث بناء على الملاحظات

○ 3) To identify associations, relationships or differences between the sets of observations.

تحديد العلاقات والارتباطات أو الاختلاف بين مجموعات الملاحظات

○ What is Data?

○ Data are numbers which can be measurements or can be obtained by counting.

- ارقام ← قياسات
- او الحصول عليها عن طريق الحساب (العد)

• Populations vs. Samples

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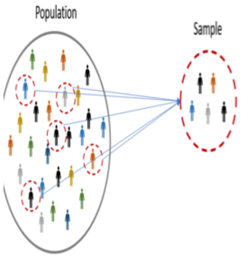
○ 1. A population

○ is the collection or set of all of the values that a variable may have. The entire category under consideration.



○ 2. A sample

○ is a part of a population. The portion of the population that is available, or to be made available, for analysis.

○ *Example*:

○ Studying the self esteem and academic achievement among college students.

- Population: all student who are enrolled in any college level.
- Sample: students' college at the University of Jordan.

○ 3.Representativeness:

○ the key characteristic of the sample is close to the population.

○ 4. Sampling bias:

○ excluding any subject without any scientific rational. Or not based on the major inclusion and exclusion criteria.

ادراج استبعاد

اي موضوع دون منطق علمي / او لا يستند الى معايير الرئيسية

ادراج استبعاد

Questions to Consider

النتيجة من البحث على مين رح تتطبق

○ ❑Reference population – to whom are the results going to be applied?

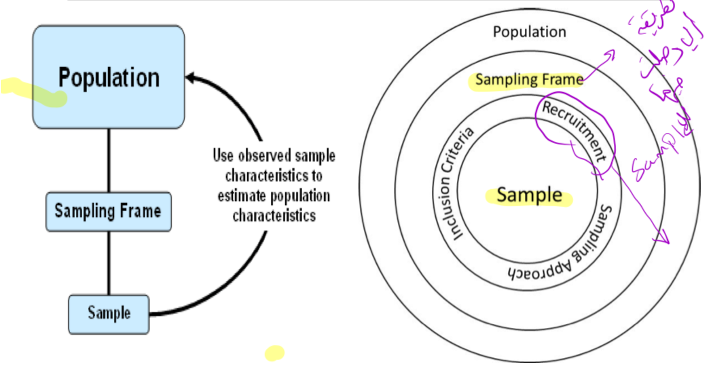
○ ❑What is the group of people from which we want to draw a sample (study population)?

○ ❑How many people do we need in our sample (Sample Size) ? ✓

○ ❑How will these people be selected(Sampling Method)?

كيف بحدد هاي الجماعة

Sampling - Populations


Population
Sampling Frame
Sample
Use observed sample characteristics to estimate population characteristics
Population
Sampling Frame
Recruitment
Inclusion Criteria
Sample
Sampling Approach
الطريقة اللي دخلت فيها ال sample

اللهم صل وسلم على نبينا محمد

Sampling ——>

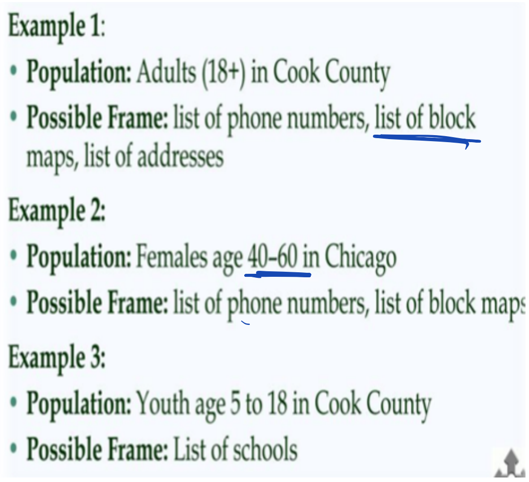
○ Element: The single member of the population (population element or population member are used interchangeably)

○ Sampling frame (Sampling Methods) :

○ 1) is the listing of all elements of a population, i.e., a list of all medical students at he university of Jordan, 2014-2016

○ 2) Sampling frame: is a listing of all the units that compose the study population.

