

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



السلام عليكم ورحمة الله وبركاته

Biostatistics

LIX

SAMPLING METHODS

Part 2

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PROBABILITY SAMPLING

- **Simple Random Sampling,**
- **Systematic Random Sampling,**
- **Stratified Random Sampling,**
- **Cluster Sampling**
- **Multistage Sampling.**
- **Multiphase sampling**

- Simple Random Sampling,
- Systematic Random Sampling,
- Stratified Random Sampling,
- Cluster Sampling
- Multistage Sampling.
- Multiphase sampling

SYSTEMATIC SAMPLING

- ❑ • Sampling with system.
- ❑ By using predefine system :
 - ❖ Identify population size .
 - ❖ Identify sample size .
 - ❖ Identify predefine system we need 10th 8th . every **kth element**
 - In this case, **$k = (\text{population size} / \text{sample size})$** .
 - ❖ **Chose first No. By using random digit .**
 - ❑ **It is important** that the starting point is not automatically the first in the list, but is instead randomly chosen from
 - ❖ **within** the first to the **kth** element in the list.
 - ❖ Use predefine system to collect 2nd 3rd K No.
 - ❖ then selecting elements at **regular intervals** through that ordered list.
 - ❖ Collect the sample size

SYSTEMATIC SAMPLING

• All elements have the same probability of selection (in the example given, one in ten). It is not 'simple random sampling' because different subsets of the same size have different selection probabilities - e.g. the set $\{4, 14, 24, \dots, 994\}$ has a one-in-ten probability of selection, but the set $\{4, 13, 24, 34, \dots\}$ has zero probability of selection



SYSTEMATIC SAMPLING

N = 100

want n = 20

$N/n = 5$

**select a random number from 1-5:
chose 4**

start with #4 and take every 5th unit

1	26	51	76
2	27	52	77
3	28	53	78
4	29	54	79
5	30	55	80
6	31	56	81
7	32	57	82
8	33	58	83
9	34	59	84
10	35	60	85
11	36	61	86
12	37	62	87
13	38	63	88
14	39	64	89
15	40	65	90
16	41	66	91
17	42	67	92
18	43	68	93
19	44	69	94
20	45	70	95
21	46	71	96
22	47	72	97
23	48	73	98
24	49	74	99
25	50	75	100

SYSTEMATIC SAMPLING

• **ADVANTAGES:**

- Sample easy to select
- Suitable sampling frame can be identified easily
- Sample evenly spread over entire reference population

• **DISADVANTAGES:**

- Sample may be biased if hidden periodicity in population coincides with that of selection.
- Difficult to assess precision of estimate from one survey.

STRATIFIED SAMPLING

By using well define stratum

- Simple Random Sampling,
- Systematic Random Sampling,
- Stratified Random Sampling,
- Cluster Sampling
- Multistage Sampling.
- Multiphase sampling

• Where population enclose(put in), a number of distinct categories,

the frame can be organized into separate "strata.

" Each stratum is then sampled as an independent sub-population, out of which individual elements can be randomly selected.

• Every unit in a stratum has same chance of being selected.

• Using same sampling fraction for all strata ensures proportionate representation in the sample.



Cont. ...STRATIFIED SAMPLING

- Simple Random Sampling,
- Systematic Random Sampling,
- Stratified Random Sampling,
- Cluster Sampling
- Multistage Sampling.
- Multiphase sampling

- **Adequate representation of minority subgroups** of interest can be ensured by stratification & varying sampling fraction between strata as required.
- Finally, since each stratum is treated as an independent population, **different sampling approaches** can be applied to different strata.

STRATIFIED SAMPLING

Draw a sample from each stratum

Women



Men



Table No1 distribution of the total sample size (286) T2DM patients on six CHC centers according to the original CHC centers attendance.

	Number of DM patients/year	Percentage	Sample
Tafilah (ALqasaba)Center	3840	34%	97
Basira Center	2196	19%	54
ALQadisiyah Center	1032	9%	26
ALHassa Center	2280	20%	57
ALAyes Center	1176	10%	29
Ain Al Bayda Center	936	8%	23
Total	11460	100%	286

$$3840/11460= 0.34$$

$$0.34 \times 286 = 97$$

Stratified R.S.

By using well define stratum :

- ❖ Identify the **variable** that we need .
- ❖ Identify the **population size** .
- ❖ Identify the **sample size** .

- ❖ **Dived population** into well define non overlapping group or subgroup (**stratum**) .

- ❖ **Chose** from each stratum No. of observation **randomly** (or sample size) **that is proportional** to its original size .

- ❖ **Collect** the total sample size, this will include the right proportion .

Stratified Sampling



Population



Strata



Sample



- Simple Random Sampling,
- Systematic Random Sampling,
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CLUSTER SAMPLING

- Cluster sampling is an example of 'two-stage sampling' .
- **First stage** a sample of **areas** is chosen;
- **Second stage** a sample of **respondents within those areas** is selected.

- A **Population** is divided **into clusters** of homogeneous units, usually based on geographical contiguity.

- **Sampling units are groups** rather than individuals.
- A sample of such clusters is then selected.
- **All units** from the selected clusters are studied.

Cont.CLUSTER SAMPLING

- **Two types of cluster sampling methods.**

- **One-stage sampling.**

All of the elements within selected clusters are included in the sample.

