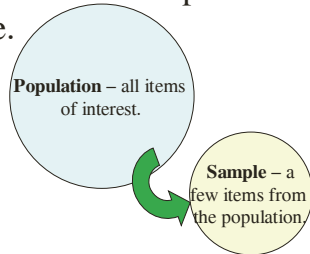


# Stat 101L: Lecture 18

## Sample Surveys

- \*Idea 1: Examine a part of the whole.



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## Properties of a Sample

- \*The sample should 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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# Stat 101L: Lecture 18

## 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 & Statistics

- \*A parameter is a summary of a model for the population (population parameters).
- \*A statistic is a summary of sample data (sample statistics).

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# Stat 101L: Lecture 18

## Example

- \* Population: All students at ISU.
- \* Question: Do you use a social networking utility like Facebook?
- \* 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 to 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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# Stat 101L: Lecture 18

## 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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# Stat 101L: Lecture 18

## 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 somewhat 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 60<sup>th</sup> student on the list from the Registrar.
  - Caution the order of the list must be random.

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# Stat 101L: Lecture 18

## 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?

- \* Undercoverage
  - 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?

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