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Week 4 Sampling techniques

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selecting the right sample for the study

Avoid using nonprobability sampling techniques in your research, such as quota and c onvenience sampling. since you will not get the desired outcome and you will actually have trouble with the generalisability of your data if you choose an incorrect sample that is not representative.

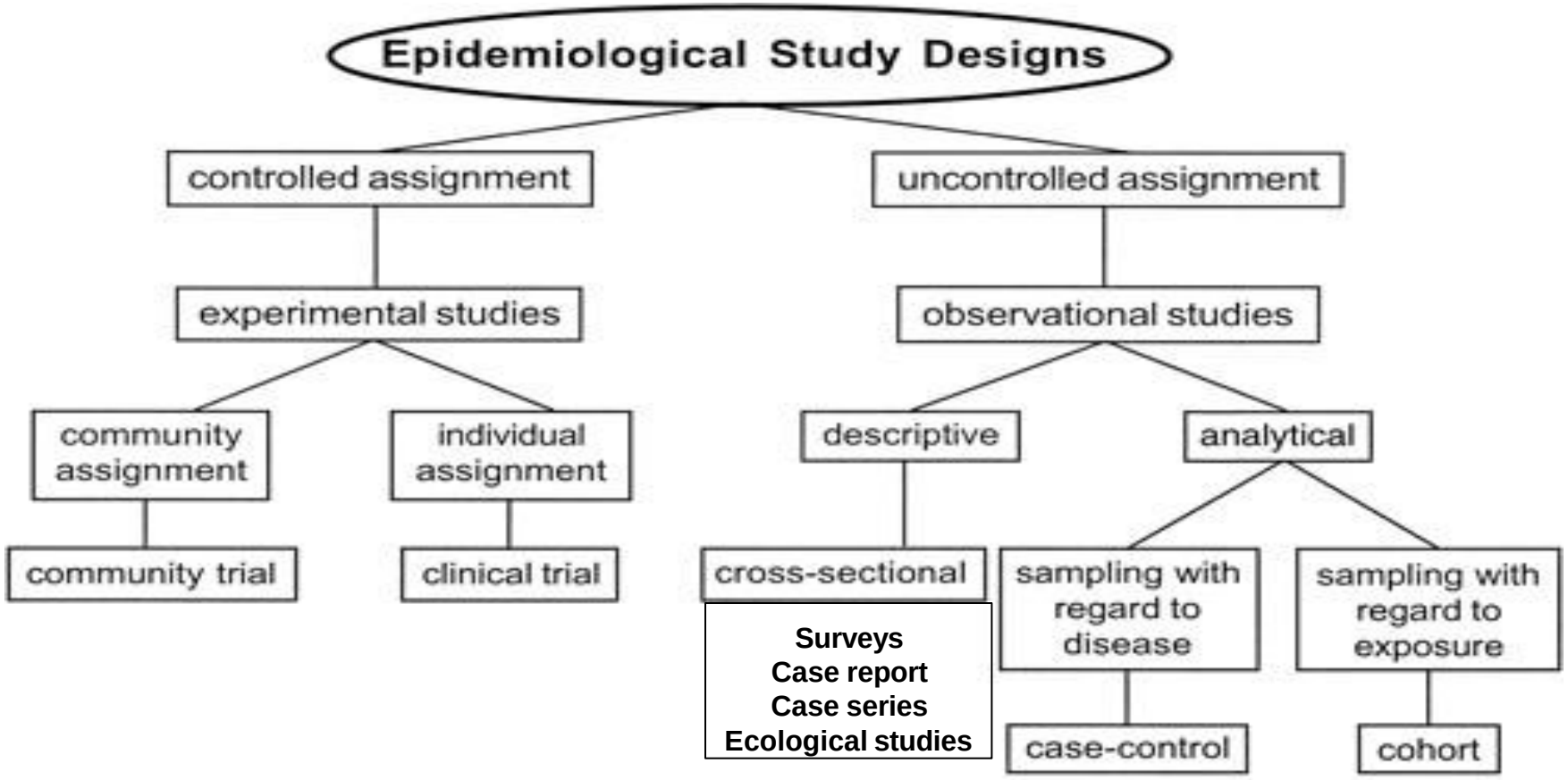
Study Design: Definition

A 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.

to translate the conceptual hypothesis into an operational one you transfer your ideas in something practical to collect data and outcomes and you test your hypothesis

This slide is essential for understanding study designs; it will be revisited in the coming weeks

Focus on two main categories of study design: controlled and uncontrolled studies .



Source: Waning B, Montagne M: *Pharmacoepidemiology: Principles and Practice*: http://www.accesspharmacy.com

Controlled Assignments:

Definition: In controlled assignments, the investigator actively implements an intervention.

