# Sample and sampling unit 5

Foundation of nursing research fifth edition by Rose Marie Nieswiadomy

Essentials of Nursing Research Appraising Evidence for Nursing Practice. 7th edition 2010. By DENISE F. POLIT

Objectives :

1. Define Population and sample.

2. Distinguish between target population and accessible population .

3. Discus the main sampling methods.

4. Discus factors to be considered in deciding the size of the sample.

# Populations

A population is the <u>entire</u> <u>aggregation</u> of cases(elements) in which a researcher is interested.

Populations are not restricted to human subjects.

A population might consist of all the hospital records on file in a particular hospital, all the blood samples taken from clients of a health maintenance Organization etc.

The population for a study is composed of two groups – the target population and the accessible population.

The **target population is the entire population** in which a researcher is interested.

The **accessible population is composed of** cases from the target population that are accessible to the researcher as study participants.

For example:

the researcher's target population might be all diabetic patients in Basra, but, in reality, the population that is accessible might be diabetic patients in a particular clinic.

# Strata

Populations consist of subpopulations, or **strata. Strata are mutually exclusive segments** of a population based on a specific characteristic.

For example:

a population consisting of all nurses in the **Basra** could be divided into two strata based on gender (males & females).

Alternatively, we could specify three strata consisting of nurses younger than 30 years of age, nurses aged 30 to 45 years, and nurses 46 years or older.

Strata are often used in sample selection to enhance the sample's representativeness.

## **Variables,**

**A variable,** is something that varies.

Weight, anxiety, and body temperature are all variables—each varies from one person to another.

Most quantitative researchers seek to understand how or why things vary, and to learn how differences in one variable are related to differences in another.

For example:

lung cancer research is concerned with the variable of lung cancer, which is a variable because not everybody has this disease.

Researchers have studied factors that might be linked to lung cancer, such as cigarette smoking.

Smoking is also a variable because not everyone smokes.

**A variable, then, is any quality of a person, group, or situation that varies or takes on different values—typically, numeric values.**

# Samples and Sampling methods

## Sampling

Is the process of selecting a portion of the population to represent the  entire population

## Sample

**is a subset of population elements.**

**In** nursing research, the elements (basic units) are usually humans. Researchers work with samples rather than with populations because it is more economical and practical to do so.

Samples are chosen through two types of sampling procedures probability and nonprobability.

# PROBABILITY SAMPLING

Probability sampling involves the random selection of elements from a population.

## A random selection process:

is one in which each element in the population has an equal, independent chance of being selected.

The four most commonly used probability sampling designs are simple random, stratified random, cluster, and systematic sampling

## Simple Random Sampling:

**Simple random sampling is the most basic probability sampling design that ensures each element of the population has an equal and independent chance of being chosen.**

the word simple does not mean easy or uncomplicated. In fact ,simple random sampling can be quite complex and time consuming, especially if large sample is desired.

In simple random sampling, researchers establish a **sampling frame, the technical** name for the list of population elements.

<span style="color:red">Example :</span>

- If nursing students at the University of Basra were the accessible population, then a (list) of those students would be the sampling frame.

After the sampling frame is developed , a method must be selected  to choose the sample . slips of papers representing each element could be place in hat and the sample selected by reaching in and drawing out as many slips of paper as desired size of the sample

the most commonly used  and accurate procedure for selecting a simple random sample is through the use of a **table of random numbers.**

A table of random numbers   include a group of numbers that has been generated in such a manner that there is no sequencing of the numbers. Today these tables are generated through the use of computers. These tables are found in many texts on statistics

Samples selected randomly in such a fashion are not subjected  to researcher biases.

- **Advantages**

1- little knowledge of population is needed

2- most unbiased of probability methods

3- Easy to analyze data and compute errors

- **Disadvantages**

1-A complete list of the population is necessary

2- Time consuming

3- Expensive

# **Stratified Random Sampling**

stratified random sampling divides the population into homogeneous subgroups, or strata , according to some variables of importance to the research study . after the population is divided into two or more strata , a simple random sample is taken from each of these subgroups .

Stratification is often based on such demographic attributes as age, gender and educational background .

Researchers may sample either **proportional stratified sampling** (involve obtaining a sample from each stratum that is in proportion to the size of the stratum in the total population) or **disproportional stratified sampling** (involve obtaining a sample from each stratum that is not in proportion to the size of the stratum in the total population ).

If a population of students in a nursing school in the United States consisted of 10% African Americans, 5% Hispanics, 5% Asians, and 80% whites, a proportionate sample of 100 students, stratified on race or ethnicity, would consist of 10, 5, 5, and 80 students from the respective strata.

