**Random and Non-Random Sampling Methods**

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There are many different approaches to sampling. These various methods can be divided into two primary categories—random sampling methods and non-random sampling methods. Every method has its own advantages and drawbacks, as well as certain contexts where it is most effective to employ.

Random sampling relies on chance to select the participants or datapoints. It ensures that everyone has an equal probability of being a part of the dataset. Simple random sampling allows for every member of the population to have the same probability of being chosen. Oftentimes, a random number generator may be used to perform this task. Another random sampling method is systematic sampling. In systematic sampling, each member of the population recieves an index number, as with simple random sampling. The difference in the method shows itself in the selection process—members are selected at regular intervals. In this system, one might choose to start with member number 6. From member 6 onwards, every eighth person could be selected. This method works well so long as there is no pattern to the dataset that might skew your results.

Another, more complex method of sampling is stratified sampling. In this method, members are divided into subpopulations, ensuring that each subpopulation is properly represented in the sample. These subpopulations are called *strata—*hence the term “stratified sampling.” From these *strata*, individual members are typically selected randomly. Cluster sampling also incorporates subgroups. The difference lies in how these sub-groups are formed. Each sub-group has similar characteristics to the entire population. Rather than randomly selecting from these subgroups, you randomly select entire subgroups.

With regards to non-random sampling methods, it is common that not every individual has the same probability of being included. Convenience sampling includes only the individuals who are easiest for the researcher to access. An example of this might include a teacher surveying only their classes to collect information, rather than a sample from the entire school. This method is very simple, however it is impossible to verify that the sample represents the population. This means its results are not generalizable. Voluntary response sampling relies on people voluntarily responding to a survey. A common example of this is the survey URL located on the bottom of every receipt you receive at many stores, such as Lowe’s or CVS. These samples are always biased in some way, as certain people are more likely to volunteer. An angry customer might be more likely to fill out a negative survey than a customer who had a generally positive experience in a store. Speaking from personal experience, I have also seen bias introduced in retail settings by employees, either by asking for positive survey responses or outright filling out surveys for customers in order to skew the data.

Determining an appropriate sample size is imperitive to ensuring the results are meaningful and generalizable. A balance must be found between practicality and statistical precision. Confidence levels are valuable to determine this sample size. Generally, data scientists aim for 95% certainty, within a margin of error. To calculate this, one must decide the confidence level and the half-width of the interval the researcher is aiming for. This allows you to define how precise the measurement will be.

If I were a data scientist studying the effectiveness of mindfulness on stress reduction in teachers. The confidence level of 95% with a margin of error of 5% in the mean stress score difference is the target. As a researcher in this project, I would estimate a moderate effect size. The target population is public school teachers in a given state. Considering these metrics, a total sample size of 300, with half of these individuals being in a control group and the other half utilizing mindfulness strategies would achieve this goal.

**References**

McCombes, S. (2023, June 22). Sampling methods: Types, techniques & examples. Scribbr. https://www.scribbr.com/methodology/sampling-methods/