قائمة بجميع عناصر المجتمع ، مثلاً ← قائمة بجميع طلاب الطب في الاردن



Example 1:

- Population: Adults (18+) in Cook County
- Possible Frame: list of phone numbers, list of block maps, list of addresses

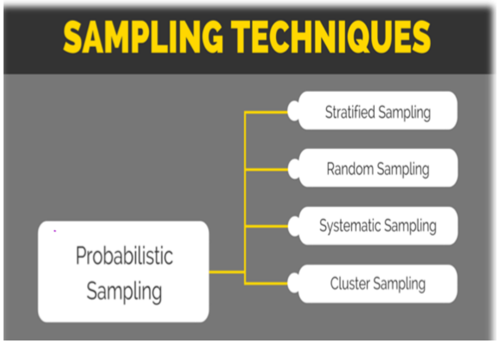
Example 2:

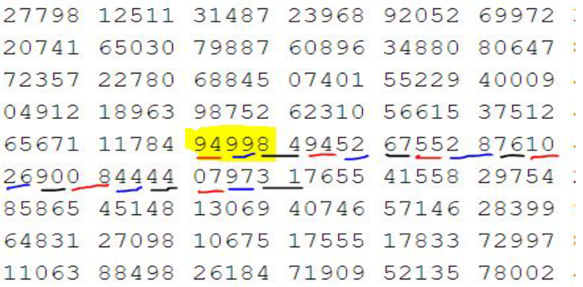
- Population: Females age 40-60 in Chicago
- Possible Frame: list of phone numbers, list of block maps

Example 3:

- Population: Youth age 5 to 18 in Cook County
- Possible Frame: List of schools

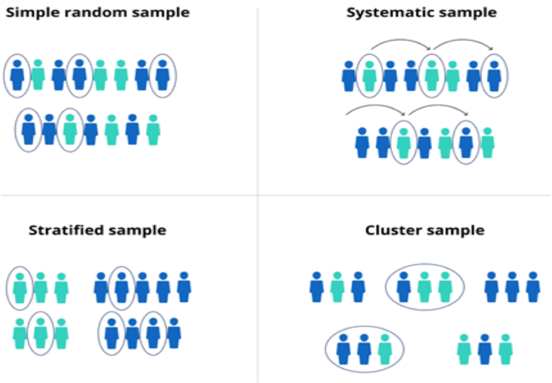
عزيزي زميلي طبيب المستقبل المشرق يفضل قبل ان تبدأ في ما تبقى ان تستعن بالله فهو خير معين ❤️و ان تتطلع على الصور بتمعن ثم الانتقال لتكمله اخر صفحه .... بالتوفيق

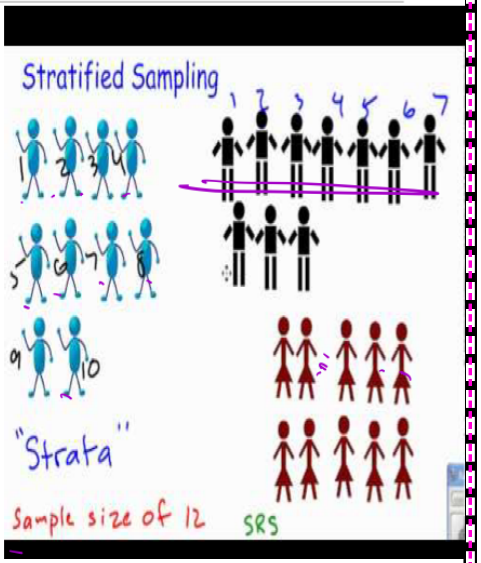

SAMPLING TECHNIQUES
Probabilistic Sampling
Stratified Sampling
Random Sampling
Systematic Sampling
Cluster Sampling