Examples of Interventions:

- Modifying a medication dose.
- Introducing a new treatment.
- Altering referral timing (e.g., early referral within 48 hours for physiotherapy vs. standard referral after one or more weeks).
- Comparing different surgical methods (e.g., laparoscopic vs. open surgery).Purpose: To evaluate outcomes based on changes in intervention (e.g., dose, timing) rather than just observing the patient.

- **Types of Controlled Experimental Studies:**

Community Assignments:

Focus on groups of communities (e.g., programs to reduce smoking among teenagers in different regions like Karak and Ma'an)
Methods include community-based resources like radio ads, posters, or leaflets.

Individual Assignments:

Focus on groups of patients or individuals from the general population, comparing different treatment outcomes.

- **Uncontrolled Assignments**:
- **Definition**: The investigator does not intervene but observes existing outcomes.

- **Example**:
- Studying aspirin's impact on colorectal cancer prevention by tracking patients already using aspirin for other conditions (e.g., ischemic heart disease) over 10-20 years.
- Purpose: Allows for observation of natural outcomes without changing the dose or regimen.

- Types of uncontrolled studies next slide

Observational Studies:

- Discussed in greater detail next week.
- **Types of Descriptive Studies**:
  - **Cross-sectional Studies**:
    - Assess the prevalence of conditions or risk factors at a specific point in time.
  - **Case Reports & Case Series**:
    - Case report: Focuses on a single patient case.
    - Case series: Involves a group of similar patient cases.
  - **Ecological Studies**:
    - Identify correlations between factors (e.g., red meat consumption and colorectal cancer).
  - **Descriptive analysis)person ,place, time)**
  - **Surveys**
- **Limitations**: Generally, escriptive studies don't assess causation or risk-factor relationships.
- **Purpose**, sisehtopyh a etareneg :

Analytical Studies:

- **Purpose**: Evaluate cause-and-effect relationships.
- **Examples**:
  - **Cohort Studies**:
  - Risk factor --> disease
    - Follow groups with and without certain risk factors (e.g., smokers vs. non-smokers) over time to assess disease incidence (e.g., ischemic heart disease, diabetes).
    - Calculate relative risk between groups.
  - **Case-Control Studies**:
  - Disease ---> risk factor
    - Useful for rare diseases.
    - Select cases with a specific condition (e.g., coronary heart disease in children) and compare to a control group to understand associated risk factors without lengthy follow-up.We then examine the risk factors in both groups and calculate the odds ratio. We'll explore this in more detail in the coming weeks.

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

- **Examples for more clarification**

•A population includes all the individuals being studied.

•For example, if I want to conduct research on medical students at Jordan University, my population would consist of all the university's medical students. **Ideally, I would include every student in the study**, as that would give the most accurate picture. However, **including everyone is often impractical**. So, **instead**, we **choose a sample that accurately represents the population**. Selecting the right sample is essential; otherwise, our results may be biased and lack validity.

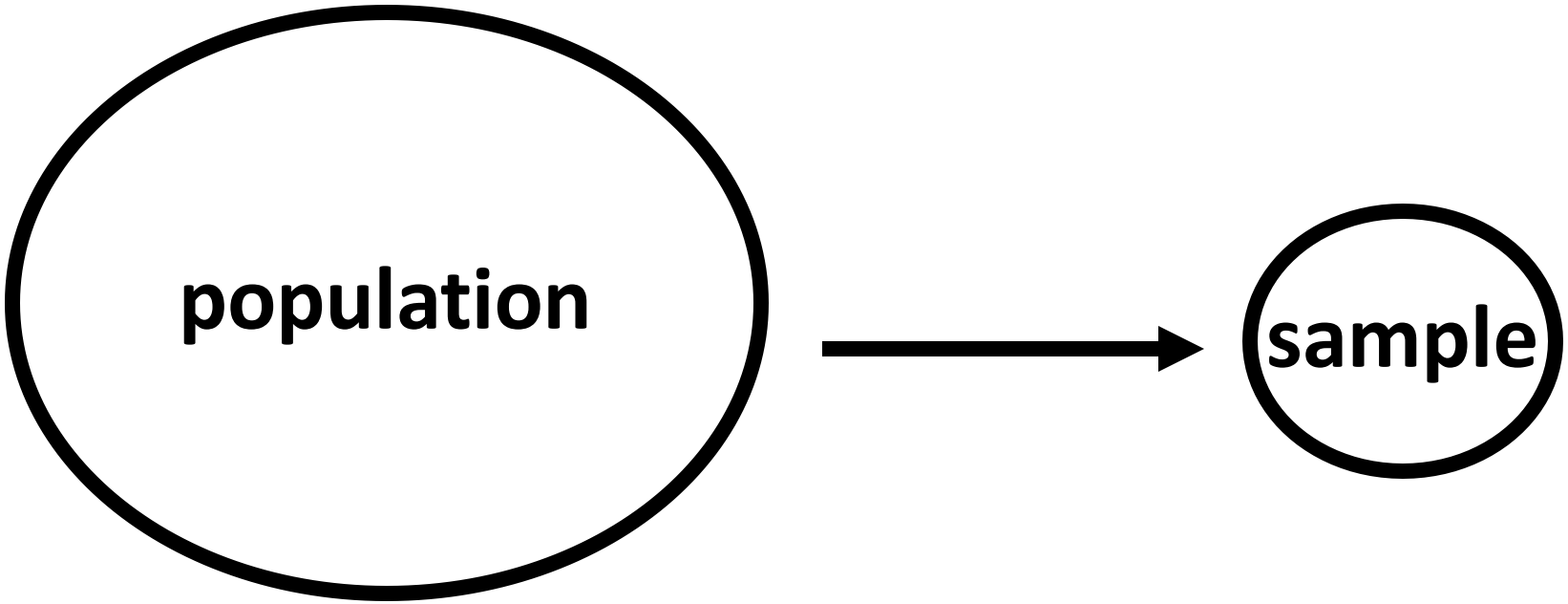
•Ideally, we would study the entire population, but in practice, that's often impossible. For instance, if we wanted to study the prevalence of illnesses among all adults in Jordan, interviewing and taking blood samples from the entire adult population (over 7-8 million people) would be unfeasible. Instead, we select a sample that reflects the general population.

