Program Evaluation Toolkit Module 4, Chapter 2: Sampling Techniques

Regional Educational Laboratory Central

From the National Center for Education Evaluation at IES

Speaker 1:

Welcome to the second chapter of Module 4. This chapter explores different sampling techniques and shows how they might be used to obtain a sample for the AMMP! evaluation. If you have not yet completed Modules 1–3, take a few minutes to familiarize yourself with the AMMP! example and logic model, available on the resources page of the website. Also refer to this page for resources to help you work through Module 4.

As discussed in chapter 1, it is often not feasible to collect data from an entire population, so a smaller sample must be selected. Important considerations in sampling include identifying whom to include in the sample, deciding whether a random or nonrandom sampling technique is appropriate, and determining an appropriate sample size—that is, deciding how many participants to include in the sample to collect enough data to answer the evaluation questions.

There are two techniques for sampling: *random sampling* and *nonrandom sampling*. In random sampling, every individual in a population has a chance of being selected for the sample. For example, if you are surveying all students in a district, each student has a chance of being selected to take the survey, even if the probability is different for each student.

Random sampling usually results in a sample that is similar to the entire population. Because every individual has a chance of being selected, a random sample is much more likely to be representative of the entire population with respect to all relevant characteristics.

In nonrandom sampling, only some individuals in a population have a chance of being selected for the sample. You might use nonrandom sampling if representativeness is not the focus of your evaluation, if you can sample only a very small number of individuals, or if you can't be sure that all individuals have a chance to be in the sample. Understanding the limitations of nonrandom sampling will help you interpret the results.

Later sections of this chapter present different types of random and nonrandom sampling techniques.

Random sampling can be helpful when you have a large population to draw from and it is impossible to collect data from everyone.

The *Representative Sampling Activity* in chapter 1 of this module demonstrates how difficult it is to obtain a sample that is representative of an entire population with respect to many characteristics. Furthermore, if the individuals in your sample are not randomly sampled, they may differ from individuals not in your sample in unknown and unobservable ways.

Random sampling can ensure that your sample is similar to the entire population with respect to all possible characteristics, even characteristics that cannot be measured or observed or differences between the sample and population that occur only by chance.

To use random sampling, you must have a list of all possible units (for example, students enrolled in schools within a particular district) that you could sample. This list is called the *sampling frame*. If you do not have such a list, you will not be able to use random sampling.

Generally speaking, random sampling is worthwhile if it is possible to take a reasonably large sample. If a random sample is small, it will likely differ from the population in important ways just due to chance. For example, if a district has 600 middle school students and you sample only 10, those 10 students will likely not represent the entire population of 600 students with respect to characteristics like gender, race/ethnicity, socioeconomic status, and prior achievement. The differences would undermine the rationale for taking a random sample in the first place. Chapter 3 addresses the issue of how large a sample should be.

A computer program, such as Microsoft Excel, can generate random numbers to determine which units from a list to sample. The units that will be sampled do not always have to be the same as the individuals who will be observed (for example, you might sample schools in order to collect data on students in those schools).

Let's say that the AMMP! evaluation team wants to use Excel to randomly select students to complete a survey. First, the team decides that 0 means that a student will not receive the survey and 1 means that a student will be invited to take the survey. Next, the team enters the function "=RANDBETWEEN(0,1)" in the column next to the students' names. The team then clicks the lower right corner of the cell that contains the function and drags the cell to the bottom of the list of students. This action triggers Excel to randomly select either 0 or 1 for each student. The team finally has a randomly generated list of individuals who will or will not be invited to take the survey.

In random sampling, every participant within a population has a chance of being selected for the sample. There are three main types of random sampling: *simple*, *stratified*, and *clustered*.

In simple random sampling, participants in a population are selected with equal probabilities and without regard to any other characteristics. In stratified random sampling, participants are first divided into groups based on known characteristics (such as gender or race/ethnicity). Then, separate simple random samples are taken from each group. In this technique, participants can be selected at random but with different probabilities for characteristics of interest. In clustered random sampling, participants are placed into specific groups, and these groups are randomly selected to be in the sample. For instance, the groups might be classrooms, schools, or districts that are implementing or not implementing AMMP!. Only participants in the selected groups can be in the sample. That is, participants cannot be in the sample if their groups are not selected.

To illustrate the different random sampling types, let's consider an example.

Suppose that AMMP! is implemented in four different schools. There are 80 teachers in the population, 20 each in the four schools. The AMMP! evaluation team want to interview a sample of 40 teachers. In simple random sampling, the team would randomly select the sample from a list of all 80 teachers. Each teacher in the population would have an equal chance of being in the sample, regardless of school. In stratified random sampling, the team would first create a separate list of teachers for each of the four schools and then randomly select exactly 10 teachers from each school. Finally, in clustered random sampling, the team would randomly select two of the four schools and interview all teachers in those two schools.

You can use stratified random sampling to ensure that certain groups are represented in the sample. For instance, suppose only 0.1 percent of students in a school district identify as American Indian. A simple random sample of 100 students would not likely include any American Indian students. Stratifying by student racial/ethnic background can ensure that American Indian students are included in the sample.

Clustered random sampling may be particularly useful when a list of all participants in a population is not available. For instance, state education agency staff might be interested in offering AMMP! across the state, but they want to test the program in select schools before making it more widely available. To do this, they might randomly select middle schools, by region, to implement or not implement AMMP!. In this way, they could obtain a representative sample of students across the state without having a list of all students.