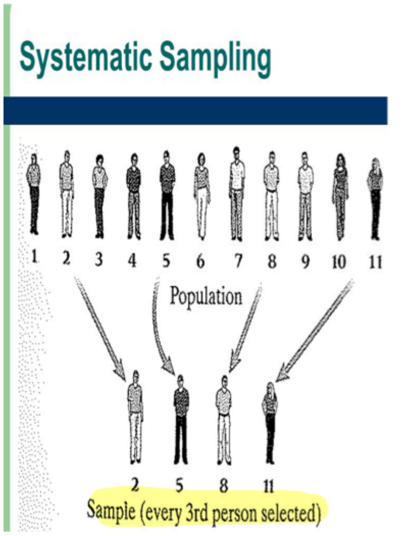


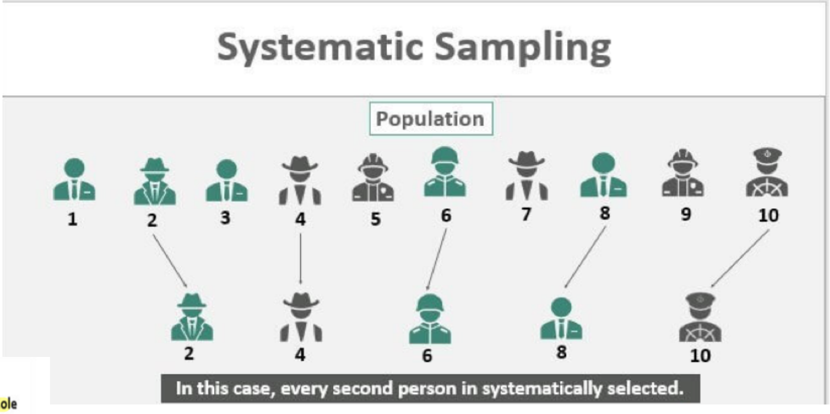
27798	12511	31487	23968	92052	69972
20741	65030	79887	60896	34880	80647
72357	22780	68845	07401	55229	40009
04912	18963	98752	62310	56615	37512
65671	11784	94998	49452	67552	87610
26900	84444	07973	17655	41558	29754
85865	45148	13069	40746	57146	28399
64831	27098	10675	17555	17833	72997
11063	88498	26184	71909	52135	78002

USING A RANDOM NUMBER TABLE TO MAKE A FAIR DECISION


Simple random sample
Systematic sample
Stratified sample
Cluster sample

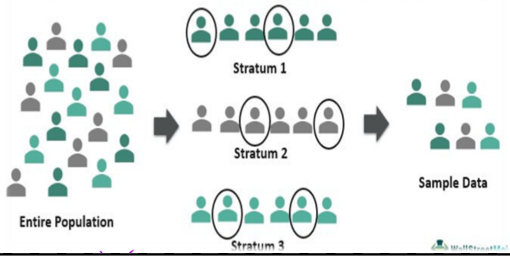

Stratified Sampling
1
2
3
4
5
6
7
1
2
3
4
5
6
7
8
9
10
"Strata"
Sample size of 12
SRS

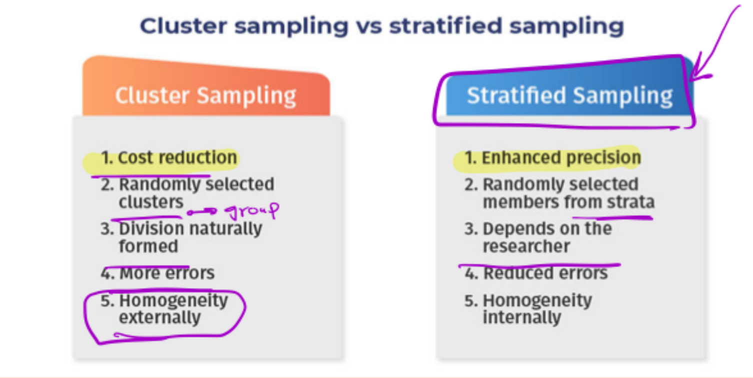

Systematic Sampling
1
2
3
4
5
6
7
8
9
10
11
Population
2
5
8
11
Sample (every 3rd person selected)


Systematic Sampling
Population
1
2
3
4
5
6
7
8
9
10
2
4
6
8
10
In this case, every second person in systematically selected.

Stratified Sampling

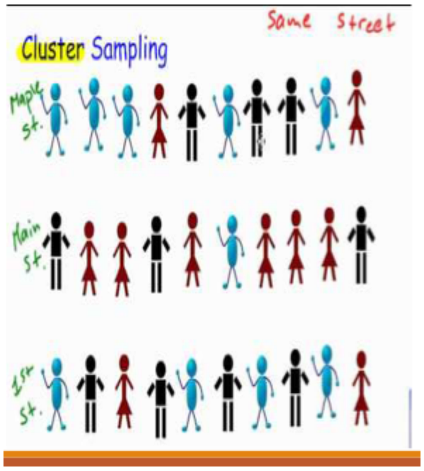
Stratified sampling, refers to random sampling techniques that clubs items of whole population into different groups called strata, based on their similar characteristics. Then, samples from each stratum are taken, whether proportionately or disproportionately.

