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## Sampling: Types of Samples

**Learning Objective: Identify the sampling method used in a study and discuss its implications and potential limitations.**

**Learning Objective: Critically evaluate the reliability and validity of results published in mainstream media.**

As mentioned in the introduction to this section, we will begin with the first stage of data production—sampling. Our discussion will be framed around the following examples:

### Example: #1

Suppose you want to determine the musical preferences of all students at your university, based on a sample of students. Here are some examples of the many possible ways to pursue this problem.

Post a music-lovers' survey on a university Internet bulletin board, asking students to vote for their favorite type of music.

This is an example of a **volunteer sample**, where individuals have selected themselves to be included. Such a sample is almost guaranteed to be **biased**. In general, volunteer samples tend to be comprised of individuals who have a particularly strong opinion about an issue, and are looking for an opportunity to voice it. Whether the variable's values obtained from such a sample are over- or understated, and to what extent, cannot be determined. As a result, data obtained from a voluntary response sample is quite useless when you think about the "Big Picture," since the sampled individuals only provide information about themselves, and we **cannot generalize to any larger group at all**.

**NOTE...**

It should be mentioned that in some cases volunteer samples are the only ethical way to obtain a sample. In medical studies, for example, in which new treatments are tested, subjects must choose to participate by signing a consent form that highlights the potential risks and benefits. As we will discuss in the next module, a volunteer sample is not so problematic in a study conducted for the purpose of comparing several treatments.

**Example: #2**

Stand outside the Student Union, across from the Fine Arts Building, and ask students passing by to respond to your question about musical preference.

This is an example of a **convenience sample**, where individuals happen to be at the right time and place to suit the schedule of the researcher. Depending on what variable is being studied, it may be that a convenience sample provides a fairly representative group. However, there are often subtle reasons why the sample's results are **biased**. In this case, the proximity to the Fine Arts Building might result in a disproportionate number of students favoring classical music. A convenience sample may also be susceptible to bias because certain types of individuals are more likely to be selected than others. In the extreme, some convenience samples are designed in such a way that certain individuals have no chance at all of being selected, as in the next example.

**Example: #3**

Ask your professors for email rosters of all the students in your classes. Randomly sample some addresses, and email those students with your question about musical preference.

Here is a case where the **sampling frame**—list of potential individuals to be sampled—does not match the population of interest. The population of interest consists of all students at the university, whereas the sampling frame consists of only your classmates. There may be **bias** arising because of this discrepancy. For example, students with similar majors will tend to take the same classes as you, and their musical preferences may also be somewhat different from those of the general population of students. It is always best to have the sampling frame match the population as closely as possible.

**Example: #4**

Obtain a student directory with email addresses of all the university's students, and send the music poll to every 50th name on the list.

This is called **systematic sampling**. It may not be subject to any clear bias, but it would not be as safe as taking a random sample.

If individuals are sampled completely at random, and without replacement, then each group of a given size is just as likely to be selected as all the other groups of that size. This is called a **simple random sample (SRS)**. In contrast, a systematic sample would not allow for sibling students to be selected, because of having the same last name. In a simple random sample, sibling students would have just as much of a chance of both being selected as any other pair of students. Therefore, there may be subtle sources of bias in using a systematic sampling plan.

### Example: #5

Obtain a student directory with email addresses of **all** the university's students, and send your music poll to a **simple random sample** of students. As long as all of the students respond, then the sample is **not subject to any bias**, and should succeed in being representative of the population of interest.

But what if only 40% of those selected email you back with their vote?

The results of this poll would not necessarily be representative of the population, because of the potential problems associated with **volunteer response**. Since individuals are not compelled to respond, often a relatively small subset take the trouble to participate. Volunteer response is not as problematic as a volunteer sample (presented in example 1 above), but there is still a danger that those who do respond are different from those who don't, with respect to the variable of interest. An improvement would be to follow up with a second email, asking politely for students' cooperation. This may boost the response rate, resulting in a sample that is fairly representative of the entire population of interest, and it may be the best that you can do, under the circumstances. **Nonresponse** is still an issue, but at least you have managed to reduce its impact on your results.

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