•**Using proper sampling techniques is crucial for generalizing our findings**. If we choose a sample that doesn't represent the population, our results will be inaccurate. For example, if we conducted a study in a village where the average age is 55 or 60, we might find that 60% of residents have type 2 diabetes. However, this result would be misleading if generalized to all of Jordan, as the village's age distribution doesn't match that of the broader population.

•Similarly, if I conducted a survey on research participation among Jordanian medical students but only surveyed first- and second-year students, I might find a participation rate of 5%. This result would likely be biased, as it excludes fourth-, fifth-, and final-year students, whose participation might be significantly higher. Thus, this sampling choice would distort the overall findings.

Sampling

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)**

  for example, conducting a survey in a small hospital with just 100 beds, where you can interview all the nurses, reach every doctor, and speak to all the pharmacists on staff

- **Probability sample survey**
  - **Systematic sampling**
    - **Record reviews**
    - **Studies of health care workers**
  - **Cluster sampling**
    - **Used in surveys of widely dispersed populations**

Definitions

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

For example, you are reviewing antibiotic prescriptions at primary healthcare centers in Jordan. Here, we are not focusing on individuals, but rather on the prescriptions themselves

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.

The sampling frame is a concept **you need to understand thoroughly**, as it serves as the **roadmap for your research. Mastering it will enable you to design sampling techniques for your own studies in the future.**

For example, in our 2016–2017 cross-sectional study on the prevalence of hypo- and hyperthyroidism in Jordan, we divided the country into northern, middle, and southern regions. From each of these regions, we gathered a sample that included both urban and rural areas. In the North, we further divided urban areas into four sections (north, middle, south, and east), and then applied a cluster sampling method due to the large number of villages in Irbid, gathering data accordingly. We followed the same approach in Amman and Al-Karak.

To develop your own sampling plan, you need to outline the entire process, step-by-step, detailing how you will collect your sample from start to finish.

Temporal Classification of Survey Research

Non-probability sampling

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

One key practice to **avoid** in your career is **non-probability sampling**. This method can lead to biased results and lacks representativeness, making it unsuitable for generalizing findings.

- **Example 1**: If you're studying complications of type 2 diabetes and decide to gather data from patients at an endocrine clinic on a single day, you might find that 60% of them have complications. However, generalizing this result is inaccurate because the sample doesn't represent the broader diabetic population.

- **Example 2**: Suppose you're studying postgraduate student satisfaction at Jordan University. If you only survey students entering the university at the main gate on a specific day, you'll likely miss students who arrive later, on weekends, or those from different faculties. This limited sampling won't accurately reflect the views of the entire postgraduate population.

- **Example 3**: For research on breastfeeding practices, if you visit primary healthcare centers only on a Tuesday, you may find an 80% breastfeeding rate. However, this sample misses working mothers who typically visit in the afternoons or on Saturdays. To capture a representative sample, you'd need to survey at different times and on different days.

In short, for representative and valid results, ensure your sample reflects all relevant groups, times, and settings

NON -PROBABILITY SAMPLING METHODS

- 1. Convenience Sampling
  - is a method by which, for convenience 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.

