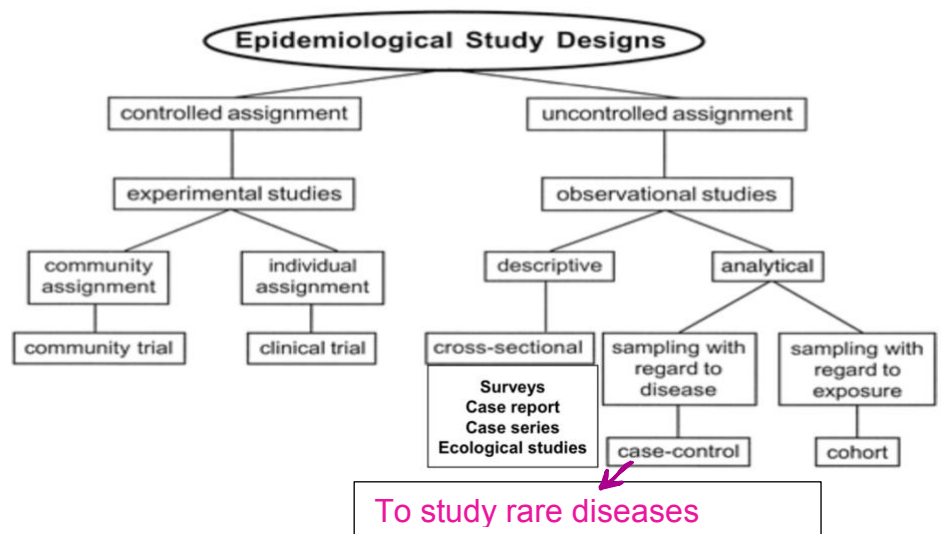


STUDY DESIGN: is a specific plan or protocol for conducting the study, which allows the investigator to translate the conceptual hypothesis into an **operational** one.



In experimental studies you should do something, apply an intervention such as changing the dose, frequency or duration. You're not just observing the patient.

1) Community assignment: talking about group of community. e.g.: program in Karak and program in Amman then compare the outcome.

2) Individual assignment: talking about group of patients.

Sampling techniques

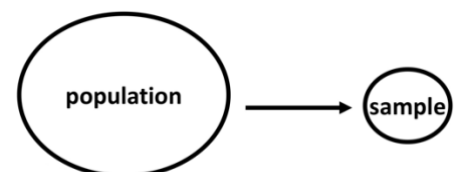
□ A Word About Sampling...

□ The **population** is all the members of the group you are researching (e.g., all youth in our city)

□ The **sample** is the selection of the population who will be asked questions (we should choose our sample correctly- be representative; otherwise, our sample will be biased)

□ To **generalize** is to state that what you say about your sample can be applied to the rest of the population.

Sampling is a process by which we study a small part of a population to make judgments about that population.



Selection of samples

Types of sampling most frequently used in health surveys

• Complete or comprehensive survey of each unit in the population (e.g., nurses in a single hospital with only 100 beds you can interview all of them, you can reach all the doctors there)

• Probability sample survey

• Systematic sampling

o Record reviews

o Studies of health care workers

• Cluster sampling. o Used in surveys of widely dispersed populations.

A study unit may be a person, a health facility, a prescription, or other such unit.

The study population, sometimes called the reference population, is the collection of the entire population of all possible study units. Again, this population may be people, health facilities, prescriptions or other such units.

A representative sample has all the important characteristics of the population from which it is drawn.

Sampling methods:

A sampling frame is a list of all of the available units in the study population. If a complete listing is available, the sampling frame is identical to the study population. The method of sampling depends on whether there is a sampling frame available. If a sampling frame exists, or if it can be created, probability sampling is used. If there is none available, probability samplings cannot be used.

•non-probability sampling a method of selecting units from a population using a subjective (i.e., non-random) method does not require a complete survey frame, it is a fast, easy and inexpensive way of obtaining data (you must avoid it throw out your career).

using non-probability methods is likely to be less representative than a probability sampling and so study results are less valid.

1. Convenience Sampling: is a method by which, for convenience's sake, the study units that happen to be available at the time of data collection are selected in the sample. This is the least representative sampling method. involves using respondents who are "convenient" to the researcher.



2. Quota sampling: is a method by which different categories of sample units are included to ensure that the sample contains units from all these categories. relies on the non-random selection of a predetermined number or proportion of unit. For example, a quota sample of patients from a health center that might include 10 patients with diabetes, 10 with diarrhea, and 10 with malaria.

Quota sampling is a method of sampling widely. Interviewers are each given a quota of subjects of specified type to attempt to recruit for example, an interviewer might be told to go out and select 20 adult men and 20 adult women, 10 teenage girls and 10 teenage boys so that they could interview them about their television viewing.