Random sampling can be burdensome, and it requires large sample sizes. In many cases, it makes more sense to obtain a sample using a type of nonrandom sampling. For example, you could use *consecutive sampling* by establishing some criterion for eligibility (for example, math teachers) and recruiting participants until you reach your desired sample size. In *convenience sampling*, you select participants who are readily available, such as parents who attend back-to-school night. In *snowball sampling*, you ask participants to refer other participants to you. For example, when you interview parents, you might ask one parent to recommend another who might have an important perspective on the topic. *Purposive sampling* is a nonrandom version of stratified random sampling. You recruit participants to ensure that certain characteristics are represented in the sample to meet the objectives of the evaluation. For example, you might collect data from a sample of teachers by including at least one teacher from each grade level. Both random and nonrandom sampling types are summarized in the *Summary of Sampling Types*, available on the resources page of the website.

Module 1 introduced AMMP! as an example used throughout this toolkit. Recall that this program addresses the issue of middle school students who are not completing their math homework, are receiving low math achievement, and are largely unsupervised after school.

The complete *AMMP! Logic Model*, is located on the resources page of the website. Let's run through the different sampling types that could be used to collect interview data as part of the AMMP! evaluation.

The AMMP! evaluation team wants to know teachers' perceptions of the program before having an informal conversation with a potential funder the following week. So the team has only one week to conduct interviews with teachers. What type of sampling should the team use?

Because the team is in a time crunch, the most applicable sampling type is convenience sampling. With limited time, it is probably most feasible for the team to interview the teachers who are available during that week. In this case, the team does not attempt to generalize to all teachers but simply gathers initial data on teacher support.

The AMMP! evaluation team wants to know whether the level of buy-in for the program is related to teachers' educational attainment and teaching experience. The team wants to use the results to describe the program for future use in the entire district. What type of sampling should the team use?

In this case, the team is considering teacher characteristics and wants to make a generalization. Therefore, the most applicable sampling type is stratified random sampling. To make claims about the district without reweighting, the team needs to make sure that groups of interest are represented in the sample in the same proportion they are represented in the full population. To understand the impact of teachers' educational attainment and teaching experience, the team collects data from a random sample in each of the different levels of attainment and experience.

The AMMP! evaluation team wants to interview students from each racial/ethnic minority group and each grade level (6, 7, and 8) to identify any demographic characteristics that are associated with students' perceptions of how well AMMP! meets their needs. The team has exactly 15 interview slots to fill. What type of sampling should the team use?

Because the team needs students across multiple racial/ethnic minority groups and grade levels, the most applicable sampling type is purposive sampling. The team can interview only 15 students, so the team wants to purposefully select students from each racial/ethnic minority group and grade level.

To understand how students who need the most support in math perceive AMMP!, the evaluation team wants to interview teachers, tutors, and parents of students in remedial math classes. Even though the team does not have the resources to interview everyone, the team wants the results to generalize to all struggling students. What type of sampling should the team use?

The team wants the results to generalize to the entire population of struggling students, so the team should choose a type of random sampling. Because the team wants to interview teachers, tutors, and parents of students in remedial math classes but cannot interview everyone, the most applicable sampling type is clustered random sampling. The team can randomly select one or more remedial math classes and then interview the teachers, tutors, and parents of students in that class or classes.

The AMMP! evaluation team wants to interview students who are enrolled in the program and have improved in homework completion. They have exactly 15 interview slots to fill. What type of sampling should the team use?

In this case, the team wants to interview students in AMMP! who have improved, but the team has a limited number of slots. Therefore, the most applicable sampling type is consecutive sampling. The team can interview students in AMMP! who meet the criteria of improved homework completion until the 15 slots are filled. They can invite all students who meet the criteria to participate but schedule interviews with only the first 15 students who respond to the invitation.

After a training session, an AMMP! tutor tells the evaluation team that some tutors felt some of the information from the training was incorrect. The team wants to better understand how this perception might impact the program. What type of sampling should the team use?

In this case, the team wants to understand a specific issue: why some tutors felt the training information was incorrect and how their perception might affect the program. Only some tutors have knowledge of this issue. Therefore, the most applicable sampling type is snowball sampling. The team needs to quickly and efficiently identify the tutors who know about the issue, so the team can first interview the tutor who approached the team and ask for referrals to other tutors.

A school within a large suburban district has implemented the AMMP! but now the entire district would like to implement the program. The district's evaluation team wants to make inferences about the benefits of the program for the entire district population. What type of sampling should the team use?

In this case, AMMP! has been scaled up, and the evaluation team now wants to generalize to the entire district. The particular characteristics of schools, teachers, or students do not need to be proportionally represented in the sample. Therefore, the most applicable sampling type is simple random sampling. Although simple random sampling is a good technique to use in this case, it is still important to verify the sample to ensure it is representative. For instance, it might be necessary to examine whether the proportion of students by race and ethnicity is representative of the school district.

If you would like additional opportunities to practice using the sampling types, see the *Extra Practice With Sampling Types* handout, available on the resources page of the website. This activity will take you approximately 20 minutes.

Although the previous AMMP! scenarios relate to selecting individuals to interview, you could use the same techniques to select a sample for a survey, assessment, focus group, or another data collection method to meet your evaluation needs.

This completes chapter 2. Next, in chapter 3, you will apply what you've learned and create a draft sampling plan for your evaluation.

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