WHAT'S IN A SAMPLE? WHY SELECTING THE RIGHT RESEARCH PARTICIPANTS MATTERS

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CE Earn Up to 7.5 Hours. See page 340.

There are many interesting topics to study in the emergency department, but no matter the topic, it is rarely logistically possible to enroll everyone with a particular condition into a research study. To feasibly conduct a study, researchers enroll a sample of people who represent the broader population. *Population* refers to the entire collection of cases one is interested in, whereas *sample* refers to a subset of that population. For example, say you are interested in studying geriatric patients who fell and sought treatment in the emergency department. The population would include all adults aged 65 years or older who had an ED visit at any United States hospital due to a fall. Or perhaps you are only interested in geriatric patients who had a fall in your region—for example, Southern California—or at your particular hospital. How you define your population will guide your decisions in selecting a sample. For example, if you are interested in all geriatric patients in the US who have fallen, meaning you want your study results to be generalizable nationally, your sample might include participants from numerous emergency departments across the country, whereas this scope would be unnecessary if you are only interested in regional or local falls.

The key principle to follow when choosing your research sample is to ensure that it is a representative sample, meaning the characteristics chosen to identify your sample are closely approximated to the characteristics of the population.[1] For example, if you know that 80% of US falls in the geriatric population occur among women, your sample should include more women than men—as close to 80% as possible. If you want to generalize your results to falls throughout the US but only collect a sample in California,

one could argue that the sample is not representative of other parts of the country, where falls due to snow might be more prevalent.

Sampling Error

Sampling error refers to the differences between the sample and the population that it is meant to represent. Sampling error is difficult to avoid because there is little chance that the sample will perfectly represent the population. Probability sampling is the best technique to use to avoid sampling error. With use of this technique, any member of the population has an equal opportunity to be enrolled in the study. To extend the previous example, any person 65 years or older who fell and was seen in an emergency department in the US should be just as likely to be included in the study, regardless of whether the fall occurred in Los Angeles, CA, or Norton, KS. Probability sampling is often difficult to achieve because of the complexity, cost, access issues, and inconvenience. However, efforts to reduce the sampling error should be instituted, such as random sampling and increasing the sample size.[2]

Sampling Bias

Sampling bias refers to the systematic enrollment of participants who either over- or underrepresent that subgroup relative to the population. Suppose you are interested in studying the 6-month transition of new graduate RNs entering the emergency department for their first job, and you have obtained a list of hospitals that offer an ED new graduate RN program. If you use only the hospitals on the contact list, sampling bias would occur because you will have favored new graduates with a structured program for their transition over new graduates who enter the ED workforce without the benefit of a structured transition program.

Whereas sampling *error* may be difficult to avoid, sampling *bias* represents a weakness in the research study's design. One common example of sampling bias is when a sample of participants is enrolled based on volunteering.

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To use the previous example, asking new graduate RNs who attend the annual ENA conference to volunteer for your study may produce bias because, arguably, ENA attendees are more professionally engaged and these new graduates are more likely to succeed in the transition period, regardless of whether they have access to a structured program. Carefully considering the sampling biases that may exist in your study while developing your sampling plan is the best way to avoid such pitfalls.

Probability Versus Nonprobability Sampling

Probability sampling, which involves randomly selecting participants, was mentioned as a technique to reduce sampling error. In simple random sampling, a sampling frame lists all possible elements for the sample and then each element is assigned a number. A table of random numbers is then used to pull the sample. Other probability methods include stratified random sampling, cluster sampling, and systematic sampling. Whichever approach is used, probability sampling requires a complete list of the population elements or members and ensures that every one has an equal probability of being selected for inclusion.

Although probability sampling is the ideal approach, most research is conducted with nonprobability sampling. The most common method used is convenience sampling, which involves enrolling participants who are most conveniently available. A nursing manager distributing a questionnaire to her or his ED nurses or a nurse observing ED patients who arrive in a wheelchair are examples of convenience samples. Likewise, posting an advertisement to attract study participants or recruiting participants from a waiting room are ways to obtain a convenience sample. A variant of this approach is snowball sampling, in which members of the sample are asked for referrals to other people who fit the eligibility criteria. Despite its frequent use, convenience sampling is the weakest method for enrolling a sample and introduces the greatest risk for sampling bias.

Another nonprobability sampling technique is quota sampling. This approach requires stratifying the population by certain characteristics, such as age, sex, or race, and quantifying the representation for each strata. Say you are interested in studying persons with asthma who present to the emergency department and their medication compliance. You learn there are no sex-related differences nationally, but your hospital disproportionately sees more women than men. To gain a more representative sample, you seek additional male participants from the local Veterans Administration hospital. Although this approach may have its flaws—for example, veterans are less compliant with medications than are non-veterans—the closer approximation of the sample to the population is stronger than a pure convenience sample.

Lastly, purposive sampling is a method of handpicking the sample. Although it is more often used in qualitative research, this method uses the researcher's judgment to intentionally select participants considered to be experienced with the subject matter. Suppose a nurse wants to study the association between nurses' knowledge of trauma and outcomes in trauma patients. An example of purposive sampling would be if she or he decides to only select nurses with at least 5 years of trauma nursing experience.

Qualitative Sampling

The topics discussed thus far have focused on quantitative research. Qualitative research, on the other hand, has very different goals and thus different considerations for a sample. Qualitative research uses rich descriptions to deepen our understanding of concepts and relationships, and thus generalizability to a population is not a guiding principle. Sampling in qualitative research is nearly always accomplished with small, nonrandom samples. Instead of looking for a random, representative sample, qualitative researchers seek specific individuals or groups with a rich experience of the concept being studied and need only as many participants as it takes to reach saturation—that is, consistent themes of responses have emerged and additional responses would not offer additional detail. Depending on the goal of the study, a wide range of participants may be included to offer a breadth of knowledge. For example, if you are interested in understanding the experience of caregivers of older patients who recently visited the emergency department, you may want to include both grown children caring for their aging parents and aging spouses, because each group will have a very different experience.

Convenience and snowball sampling also can be used in qualitative research. Purposive sampling is common in qualitative research, and different strategies are used depending on the goals of the research. Strategies include maximum variation sampling, homogenous sampling, extreme/deviant case sampling, identity sampling, typical case sampling, critical case sampling, criterion sampling, theory-based sampling, and (dis)confirming sampling.[3]

Whether one is conducting quantitative or qualitative research, it is important to outline the goals of the research

and identify the most appropriate sampling plan to meet the goals of the study. Planning for the best sample early will benefit the study's outcomes by predicting areas of bias and design weaknesses prior to initiating the research.

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