Sampling Procedures

Simple random sampling

- Most intuitive form of sampling
- Every individual/unit in the population has an equal chance of being included in the sample
- Example: think of putting names of all the students in this class in a hat and randomly selecting five

Stratified random sampling

- Divide population into groups (called strata); these groups must be similar
- Within each stratum (group), employ simple random sampling (each individual in a stratum has an equal chance of being included in the sample)
- Example: divide names (in population) into many hats, then randomly select names from within each hat

Cluster sampling

- Divide population into groups (called clusters); sometimes these groups are similar, but they don't have to be
- Randomly sample from clusters (every cluster has an equal chance of being selected)
- Include everyone in the selected clusters in the sample
- Example: divide names (in population) into many hats, then randomly sample hats and include all the individuals whose names are in the selected hats

Multistage sampling

- Divide population into groups (called clusters); sometimes these groups are similar, but they don't have to be
- Randomly sample from clusters (every cluster has an equal chance of being selected)
- Within each cluster that was selected, employ simple random sampling
- Example: divide names (in population) into many hats, randomly sample hats, and then randomly select names from within each of the selected hats

Description: In the United States, we are well aware of our aging infrastructure and the need for repairs, which will likely be costly. An employee in the state Department of Transportation has been tasked with estimating the condition of highways under its jurisdiction and the cost of urgent repairs. The researcher has to decide on a practical sampling method for this problem. For these exercises, you should consider the population to be the entirity of highway miles (one mile segments) under jurisdiction (e.g. if there are 25,000 miles of highway, then the population is 25,000 one mile segments, or 25,000 "individuals").

Instructions: Identify the following sampling schemes as (1) simple random sampling, (2) stratified random sample, (3) cluster sampling, or (4) multistage sampling.

1. The employee selects a number of highways (n) randomly and without replacement from the list of all highways (N) maintained by the Department. Then, highway engineers visit the selected highways, inspect and rate the condition of the pavement, and estimate repair costs. What kind of sampling scheme is this? Justify your answer.

Do you recommend this sampling method in the context of this problem? Why or why not?

2. The employee selects a number of one-mile segments randomly and without replacement from all the stretches of highway (e.g. if there are 25,000 miles of highway, the researcher selects n one-mile segments from the 25,000 miles) maintained by the Department. Then, highway engineers visit the selected one-mile segments, inspect and rate the condition of the pavement, and estimate repair costs.

Do you recommend this sampling method in the context of this problem? Why or why not?

3. The employee groups the stretches of highway by highway and then from each highway samples one-mile segments randomly and without replacement (e.g. if length of highway A is 50 miles, it consists of 50 one-mile segments from which a number, m, are selected). Then, highway engineers visit the selected segments, inspect and rate the condition of the pavement, and estimate repair costs.

Do you recommend this sampling method in the context of this problem? Why or why not?

4. The employee selects a number of highways (n) randomly and without replacement from the list of all highways (N) maintained by the Department. Then, a number of one-mile segments (m) are selected at random and without replacement from the total length of each selected highway (e.g. if length of highway A is 50 miles, it consists of 50 one-mile segments from which a number, m, are selected). Then, highway engineers visit the selected segments, inspect and rate the condition of the pavement, and estimate repair costs.

Do you recommend this sampling method in the context of this problem? Why or why not?