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Researchers often use a disproportionate sample whenever comparisons between strata of unequal size are desired. In our example, the researcher might select 20African Americans, 10 Hispanics, 10 Asians, and 60 whites to ensure a more adequate representation of the viewpoints of the racial minorities

- **Advantages**

1- Increases probability of sample being representative

2-Assure adequate number of cases for subgroups

- **Disadvantaged**

1- Required accurate knowledge of population

2- may be costly to prepare stratified lists

3- Statistics more complicated

# Systematic Sampling

**Systematic sampling is the selection of every** *case from a list. By dividing the population* size by the desired sample size, the researcher establishes the **sampling interval, which is the** standard distance between the selected elements. such as every 10th person on a patient list..

Systematic sampling designs can be applied in such a way that an essentially random sample is drawn

For instance, if we wanted a sample of 50 from a population of 5,000, our sampling interval would be 100 (5,000/50  100). In other words, every 100th case on the sampling frame would be sampled.

Next, the first case would be selected randomly (e.g., by using a table of random numbers).

If the random number chosen were 73, the people corresponding to numbers 73, 173, 273, and so forth would be included in the sample.

Systematic sampling conducted in this manner is essentially identical to simple random sampling and often is preferable because the same results are obtained in a more convenient manner

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 |

- **Advantages**

1- Easy to draw sample 2- Economical 3- Time saving technique

- **Disadvantages**

1- Sample may be biased if ordering of the population is not random

2-Afer the first sampling element is chosen, population members no longer have equal chance of being chosen

# Part 2

# Nonprobability Sampling

In **nonprobability sampling,** researchers select elements by nonrandom methods.

Non random methods of sampling are more likely to produce a biased sample than the random methods.

In fact in non probability sampling ,certain elements of the population may have no chance of being included in the sample . This restricts the generalization that can be made about the study.     .

yet most nursing research involve this type of sampling procedure . True random samples are rare in nursing research. The most frequent reasons for use nonprobability samples involve convenience and desire to use available subject.

Methods of nonprobability sampling in quantitative studies are convenience, quota, and purposive

**<span style="color:red">Convenience Sampling:</span>**

**Convenience sampling also referred as accidental or incidental <u>involves</u>** choosing readily available people or objects for the study .these elements may or may not be typical of the population . However convenience sampling has probably been the most frequently used sampling method in nursing research. They are used because of the saving money and time

- Stopping people at a street corner to conduct an interview is sampling by convenience.

- Sometimes , researchers seeking people with certain characteristics place an advertisement in a newspaper, put up signs in clinics or supermarkets, or post messages in chat rooms on the Internet.

- A faculty member who distributes questionnaires to nursing students in a class is using a convenience sample, or an **accidental sample, as it is sometimes** called.

These approaches are subjected to bias

**Snowball sampling** (**also called network sampling or chain sampling**)

**Is a type of convenience** sampling in which subjects provide the names of other people they know to meet the criteria for the study.

With this approach, early sample members are asked to identify and refer other people who meet the eligibility(suitability) criteria. This method of sampling is often used when the research population is people with specific traits who might otherwise be difficult to identify (e.g., people who are afraid of hospitals).

# Quota Sampling

Quota sampling divides the population into homogeneous strata (subpopulations) to ensure representation of the subgroups in the sample; within each stratum , subjects are sampled by convenience.

Quota sampling is similar to stratified random sampling in the first step . The difference that stratified random sampling involve random sampling method of obtaining sample members, whereas quota sampling obtains members through convenience sample.

# Purposive Sampling

In **purposive (or *judgmental) sampling, participants are hand-picked to be** included in the sample based on the researcher's knowledge about the population..

Researchers might decide purposely to select subjects who are judged to be typical of the population or particularly aware about the issues under study.

This method can be used to advantage in certain situations. For example, purposive sampling is often used when researchers want a sample of experts.

# Sample Size

**Sample size—the number of subjects in a sample—is a major issue in conducting** and evaluating quantitative research. No simple equation can determine how large a sample is needed, but quantitative researchers often strive for the largest sample possible. The larger the sample, the more representative it is likely to be. Every time researchers calculate a percentage or an average based on sample data, the purpose is to estimate a population value. The larger the sample, the smaller the sampling error.

**Some factors to be considered are**

1-homogeneity of the population, if the population is very homogeneous or alike on all variables other than the one being measured, a small sample size may be sufficient .

2- the degree of precision desired by the researcher . if the researcher wants to be very precise in generalization to the population based on sample data, a large sample may be necessary for the sample to represent the population accurately.

3- the type of sampling procedure . When probability sampling methods are used, smaller are required when non probability sampling methods are employed .

A key consideration in assessing a sample in a quantitative study is its **representativeness—** the extent to which the sample is similar to the population and avoids bias.

# Sampling bias

**Sampling bias refers to the systematic overrepresentation or** underrepresentation of some segment of the population.

Sampling bias occurs when samples are not carefully selected by the researcher.

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## Sample error

Is the difference between data obtained from samples and data that should be obtained if an entire population was studied. This error is related to chance and not under the researcher control.

Random assignment involve the unbiased assignment of subjects into groups in experimental studies.

While random sampling concerns selection of a sample from population.