- you gather data from **easily accessible subjects rather than a truly representative group**.
- **For example**, if you're studying patient satisfaction with outpatient care at Jordan Hospital and you only survey people waiting at the main pharmacy, you're assuming they represent all outpatients. However, this sample may not accurately reflect the experiences of all patients, as it's limited to those who happen to be at that specific location.

NON -PROBABILITY SAMPLING METHODS

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. For example, a quota sample of patients from a health center that might included 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.

•**Quota sampling** is a form of non-probability sampling that closely resembles convenience sampling, with a key distinction. In quota sampling, you aim to **include specific subgroup**s within your sample, but **without considering the overall distribution** of these subgroups in the population.

•**For example:**
•If you want to study outpatient satisfaction at Jordan Hospital, you might decide to survey 10 patients each with diabetes, diarrhea, and bronchial asthma in the pharmacy queue. However, this approach overlooks the actual proportion of these conditions among all patients. Out of 100 patients seen in the last two hours, there might be 50 with diabetes, only five with asthma, and five with ischemic heart disease. **This lack of alignment with the real distribution leads to a sample that doesn't represent the true patient population.**
•Similarly, if you're studying research participation among medical students, you might choose 20 students each from first, second, third, and final years without checking the actual proportion of students in each year. **In contrast**, with **stratified sampling** (a probability sampling method), you would align the sample to match population proportions. For instance, if first-year students make up 20% of the total medical student population of 3,000, they would represent 20% of your sample.

•The main difference, therefore, is that **stratified sampling considers the distribution of subgroups within the population**, making it a probability-based approach suitable for accurate representation, while **quota sampling does not account for this distribution** and may lead to biased results.

Types of Probability Samples

To ensure valid and representative results, we should agree to avoid using convenience or quota sampling. Instead, we'll rely on **probability sampling methods**, which include

- **Simple Random**
- **Systematic Random**
- **Stratified Random**
- **Random Cluster**
- **Stratified Cluster**
- **Complex Multi-stage Random**

(various kinds)

In fact, most medical research uses **multi-stage sampling**, as it combines multiple sampling methods in a step-by-step approach to ensure comprehensive representation. This method helps us achieve an accurate and balanced sample, which is essential for high-quality research.

1. Simple Random Sampling-1

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).

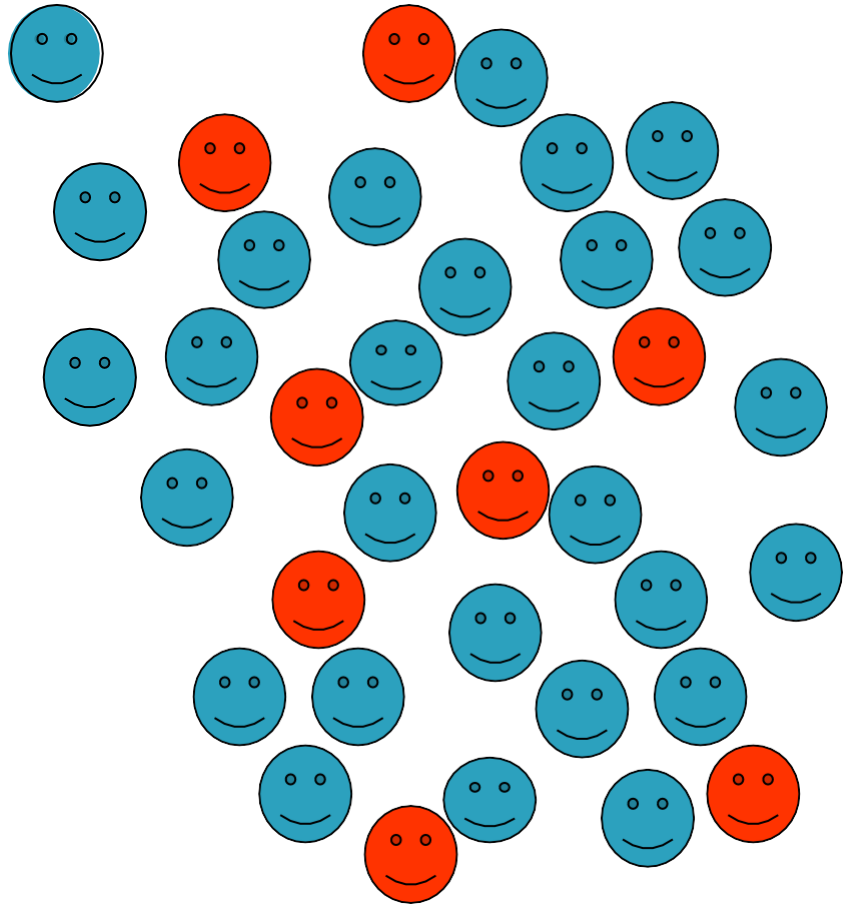
b) Decide on the size of the sample (say 20 facilities).