It suffers from a number of methodological flaws, the most basic of which is that the sample is not a random sample and therefore the sampling distributions of any statistics are unknown.

The main difference between quota and stratified sample: in stratified sample we look to the proportions in different parts of the sample and take the number according to the distribution of this sample, while in quota sample takes equal numbers without looking to the distribution in whole population.

Remember that we don't follow quota or convenient samples; Instead we follow probability samples.

Probability Samples

1. Simple sample

a) Make a numbered list of all units in the reference population from which you will select the sample (for example, a list of all the health centers in the country).

b) Decide on the size of the sample (say 20 facilities).

c) Choose the facilities to include by a lottery method. (For example, the numbers of all the facilities can be placed in a box and drawn, a random number table can be used, or random numbers can be generated using a spreadsheet or calculator).

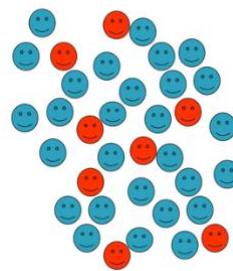
• Each element in the population has an **equal probability of selection** AND each combination of elements has an equal probability of selection

• Names drawn out of a hat

• Random numbers to select elements from an ordered list

How to select a random number?

- Flip a coin
- Choose a number from a 'hat'
- Bank note
- Calculator
- Computer
- Table of random number



2. Systematic sample: In systematic sampling, sample units are selected from a numbered list of all units in the study population by using a regular interval, starting from a random sampling starting point.

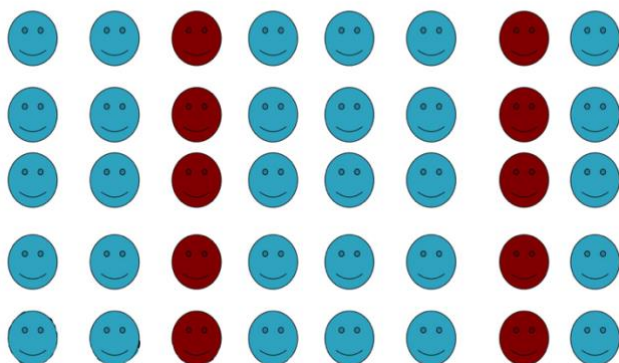
• To calculate the sampling interval: Determine the total number of units in the population

Sampling interval = number of units / desired sample size

For example, if we want to select 20 health centers from a list of 46 in our sampling frame, our sampling interval would be $46/20 = 3$.

The first facility chosen in this case can be 1, 2 or 3, which are all the possible sampling units within the first sampling interval. This is selected by choosing a random number with one digit less than or equal to the sampling interval. Later facilities are selected by adding the sampling interval to the previous result. If the first result was 3, then the next facilities selected would be facility 6, 9 and so forth. The method just described gives every unit an equal chance of being selected.

Sample 12, sampling interval = $48/12=4$



Examples

Assume you are doing a study involving children under 5. There are a total of 1500 households, and you have a required sample size of 100 children. From a preliminary study you have done, there is one child every 2.5 households. Therefore you would need to visit 100×2.5 or 250 households to find the required 100 children.
sampling interval = $1500/250=6$ (Visit every 6th household)

- select a number between 1 and the sampling interval
- add the sampling interval to the chosen starting point to obtain the second sampling unit, add the interval to the second unit

3. Stratified sample: is used when the reference population contains clearly different sub-populations, which should be considered separately.



•When stratified sampling is used, the sample frame (the list of the overall population) is sorted into two or more groups. These different strata (groups) may then be sampled either randomly or systematically.

•Basis for grouping must be known before sampling

•Select random sample from within each group

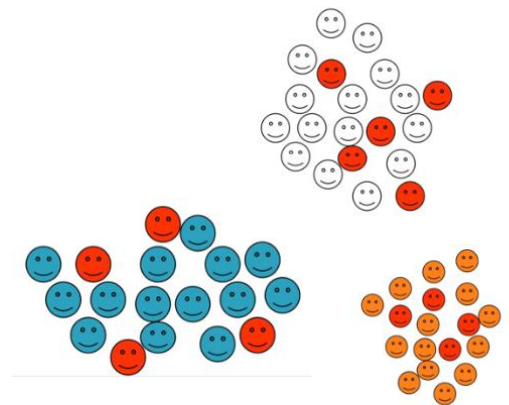
• For a given sample size, reduces error compared to simple random sampling IF the groups are different from each other

•Tradeoff between the cost of doing the stratification and smaller sample size needed for same error

• Probabilities of selection may be different for different groups, as long as they are known

• Over sampling small groups improves intergroup comparisons

researchers divide subjects into subgroups called strata based on characteristics that they share (e.g., race, gender, educational attainment). Once divided, each subgroup is randomly sampled using another probability sampling method.