- **Two-stage sampling.**

A **subset of elements** within selected clusters are **randomly select selected for** inclusion in the sample

- Simple Random Sampling,
- Systematic Random Sampling,
- Stratified Random Sampling,
- Cluster Sampling
- **Multistage Sampling.**
- Multiphase sampling

MULTISTAGE SAMPLING

- The Complex form of cluster sampling in which two or more levels of units are embedded one in the other.
- **First stage, a random number of districts** chosen in all states.
- Followed by a **random number of villages.**
- **Then third** stage **units will be houses**

table 3.1: distribution of the total sample size (500) of mutah university students according to the original population of each chosen faculty

faculty	original size N	percent	sample size
Medicine	2620	0.055×2620	144
nursing	658	0.055×658	37
law	945	0.055×945	52
sport	1215	0.055×1215	67
science	1632	0.055×1632	90
engineering	1989	0.055×1989	110
total	9059		500

First stage categorizing all the 12 governorates in Jordan into three geographic regions

North (Irbid, Ajloun, Jerash, and Al-Mafraq), **Central** (Al-Balqa, Amman, Al-Zarqa, and Madabah), the **South** (Al-Karak, Al-Tafilah, Ma'an, and Al-Aqaba)

Second stage, one governorate from each region was chosen by simple random sampling technique

North : **Irbid** Center : **Amman** South : **Al-Karak**

Third stage, all hospitals in each chosen Governorate were categorized, Then the **Governmental hospitals** were chosen randomly

Irbid (Abu Obaida, Princess Raya, **Princess Rahma** , Al-Ramtha, Al-Yarmouk, Moaz bin Jabal)

Amman (**Al Bashir**, Dr. Jamil Al-Tutanji, Al-Karama, **Prince Hamzah**)

Al-Karak (Ghor Al Safi , **Al-Karak governmental**)

Fourth stage: a systematic random sample was applied for participating collect



The first participant was chosen blindly from the patient's list attending, then using the sampling interval, the sampling interval repeatedly until the last participant on the list. Until the required sample from each hospital have been collected.

Each participant had been **interviewed face to face** directly by the researcher. Using **well constructed validated and reliable** questionnaire. This questionnaire composed of (52 items) **four sections**.

NON-PROBABILITY SAMPLING

NON PROBABILITY SAMPLING

- Any sampling method where some elements of population have **no chance** of selection
- or where **the probability of selection can't be accurately determined.**

It involves the selection of elements based on assumptions regarding the population of interest, which forms the criteria for selection.

QUOTA SAMPLING

- The population is first **segmented** into **mutually exclusive sub-groups**, just as in stratified sampling.
- Then judgment used to **select subjects** or units from each segment based **on a specified proportion**.
- For example, an interviewer may be told to **sample 200 females** and **300 males** between the age of 45 and 60.
- It is **this second step which makes the technique one of non-probability sampling**.
 - In quota sampling the selection of the sample **is non-random**.

Cont. ..Quota Sampling

- In quota sampling the selection of the sample **is non-random**.
- For example interviewers might be tempted to interview those who look **most helpful**.
The problem is that these samples may be **biased because not everyone gets a chance** of selection.

This random element is its **greatest weakness** and quota versus probability has been a matter of controversy for many years

CONVENIENCE SAMPLING

- Also known as **grab** (grasp) or **opportunity** sampling or **accidental** عرضي or **haphazard** sampling.
- ❖ • Involves the **sample** being drawn from that part of the population which is **close to hand**.
- ❖ That is, readily **available**
- ✓ and convenient مريح.
- ❑ • The researcher using such a sample
- ❖ **cannot scientifically** make generalizations about the total population from this sample because it would
- ❖ **not be representative** enough.

Examples,

- if the interviewer was conducting a survey at a shopping center early in the morning on a given day, the people that he/she could interview would be limited to those given there at that given time, which would not represent the views of other members of society in such an area, if the survey was to be conducted at **different times of day** and **several times per week**.
- a student working on a project ask an entire class to fill out a survey.
- A researcher standing outside a bank asking customers what they think about bank's service. Those who thinks the bank service is poor would be doing business elsewhere.

CONVENIENCE SAMPLING

- Use results that are easy to get



SNOWBALL SAMPLING

Existing **study subjects** are used to **recruit** more subjects into the sample

JUDGMENTAL OR PURPOSIVE SAMPLING

- ❖ The researcher chooses the sample **based on** who they
- ❖ think would be **appropriate** for the study.

This is used primarily when there is a limited number of people that have expertise in the area being researched

SAMPLING PROCESS

- The sampling process comprises several stages:
 1. Defining the population of concern
 2. Specifying a **sampling frame**, a set of items or events possible to measure
 3. Specifying a **sampling method for** selecting items or events from the frame
 4. Determining the **sample size**
 5. Implementing the **sampling plan**
 6. Sampling and **data collecting**
 7. Reviewing the **sampling process**

Cont. ..STRATIFIED SAMPLING

- Using same sampling fraction for all strata ensures proportionate representation in the sample.
- Adequate representation of minority subgroups of interest can be ensured by stratification & varying sampling fraction between strata as required.
- Finally, since each stratum is treated as an independent population, different sampling approaches can be applied to different strata.

Thank you!