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.)

- **For example,** if there are 100 students in a class and I want to gather opinions on this lecture, I could randomly pick 10 or 20 students by drawing names from a hat or using a random number generator.

Simple Random Sampling-2

- **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**

Nowadays, various software programs simplify random sampling, especially when selecting a subset from a larger group. For instance, if you need to select 15 out of 100 subjects, you can use analytical programs like **Stata** to generate random selections. By entering your parameters (e.g., 100 total subjects, needing 15 selections), the program will randomly assign subjects like "1, 15, 20, 21," **ensuring each has an equal chance of being picked**.

This method is commonly used in clinical trials, where randomization is crucial to assign patients fairly across different intervention groups. The key is to ensure that every individual, whether a student in a classroom or a patient in a study, has an equal opportunity to be chosen, thus minimizing bias in the selection process.

2. Systematic Sampling

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**
- **Determine the sampling interval** $= \dfrac{\text{number of units}}{\text{desired sample size}}$

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.

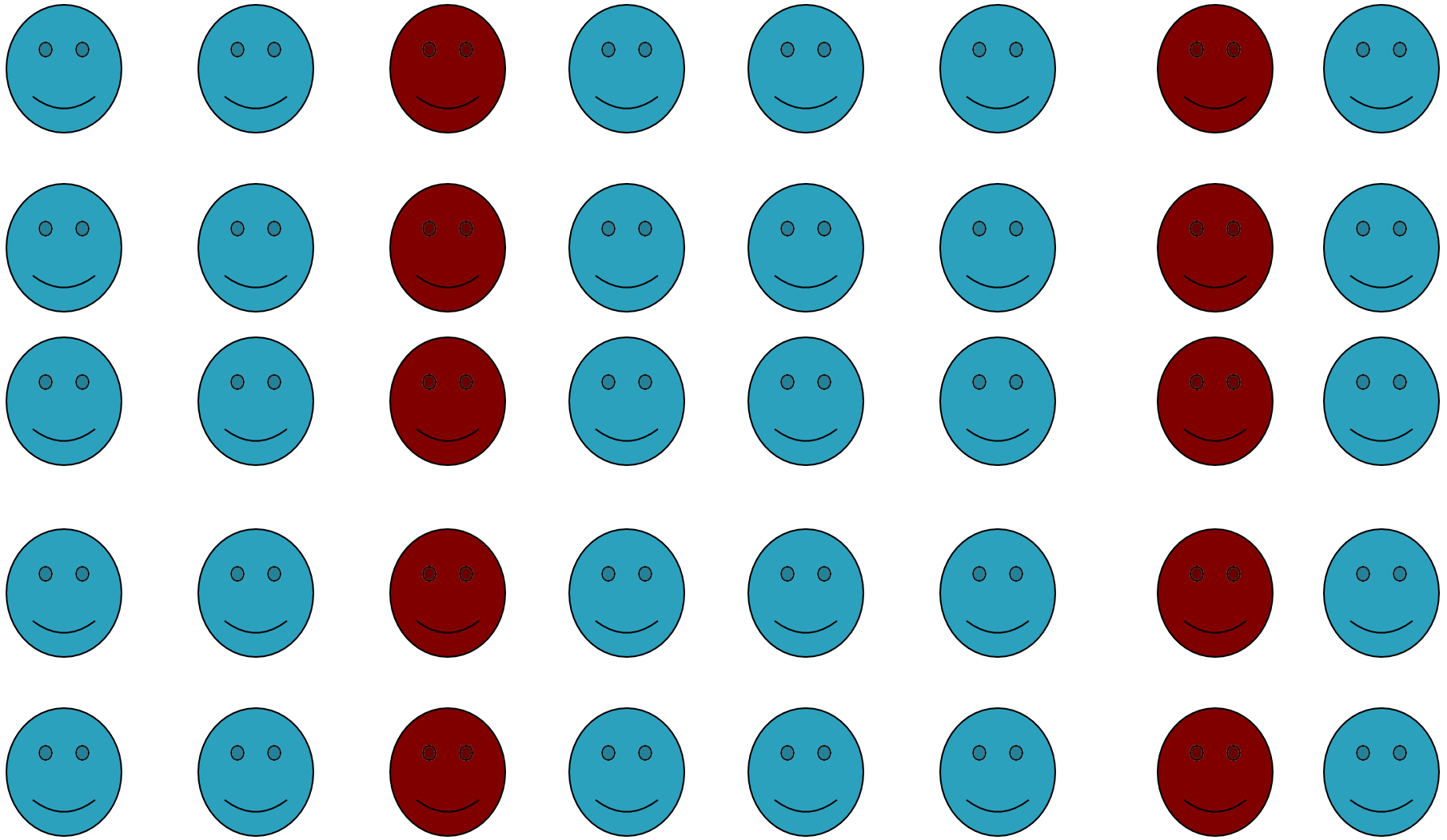
Instead of manually writing all names, you determine a sampling interval by dividing the total population by the desired sample size. Examples:

• if there are 100 students and you want to select 10, you divide 100 by 10, resulting in an interval of 10. You could start with the first student and then select every 10th student after that—student 1, 11, 21, 31, and so on.