4. Cluster sample: Dividing the population into subgroups called clusters (not as homogeneous as strata), randomly sampling clusters, and then possibly selecting a random sample of people in each cluster. (is a probability sampling method in which you divide a population into clusters, such as districts or schools, and then randomly select some of these clusters as your sample)

•In a cluster sample, a group of sample units is selected together, rather than each unit being selected separately.

(Sampling unit is a group of individuals) e.g.

•Households

•Health centers

•Schools

•Village

•Selection with probability proportional to size

e.g., EPI WHO sampling procedure of selecting 30 groups of 7 children is a common cluster sampling method.

•The main **advantage** of cluster sampling is that the method is easy to use and often logistically simpler to organize.

•The **disadvantage** is that the samples selected may be less representative especially when the number of clusters selected is small. As a rough guide, double the sample size if cluster sampling is used.

(not feasible to go for each center for example to collect your data, that is why we have cluster sampling & will take a sample randomly to represent the whole population)

Steps in selecting a cluster sample:

- Enumerate all population concentrations in the sampling universe
- Draw up a cumulative population list
- Determine the sampling interval
- Pick a number between 1 and the sampling interval from a random number table
- Add the sampling interval to the chosen starting point to obtain the second cluster, add the interval to the cluster
- Select individuals=sample size/number of clusters
- Design effect

Stratification is excellent (more valid) but not feasible as cluster sampling.

Stratification vs. Clustering

Stratification

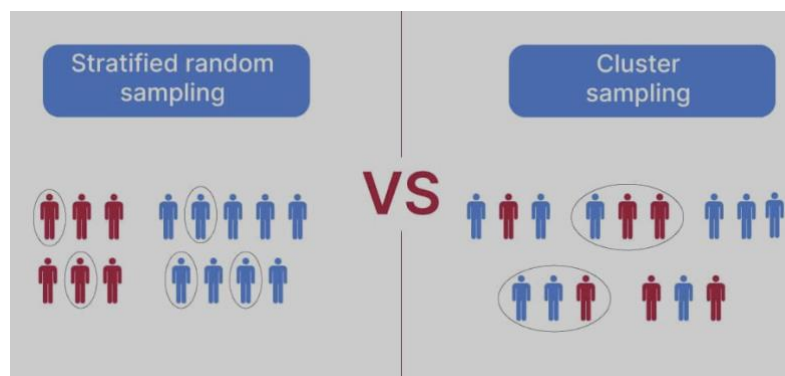
- Divide population into groups different from each other: sexes, races, ages
- Sample randomly from each group
- Less error compared to simple random
- More expensive to obtain stratification information before sampling

Less feasible than clustering

Clustering

- Divide population into comparable groups: schools, cities
- Randomly sample some of the groups
- More error compared to simple random
- Reduces costs to sample only some areas or organizations

More feasible but less representative when compared with stratified sampling



5. Complex Multi-stage sample (various kinds) (mostly used): Multistage Sampling In multistage sampling, the methods described above can be combined. For example, we might wish to select 32 health facilities in a country containing 56 districts, each of which contains a number of health facilities. From the 56 districts, 16 districts would first be selected. In each district two health facilities would then be randomly selected. This would be two-stage random sampling.

divide the population into clusters and select some clusters at the first stage. At each subsequent stage, you further divide up those selected clusters into smaller clusters and repeat the process until you get to the last step.

Example 1

□ Prevalence of stress among medical students

We have 6 universities teaching medicine & we need to look to the numbers of students in each university & the years from 1-6 then after stratifying by year we look to the prevalence stress by gender, if there is no difference just take the sample from that class or if there is a difference, we stratify each year by gender.

Example 2

□ Satisfaction of postgraduate students with studying at Jordan University

We need to split students into scientific stream and humanities for example (medicine, engineering & humanities) so we satisfy postgraduate students into 3 groups & look to the whole number of postgraduate students in JU & to the proportion of each group then take the sample. However, we need to consider in the field work that they can come in the morning, afternoon..etc. So, the sample should be taken in different times in different days otherwise, your sample will be non-representative.

Example 3

□ Prevalence of adult hypothyroidism in Jordan

Take the sample from middle, north & south and satisfied by gender as well.

•Complications rate of type II diabetes mellitus in Jordan

Some DM 2 patients will be treated at primary health care centers. Depending on researcher, the sample from where will be collected. So, if you search for complication you should go to the PHC, endocrine clinics & internal medicine.

•Stress level among medical residents at Jordan university hospital

Look at different teams & different speciality (don't forget the gender)

•Satisfaction of healthcare professionals working at Jordan university hospital

Satisfy the hospital by departments then select a sample from each one.

Thank you!

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