

# Sample size in quantitative research

Sample size will affect the significance of your research.

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**YOU'VE** probably been asked (or have asked) the question: How many subjects do I need for my research study? That's your sample size—the number of participants needed to achieve valid conclusions or statistical significance in quantitative research. (Qualitative research requires a somewhat different approach.

In this article, we'll answer these questions about sample size in quantitative research: Why does sample size matter? How do I determine sample size? Which sampling method should I use? What's sampling bias?

## Why does sample size matter?

When sample sizes are too small, you run the risk of not gathering enough data to support your hypotheses or expectations. The result may indicate that relationships between variables aren't statistically significant when, actually, they are. You also may be missing subjects who might give a different answer or perspective to your survey or interview. Samples that are too large may provide data that describe associations or relationships that are due merely to chance. Large samples also may waste time and money.

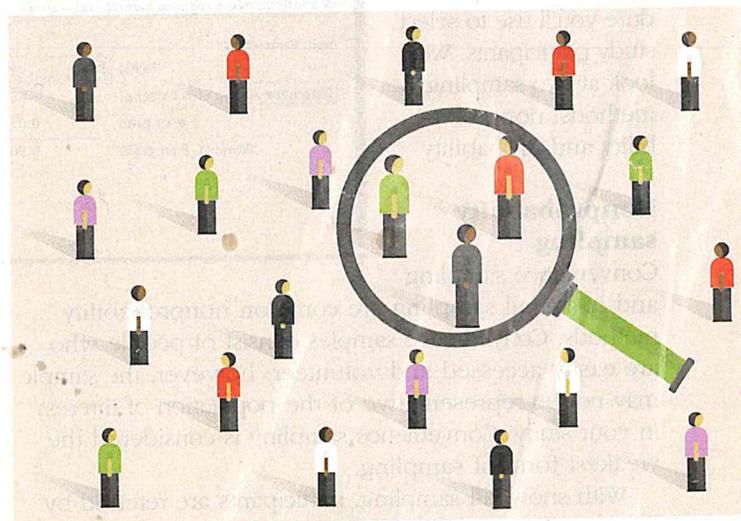
## How do I determine sample size?

Larger sample sizes typically are more representative of the population you're studying, but only if you collect data randomly and the population is heterogeneous. Large samples also reduce the chance of outliers. However, large samples are no guarantee of accuracy. If your population of interest is homogenous, you may need only a small sample.

If you're studying subjects over longer periods of time, as in longitudinal designs, you can expect subject attrition. Know your population and how responsive they may be to repeated questionnaires and interventions. Even if you're not conducting a longitudinal study, be realistic about how many people would agree to participate in research.

For a pilot study (a small-scale version of a bigger study testing the efficacy of an intervention), you'd usually need around 30 subjects, although that number varies according to different experts.

No matter the type of study you're conducting, take into account time (yours and the subjects'), subject cooperation, and resources (such as statistical assistance, access to subjects, managerial support for your study, and co- or sub-investigators).



## Power analysis

Power analysis is a robust way to determine sample size and decrease the risk of type II errors (false-negative conclusions that a finding was due to chance when actually it was the result of the intervention). A power analysis calculation includes a significance criterion, effect size, and power to arrive at a sample size. The *significance criterion* is referred to as alpha and usually is set at 0.05, which means that in 5 of 100 situations the result would be due to chance and not the intervention. *Effect size* (usually described as small, moderate, or large) is the magnitude or strength of the relationship between the variables you're studying. In nursing, we often propose that variables moderately affect one another

or are correlated. For example, when oncology nursing studies about the effectiveness of symptom management interventions were combined and analyzed, a moderate to large effect was found. *Power* (1-beta) usually is set at .80, which means that there's a 20% risk of committing a type II error. (See *Feel the power*.)

### Which sampling method should I use?

The sampling method isn't the same as the sample. It's the procedure you'll use to select study participants. We'll look at two sampling methods: nonprobability and probability.