• if you need to select 20 health centers from a list of 46, you divide 46 by 20, giving an interval of approximately 3. Starting with the first health center, you would then choose every 3rd one: 1, 4, 7, 10, 13, and so on. This method is straightforward and ensures a consistent selection across the population.

•For a **door-to-door approach** on Street X, where we need to select 5 apartments out of 20, we could use a systematic sampling method. Starting with apartment 1, we'd select every 4th apartment, resulting in a sequence like: apartment 1, 5, 9, and 14. If apartment 14 is unavailable or unreachable, we would simply move to the next, apartment 15, and continue adding 4 until we've reached our desired sample of 5 apartments. This approach allows flexibility if certain units are unavailable, ensuring that the sample can still be completed systematically.

Sample 12, sampling intreval=48/12=4



Example:

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 100X2.5 or 250 households to find the required 100 children.

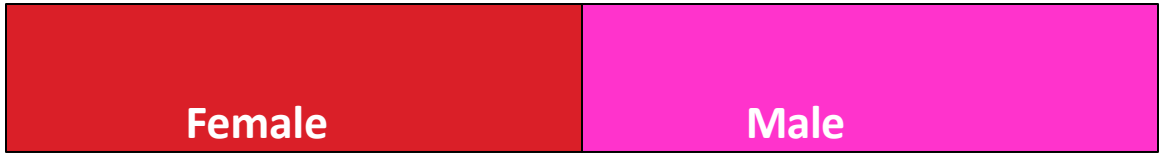
sampling interval=1500/250=6 (Visit every 6th household)

- **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 ….**

So we will go to no. 1,7,13,19,25…..

3. Stratified Sampling-1

- **Stratified sampling 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**

•**Stratified sampling is crucial to understand, as it ensures that each subgroup within a population is proportionally represented in a sample.** Imagine it as creating a pie chart, where each slice corresponds to a specific demographic in your study.

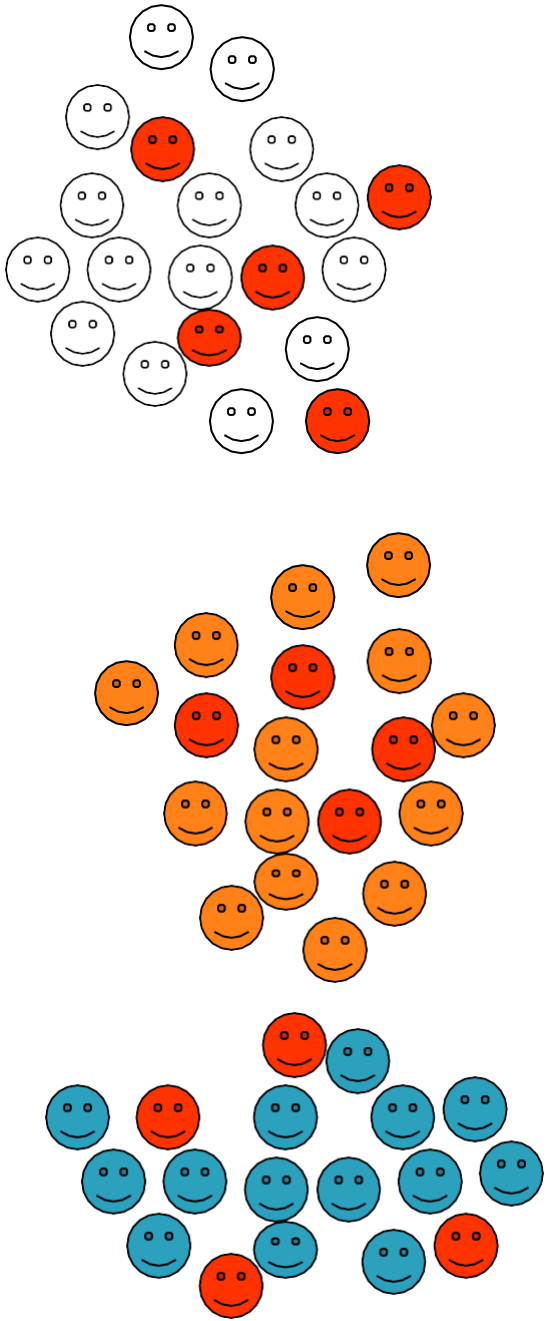
- For example, in a class with 70 females and 30 males (total 100 students), if we want a sample of 10 students, we would include 7 females and 3 males, preserving the same gender distribution as in the class.
- In a study on medical students' research participation across academic years (from year 1 to year 6), we first assess the distribution of students in each year. For example, if year 1 has 200 students out of a total of 1,000 (20%), then 20% of our sample would come from year 1. We would repeat this process for each academic year, ensuring that our sample accurately reflects the population's composition.
- When assessing staff satisfaction at a hospital with departments such as Surgery, Internal Medicine, and OB-GYN, we calculate the proportion of staff in each department relative to the total. For instance, if Surgery makes up 15% of the staff, we would include 15 staff members from Surgery in a sample of 100, replicating the distribution across all departments.