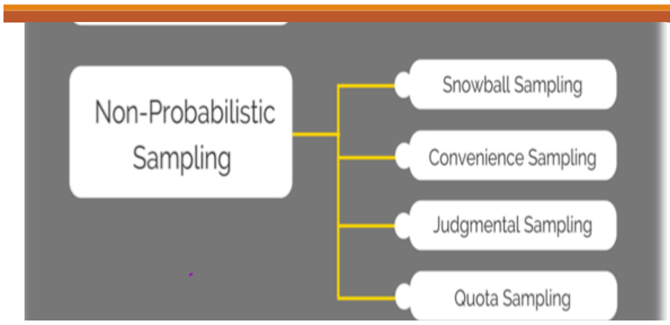

Stratum 1
Stratum 2
Stratum 3
Entire Population
Sample Data



Cluster sampling vs stratified sampling

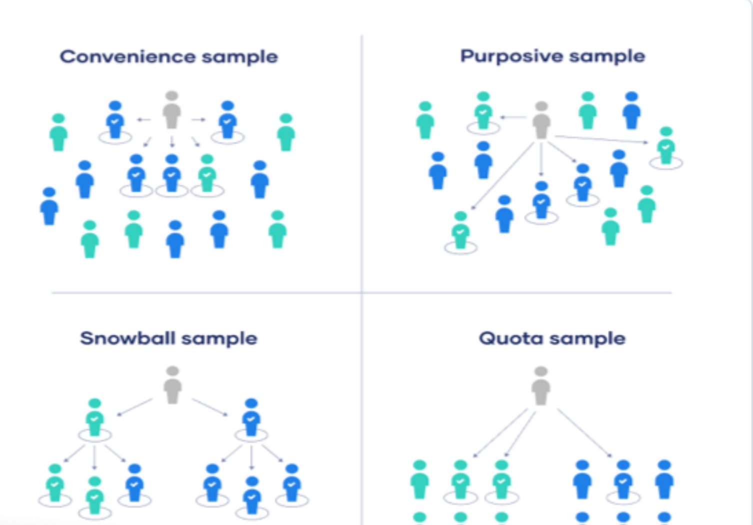
Cluster Sampling	Stratified Sampling
1. Cost reduction	1. Enhanced precision
2. Randomly selected clusters → group	2. Randomly selected members from strata
3. Division naturally formed	3. Depends on the researcher
4. More errors	4. Reduced errors
5. Homogeneity externally	5. Homogeneity internally

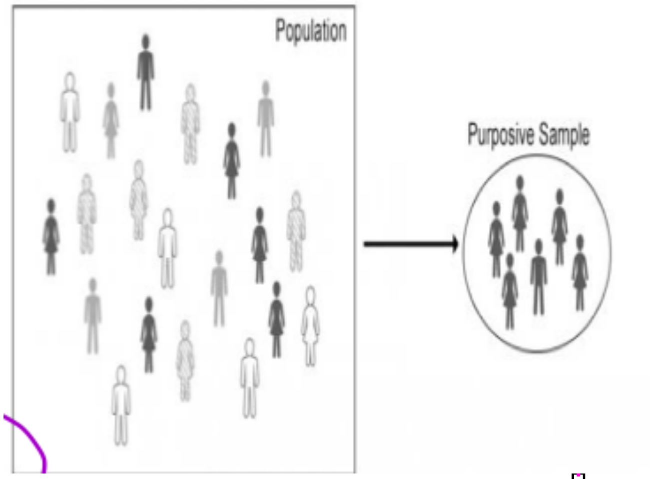

Same Street
Cluster Sampling
Maple St.
Main St.
1st St.