### Nonprobability sampling

Convenience sampling and snowball sampling are common nonprobability methods. Convenience samples consist of people who are easily accessed and volunteer; however, the sample may not be representative of the population of interest in your study. Convenience sampling is considered the weakest form of sampling.

With snowball sampling, participants are referred by other participants. This method can be used when you have difficulty locating participants. For example, when interviewing undocumented immigrants, the researcher gains the trust of a few participants and relies on them to identify other undocumented immigrants who might participate.

### Probability sampling

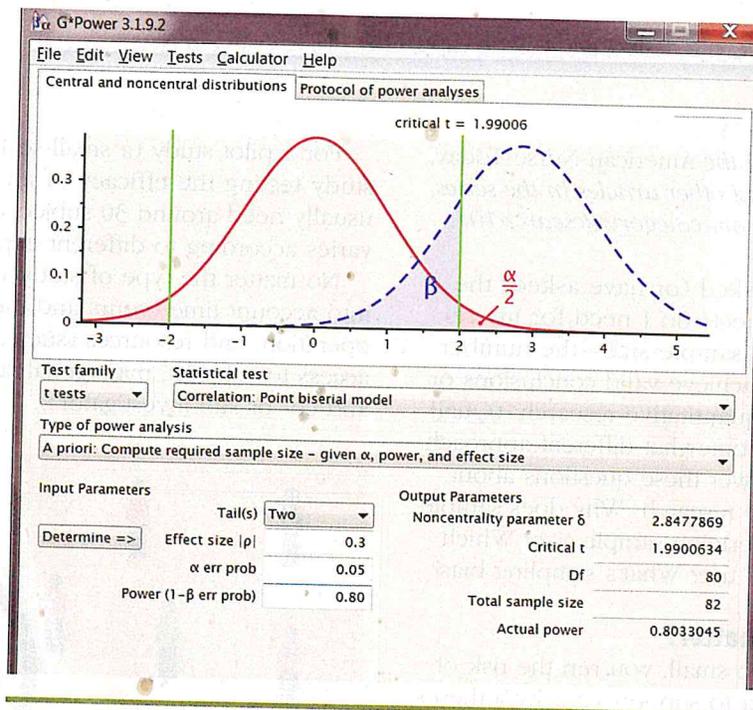
With probability sampling, everyone in an identified population has an equal chance of being in the sample. You can use a variety of approaches, including simple random, stratified random, multistage cluster, and systematic random sampling. For example, systematic random sampling of patients on a medical-surgical floor for an intervention study may include selecting every sixth room number. (Visit [bit.ly/2FZLzYX](http://bit.ly/2FZLzYX) to learn

## Feel the power

Betty, a pediatric nurse, wants to study the effect of distraction on children's discomfort during insertion of an I.V. catheter before a procedure in the radiology department. She reaches out to experts at her facility to help her determine how many subjects she needs for her study.

Researchers assist her using G\*Power, a free online power analysis tool. (Vanderbilt University also has a free power and sample size calculation program that can be downloaded at [biostat.mc.vanderbilt.edu/wiki/Main/PowerSampleSize](http://biostat.mc.vanderbilt.edu/wiki/Main/PowerSampleSize).)

With significance set at 0.05, a moderate effect size of 0.3, and power at .80, Betty will need 82 subjects (see below).



more about types of probability sampling.)

### What's sampling bias?

Sampling bias can occur when a particular overrepresentation or underrepresentation of the population occurs. For example, if a researcher wants to study which method of education is more effective by gender in reducing hospital readmissions, the number of men and women should be evenly distributed. Bias occurs when the researcher deliberately omits or makes a conscious decision to exclude a participant who's had several readmissions for exacerbation of his heart failure. Both omissions reflect bias and may distort study re-

sults and undermine the validity of the study.

### What are the practice implications?

As nurses become more involved in evidence-based practice projects and research investigations, they'll need to understand key elements of research, such as sample size, so they can critically appraise and generate evidence. Remember that the "right" number of subjects in your investigation impacts statistical and clinical significance support for your study findings. ★

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