•**Stratified sampling is especially useful when dealing with factors like gender, age, or health status that significantly influence the study.**

- For example, hypothyroidism prevalence is often higher among females. If we conduct a study comparing hypothyroidism rates in two regions, Irbid and Ma'an, but with varying gender proportions in each sample, gender becomes a confounding factor that could skew our results. In this case, stratifying the sample by gender helps balance these differences.
- Suppose we're studying research participation rates among medical students and literature shows differences between male and female students. In that case, we stratify by gender to capture this difference accurately. If 60% of students in a particular year are female, and we need a sample of 40 students, we would select 24 females and 16 males. This way, we maintain the 60% female and 40% male distribution within the sample, ensuring accurate representation ,
- if there is no differences between male and female for example, so we do not stratify based on gender and pick them randomly

Stratified Sampling-2

- For a given sample size, reduces error compared to simple random sampling IF the groups are different from each other
- Tradeoff (b a l a n c e) 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



4. Cluster Sampling

- **Cluster sampling: 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.**

- **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.

•For a study on iron deficiency anemia in primary schools in Irbid, let's consider that there are around 300 primary schools in the area**. Ideally, we would collect samples from all 300 schools**, but this **isn't always feasible. Instead, with cluster sampling, we treat these schools as units or clusters rather than focusing on individual students.**

•In this approach, we apply simple random sampling to the schools as whole units. Out of the 300 schools, we **might randomly select 10 schools** to include in the study, **with each school serving as a distinct unit**, which makes it more practical to gather data from selected clusters across Irbid.
•**If we consider geographic variation**, we can further refine our sampling by first distinguishing between the main city and surrounding villages. For instance, in the main city, there might be 100 schools, and we would **randomly select five of these**. **Similarly**, we could select a random sample from the **villages.**
•In a **more detailed breakdown**, Irbid could be divided into regions—north, east, south, and west. Within each region, we would select a proportionate number of schools based on the total in that area. For example, if the eastern part of Irbid has 40 primary schools, we might randomly select three or four schools from this cluster. This **ensures that our sample represents the distribution of schools across the various areas of Irbid.**

- **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.**

For instance, if I have a sample of 200 schools, I'll collect data from each school based on the number of students enrolled there. However, it may not be feasible to gather data from all 300 schools. Similarly, for a study on vaccination in Jordan, where there are around 700 primary healthcare centers, covering every center would be impractical.
If the study is focused on different regions (e.g., north, central, and south Jordan), in the central region with around 200–250 primary healthcare centers, cluster sampling becomes beneficial. By randomly selecting 20 centers from these, we can represent the central region effectively without visiting each one.
Additionally, in cases like Amman, with towns and villages around it, we might stratify the sample by dividing it into northern, southern, eastern, and central sections, then select clusters from each area for a comprehensive representation.

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**

To conduct your study, it’s essential to divide your population strategically. For example, if you're researching primary healthcare centers or schools across Jordan, using cluster sampling becomes important because it makes the study more manageable and practical.

While stratification is an excellent and highly valid approach that reduces error more effectively, it may not be feasible for large populations. Cluster sampling, on the other hand, allows for easier data collection across widespread groups, making it a more practical choice despite potentially introducing a slightly higher margin of error compared to stratified sampling.

Stratification vs. Clustering

Stratification	Clustering
• 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	• 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. 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.

