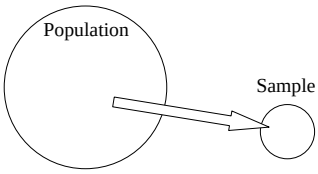
Stat 101 – Lecture 17

Sample Surveys

- Idea 1: Examine a part of the whole.



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Properties of a Sample

- Would like the sample to be representative of the population.
- This may not be possible, but at least we would like a sample that is not biased.

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Sample Surveys

- Idea 2: Randomize
  - Selecting items for the sample should be done at random so as to reduce the chance of getting a biased sample.

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Sample Surveys

- Idea 3: It's the sample size!
  - What fraction of the population is sampled is not important.
  - The size of the sample is the important thing.

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What about a census?

- Would a census of the population be a better way to go?
  - Difficult to do.
  - Populations are often dynamic.
  - Can be more complex.

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Parameters and Statistics

- A parameter is used in a model of the population (population parameters).
- A statistic is a summary of sample data (sample statistics).

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Example

- Population: All students at ISU.
- Question: Have you posted a video on YouTube?
- Population parameter: Proportion of all ISU students who would answer yes.

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Example

- Sample: 400 ISU students.
- Sample statistic: the proportion of the 400 students in the sample who say yes.

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How do we select the 400?

- Put an ad in the ISU Daily with the question and ask students to drop off their answers.
- Stand in front of the library and ask the first 400 students who come by.

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Simple Random Sample

- Want a representative sample but will settle for one that is not biased.
- SRS – Each combination of 400 ISU students has the same chance of being the sample selected.

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Simple Random Sample

- Sampling Frame
  - A list of all students at ISU (the Registrar has such a list)
  - Use random numbers to select 400 students at random from this list.

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Simple Random Sample

- If one were to do this more than once
  - Different random numbers will give different samples of 400 students.
  - We have introduced variability by sampling!

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Other Sampling Plans

- Stratified
  - Divide population into strata (subpopulations) and select a SRS from each strata.
  - Divide ISU students into colleges and select a SRS from each college.

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Other Sampling Plans

- Cluster and multistage
  - Divide population into clusters, each cluster being representative of the population, and select a cluster as your sample.

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Other Sampling Plans

- Systematic
  - Select in a systematic way from the sampling frame.
  - Select every 70th student on the list from the Registrar.
  - Caution the order on the list must be random.

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What can go wrong?

- Relying on volunteers – Ad in the Daily.
- Convenience – The first 400 students to come by the library.
- Bad frame – using the ISU directory of phone numbers.

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What can go wrong?

- Under coverage
  - 1,000,000 products sold.
  - 100,000 warranty cards returned.
  - 1,000 people selected from those who returned warranty cards.

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Other problems

- Non response
- Question bias/Response bias
  - Would you favor or oppose a law that would take away your constitutional right to own guns?
  - Do you favor or oppose gun control?

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