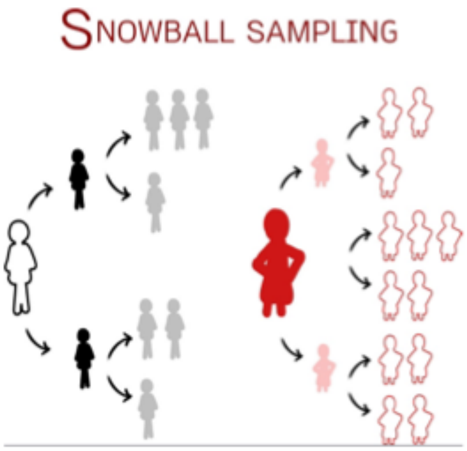


Non-Probabilistic Sampling

- Snowball Sampling
- Convenience Sampling
- Judgmental Sampling
- Quota Sampling


Convenience sample
Purposive sample
Snowball sample
Quota sample


Population
Purposive Sample


SNOWBALL SAMPLING

اللهم صل وسلم على نبينا محمد

Types of Sampling Methods

Probability Sampling

Involves the use of random selection process to select a sample from members or elements of a populations.

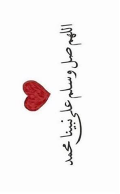
Involves random selection procedures to ensure that each unit of the sample is chosen on the basis of chance All units of the study population should have an equal or at least a knownnchance of being included in the sample

Requires a sampling frame Listing of all study units

Simple Random Sampling

- This is the simplest of probability sampling
  - ○ Make a numbered list of all units in the population
  - ○ Decide on the sample size
  - ○ Select the required number of sampling units using the lottery method بالسحب

or a random number table


اللهم صل وسلم على نبينا محمد

Systematic Sampling

Individuals are chosen at regular intervals from the sampling frame Ideally we randomly select anumber to tell us the starting point :

- ○ every 5th household
- ○ every 10th women attending ANC

Sample fractions = sample size / study of population → تستخدم لتحديد كل كم اخذ sample

Stratified Sampling

•If we have study units with different characteristics which we want to include in the study then the sampling frame needs to be divided into strata according to these characteristics

•Ensures that proportions of individuals with certain characteristics in the sample will be the same as those in the whole study population

•Random or systematic samples of predetermined sample size will have to be obtained from each stratum based on a sampling fraction for each stratum

Cluster Sampling

- Selection of study units (clusters) instead of the selection of individuals All subjects/units in the cluster who meet the criteria will be sampled.
- ○ Clusters often geographic units
- ○ e.g. schools, villages etc

Usually used in interventional studies

- ○ E.g. assessing immunization coverage

Advantages : 1) sampling frame is not required in this case 2) Sampling study population scattered over a large area

Nonprobability sampling:

the sample elements are chosen from the population by nonrandom methods.

Convenience sampling (Accidental or incidental sampling):

People may or may not be typical of the population, no accurate way to determine their representativeness

- ○ Most frequently used in health research

Advantages:

- ○ Saves time and money

قد يكون الناس أو لا يكونون نموذجيين للسكان ، ولا توجد طريقة دقيقة لتحديد مدى تمثيلهم

Snowball sampling

A method by which the study subjects assist in obtaining other potential subjects (networking)

•Useful in topics of research where the subjects are reluctant to make their identity known, Drug users, Aids patients, etc.

طريقة تساعد من خلالها موضوعات الدراسة في الحصول على موضوعات أخرى محتملة (التواصل)

• مفيد في موضوعات البحث حيث يتردد الأشخاص في الكشف عن هويتهم ، ومتعاطي المخدرات ، ومرضى الإيدز ، وما إلى ذلك.

Quota sampling

ملاءمة

In quota sampling, the sample is selected by convenience (e.g. the first 50% of males and 50% of females)

- ○ A mean for securing potential subjects from these strata → طبقات
- ○ In a quota sampling variables of interest to the researcher

(include subject attributes), such as age, gender, educational background are included in the sample

Purposive sampling

(handpicking, judgmental)

- Subjects are chosen because they are typical or representative of the accessible population, or because they are experts (more knowledgeable) in the field of research topic.
- Qualitative researchers use Purposive sampling

- **Multistage Sampling**
    - ○ Involves more than one sampling method
    - ○ Is therefore carried out in phases
    - ○ Does not require a initial sampling frame of whole population
    - ○ NEED TO KNOW SAMPLING FRAME OF CLUSTERS E.G. PROVINCES
    - ○ Require sampling frames of final clusters final clusters
    - ○ Applicable to community based studies e.g. interviewing people from different villages selected from different areas, selected from different districts, provinces