Multistage sampling combines multiple sampling methods, including simple random sampling, stratified sampling, cluster sampling, and systematic sampling, **to efficiently gather representative data.**

For example, if we want to study iron deficiency anemia in 200 primary schools, we would begin by stratifying Jordan into northern, central, and southern regions. Focusing on the northern region, we might then further stratify Irbid into four sub-regions. In one sub-region, say North Irbid, with 30 primary schools, we would randomly select four schools as clusters.
Within each selected school, we would further stratify by grade level, from class one through class six. If, in class one, there are four sections (A, B, C, and D), we could then choose a class as a subgroup and select a sample of 10 students from a section. **If we want to account for gender differences in iron deficiency prevalence, we would further stratify into male and female students.**
I**f no difference in prevalence is expected between genders, we could select 10 students randomly from the section using either simple random sampling** (e.g., by drawing names or seat numbers) **or systematic sampling.** For systematic sampling, if the class has 40 students and we need 10, we would set a sampling interval by dividing 40 by 10 (resulting in an interval of 4). We would then select students at intervals: for example, students numbered 1, 5, 9, 13, and so on.

In summary, multistage sampling allows us to start with broad geographic or administrative stratification, apply cluster sampling within those strata, and then move to targeted selection within schools and classrooms to ensure a diverse and representative sample

Example 1

- Prevalence of stress among medical students

- We have six universities offering medical programs, and we need to examine the student population across each university. First, we'll categorize students by year, from first through sixth year. After stratifying by year, we'll assess stress prevalence by gender. If no gender differences are found, we'll take the sample from the class as a whole. However, if there are differences in stress prevalence by gender, we will further stratify students in each year by gender.

Example 2

- Satisfaction of postgraduate students with studying at Jordan University

To ensure a representative sample of postgraduate students, we begin by dividing them into major academic streams, such as scientific (which includes fields like medicine and engineering) and humanities, creating distinct groups. Within the scientific stream, we further stratify based on specific faculties—such as medicine, nursing, rehabilitation, and pharmacy—so that each subgroup's representation aligns with its actual proportion within the overall student population. Once sample sizes are determined, fieldwork scheduling must be planned to cover all time frames that students might be available. This includes conducting visits across various times and days, ensuring that morning, afternoon, and evening classes are all accounted for, as well as weekend schedules if necessary. For example, on a university schedule, we might visit on Sunday morning, then Monday afternoon, and Wednesday evening, repeating this cycle to capture a comprehensive sample. Similarly, for a study on patient satisfaction in an emergency department, ensuring representativeness would require visiting during different shifts (A, B, and C) across various weekdays, including weekends (Friday and Saturday), to capture data on all types of patient and family experiences.

Example 3

- Prevalence of adult hypothyroidism in Jordan

We conducted the sampling across the three main regions of Jordan: north, middle, and south. Additionally, we stratified the sample by gender to ensure representation from both male and female participants.

Complications rate of type II diabetes mellitus in Jordan

- When considering patients with type 2 diabetes, hypertension, or bronchial asthma, it's important to note that they will be treated across various sectors, including Primary Healthcare (PHC), the Ministry of Health (MOH), private medical services, and Jordan University Hospitals.
- If your study is focused on the complication rates of type 2 diabetes, you need to clarify whether you are targeting patients from all healthcare sectors, or just from a specific sector, such as the Ministry of Health. For example, if you are focusing on MOH patients, you would need to define inclusion criteria specific to this group, such as those with insurance coverage. At tertiary clinics, such as Basheer Hospital, you would find patients with more severe complications. In contrast, patients with well-controlled or mild type 2 diabetes are typically seen by Primary Healthcare Physicians, who may only refer them to specialists like endocrinologists or internists once a year or every other year.
- In Jordan, approximately 50% of type 2 diabetes patients are seen by Primary Healthcare Physicians, 10% by Family Physicians, 30% by Internists, and 10-15% by Endocrinologists. To ensure your sample is representative, it should be divided according to these categories. If your sample is mainly from endocrinology clinics, you are likely to see a higher complication rate. However, if your sample is primarily from Primary Healthcare centers, the complication rate may be lower, as these patients tend to have better control over their condition and do not require specialized care.
- In summary, it's crucial to understand the nature of the disease, where the patients are being treated, and how to obtain a representative sample for your study. The approach for studying rheumatoid arthritis or hypertension patients should follow a similar logic: define your target patient group, understand where they are being treated, and ensure your sample reflects this distribution.

Stress level among medical residents at Jordan University Hospital

we have stress level among medical resents we need to have to look at different years and different specialities and take the sample from there and if there is a difference by gender we need to look at the stratified sample by gender

Satisfaction of healthcare professionals working at Jordan University hospital

this is very important we need to stratify the hospital by department and then to select a sample from each department and maybe you can stratify the sample of each Department by for example physician or a nurse and then you decide then you collect your sample

سِر.. لا يكفّكَ عن مسيركَ طولُ
فالسيرُ في دربِ الوصولِ وصولُ!

VERSIONS	SLIDE #	BEFORE CORRECTION	AFTER CORRECTION
V1→ V2			
V2→V3			

امسح الرمز و شاركنا بأفكارك لتحسين أدائنا !!