Inferences
Sections 8.4, 8.5, 8.6
Lecture 18

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Outline

1. Inferences
2. Stratified Sampling
3. Sampling Bias
4. Assignment

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Inferences

- Our purpose in taking a sample is to obtain information about the population.
- The sample is only a means to an end.
- However, because the sample gives us only part of the picture, it may be misleading.

Inferences

Definition (Inference)

In a statistical study, an inference is a conclusion drawn about the population, based on the information found in a sample.

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- How wrong?

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Definition (Inference)

In a statistical study, an inference is a conclusion drawn about the population, based on the information found in a sample.

- Could the inference be wrong?
- How wrong?
- One of the most important functions of statistics is to put a bound on the likely size of the error.

Random vs. Representative

- If a sample is representative of the population, then the inferences that we draw from it will accurately reflect the characteristics of the population.

Random vs. Representative

- If a sample is representative of the population, then the inferences that we draw from it will accurately reflect the characteristics of the population.
- So, rather than select a *random* sample, why not just select a *representative* sample?
- After all, a random sample, left to chance, may not be representative.

Random vs. Representative

Fact

The larger a simple random sample, the more likely it is to be representative of the population.

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Stratified Sampling

Definition (Stratum)

A stratum is a portion of the population that is homogeneous in some respect that is relevant to the study.

Definition (Stratified Sampling)

A stratified sample selects a *predetermined* number of individuals from each stratum in the population.

- Typically, a simple random sample is taken within each stratum.

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Definition (Stratum)

A stratum is a portion of the population that is homogeneous in some respect that is relevant to the study.

Definition (Stratified Sampling)

A stratified sample selects a *predetermined* number of individuals from each stratum in the population.

- Typically, a simple random sample is taken within each stratum.
- Is a stratified sample a simple random sample?

Stratified Sampling

Example (Stratified Sampling)

Possible strata:

- Males, females.
- Democrats, Republicans, Independents.
- Freshmen, Sophomores, Juniors, Seniors.
- Faculty, Students, Staff.

Stratified Sampling

- Why use stratified sampling?

Stratified Sampling

- Why use stratified sampling?
- It is an effort to make the sample representative.

Stratified Sampling

Example (Stratified Sampling)

- We could choose our sample to be 50% male and 50% female to reflect the population.

Stratified Sampling

Example (Stratified Sampling)

- We could choose our sample to be 50% male and 50% female to reflect the population.
- What if we chose 25% male and 75% female?

Example

Example (Stratified Sample)

- Suppose we have a group of 100 men and 100 women.
- Use the TI-83 to get sample of 5 men and 5 women.
- We measure the height of each person in the sample.
- How should we compute the average height to best estimate the average height in the population?

Example

Example (Stratified Sample)

- Suppose we have a group of 100 men and 100 women.
- Use the TI-83 to get sample of 8 men and 4 women.
- We measure the height of each person in the sample.
- How should we compute the average height to best estimate the average height in the population?

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Sampling Bias

Definition (Undercoverage Bias)

Undercoverage bias occurs when a portion of the population is *systematically* left out of the selection process.

Definition (Nonresponse Bias)

Nonresponse bias occurs when a portion of the selected sample declines to participate in the study.

Definition (Response Bias)

Response bias occurs when individuals give what the perceive to the the preferred response rather than their true opinion.

Sampling Bias

Example (Sampling Bias)

Which type of bias is it?

- A telephone survey is done using random dialing.
- Survey questions are sent by e-mail to students on a college campus.
- A random sample of students are asked about their drug abuse.

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Assignment

- Read Sections 8.4, 8.5, 8.6.
- Apply Your Knowledge: 9, 10, 13, 14.
- Check Your Skills: 24, 25.
- Exercises 32, 33, 34, 37, 41.