**EXAMINING POPULATIONS AND SAMPLES IN RESEARCH**

**Understanding Sampling Concepts**

A sample is the selected group of people or elements in a study. The sample selected should represent an identified population, or a particular group of individuals or elements, that is the focus of the research.

Sampling theory was developed to determine the most effective way of acquiring a sample that accurately reflects the population under study.

The individual units of the population and sample are called elements. An element can be a person, event, object, or any other single unit of study. When elements are persons, they are referred to as participants or subjects.

The target population is the entire set of individuals or elements who meet the sampling criteria. An accessible population is the portion of the target population to which the researcher has reasonable access.

In quantitative studies, researchers obtain a sample from the accessible population with the goal of generalizing the findings from the sample to the accessible population and then, more abstractly, to the target population.

Sampling criteria include the list of characteristics essential for eligibility or membership in the target population. The sample is selected from the accessible population that meets these sampling criteria.

Sampling criteria for a study may consist of inclusion or exclusion sampling criteria, or both. Inclusion sampling criteria are the characteristics that the subject or element must possess to be part of the target population. Exclusion sampling criteria are those characteristics that cause a person or element to be excluded from the target population.

**Representativeness of a Sample in Quantitative and Outcomes Research**

Representativeness means that the sample, the accessible population, and the target population are alike in as many ways as possible.

In quantitative research, representativeness is evaluated in terms of the setting, characteristics of the subjects, and distribution of values on variables measured.

Measurement values in a study often vary randomly among subjects. Random variation is the expected difference in values that occurs when different subjects from the same sample are examined. As sample size increases, random variation decreases, improving representativeness.

Systematic bias occurs when the selected subjects differ in some specific way from those of the population. It can also occur when a large number of persons decline to participate in a study or a large number of subjects withdraw or are lost from a study.

For everyone in the accessible population to have an opportunity for selection in the sample, each person in the population must be identified. To accomplish this, the researcher must acquire a list of every member of the population, using the sampling criteria to define eligibility. This list is referred to as the sampling frame.

In quantitative research, a sampling plan—outlining the strategies the researchers will use to obtain the study sample—is developed to increase the representativeness of the target population and to decrease systematic bias and sampling error.

**Probability Sampling Methods**

In probability sampling, each person in a population has an opportunity to be selected for a sample, increasing the sample’s representativeness of the target population. This decreases systematic bias and increases validity.

The common probability sampling methods used in nursing research include simple random, stratified random, cluster, and systematic sampling.

Simple random sampling is the most basic of the probability sampling plans. It is achieved by randomly selecting elements from the sampling frame. Common methods rely on a computer program or table of random numbers.

Stratified random sampling is used in situations when the researcher knows that specific variables in the population, such as age, gender, socioeconomic status, and diagnosis, impact representativeness. To ensure all levels of the identified variables are adequately represented, researchers divide the population into smaller groups that achieve the same degree of representativeness, then sample from the smaller group.

In cluster sampling, a researcher divides the entire population into clusters or groups, such as cities, institutions, or units, with which elements of the identified population can be linked. The researcher then selects a random sample of these clusters and proceeds to use all observations in the selected clusters in the sample.

When an ordered list of all members of the population is available, systematic sampling can be used with the researcher selecting every individual on the list, using a randomly selected starting point.

**Nonprobability Sampling Methods Used in Quantitative Research**

In nonprobability sampling, not every element of a population has an opportunity to be selected for the sample.

The five nonprobability sampling methods most frequently used in nursing research are convenience, quota, purposeful, network, and theoretical sampling.

Convenience sampling, used frequently in quantitative, qualitative, and outcomes studies, provides a way to conduct studies on nursing interventions when researchers are unable to use probability sampling methods.

As part of some quasi-experimental studies, subjects are randomly assigned to groups. This random group assignment is a design strategy; it does not alter the risk of biases resulting from convenience sampling but it does strengthen the equivalence of the study groups.

Quota sampling, commonly in quantitative and outcomes research, is similar to stratified random sampling and overcomes some of the disadvantages of convenience sampling. The goal is to sample in a manner that replicates proportions of subgroups present in the target population, particularly of subjects likely to be underrepresented in a typical convenience sample, such as females; minority groups; and the elderly, poor, rich, and undereducated.

**Sample Size in Quantitative Studies**

Factors to consider in making decisions about sample size in quantitative studies include the type of study, number of variables, sensitivity of the measurement tools, data analysis techniques, and expected effect size.

The sample size must be large enough to identify relationships among variables or to determine differences between groups.

Power is the study’s capacity to detect differences or relationships that actually exist in the population or the capacity to correctly reject a null hypothesis.

The adequacy of the sample size is evaluated using a power analysis.

In power analysis, effect size, level of significance (alpha = 0.05), and standard power (0.8 or 80%) are used to determine sample size. The larger the sample size and the effect size, the greater the power to detect relationships and differences.

The effect size indicates the size of the difference between the groups. When the effect size is small, detecting it is more difficult and requires larger samples.

**Sampling in Qualitative Research**

Qualitative sampling methods are fundamentally different from quantitative sampling methods. Since the intent of qualitative research is an in-depth understanding of a phenomenon, sampling in qualitative research focuses more on selecting information-rich cases or participants who researchers believe will provide them the best study data.

With purposeful sampling, the researcher consciously selects certain subjects, elements, or incidents to include in the study. Purposive sampling is the best way to gain insights into a new area of study, discover new meaning, or obtain in-depth understanding of a complex experience, situation, or event.

In network sampling, researchers purposely find a few participants who meet set criteria, then ask their assistance in finding others with similar characteristics.

Theoretical sampling, most frequently used with grounded theory research, is used to develop a selected theory. The researcher gathers data from any person or group able to provide relevant, varied, and rich information for theory generation.

**Sample Size in Qualitative Studies**

The depth of information needed to gain insight into a phenomenon, describe a cultural element, develop a theory, describe an important health care concept, or understand a historical event determines the number of people, sites, artifacts, or documents sampled.

Important factors to consider in determining sample size for qualitative studies include the scope of the study, nature of the topic, quality of the data collected, and design of the study.

The number of participants in a qualitative study is adequate when saturation and verification of information is achieved. Saturation occurs when additional sampling provides no new information or is redundant with previously collected data. Verification occurs when researchers are only able to further confirm hunches, relationships, or theoretical models.

**Research Settings**

The selection of a setting is based on the purpose of the study, the accessibility of the setting(s) or site(s), and the number and type of participants or subjects available in the settings. Three common settings for conducting research are natural, partially controlled, and highly controlled.

A natural, or field setting, is an uncontrolled, real-life situation or environment. The researcher does not manipulate or change the environment for the study.

A partially controlled setting is an environment that is manipulated or modified in some way by the researcher.

A highly controlled setting is an artificially constructed environment developed for the sole purpose of conducting research. This setting reduces the influence of extraneous variables, which enables researchers to examine accurately the effects of independent variables on dependent variables.