36-303: Sampling, Surveys and Society

What is Sampling?

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Review Quiz

- Fill in your name.
- Answer questions on the handout.
- You have 30 minutes.

Handouts

- Quiz
- Project Ideas
- Lecture Notes
  - Quiz
  - Forming Project Groups
  - Project Ideas and Class Schedule
  - What is Sampling?

Forming Project Groups

- Find people you can work with
- Use the discussion board Blackboard to find a group to join or find a person to add to your group
- Groups should be 4-5 students each
- *Email brian@stat.cmu.edu with your proposed group members, by Monday at 5:00pm. ONE EMAIL PER GROUP.*
- *I will assign you to a group if you do not choose.*

Project Ideas, Class Schedule

- Project Ideas

- Handouts next week will give details on
  - Schedule of topics in lectures for the course
  - Schedule of deadlines/landmarks for your projects.

What is Sampling?

- Sampling is a statistical process of "purposefully" selecting a subset of units from a population in order to make inferences about the entire population.
- *Every sampling method is designed to make errors* (because not everyone should be in the sample!)
- *A census is designed to make no errors* (because everyone should be in the census!)

A Sample and a Census are not the same thing!

- In a *sample* there are two sources of error
  - The data set *is not* the whole population
  - Errors in the design or implementation of data collection
- In a *census* there is only one source of error
  - The data set *is* (supposed to be) the whole population
  - Errors in the design or implementation of data collection

Sampling in the US Census

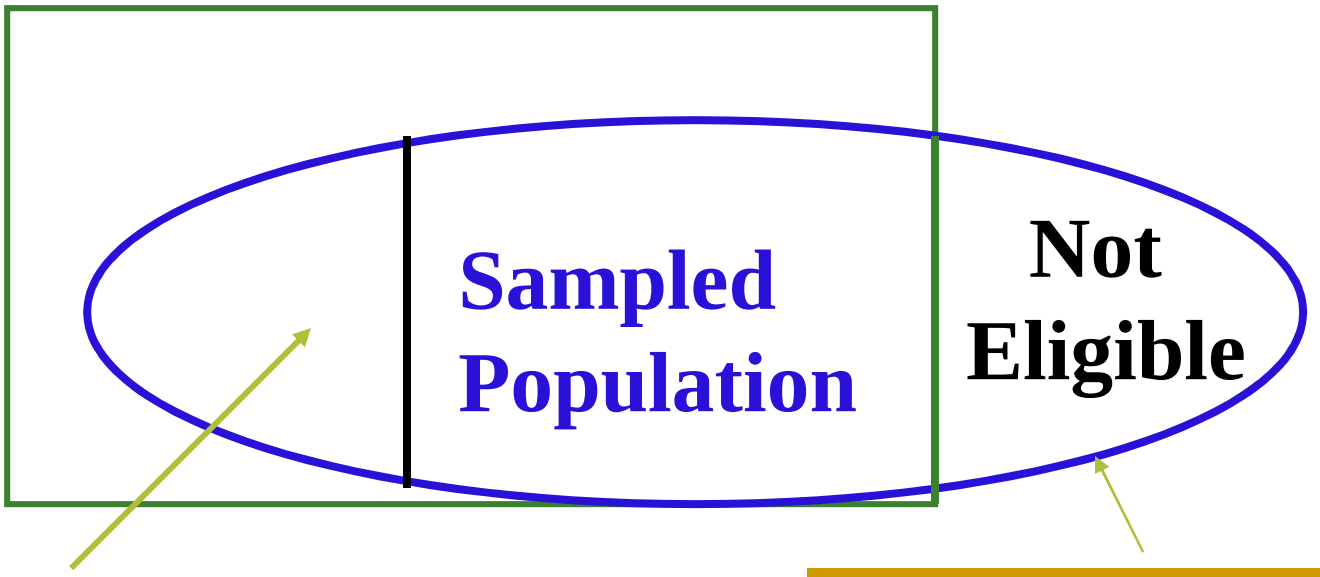
- *Constitution requires "actual enumeration"* (Census) for the purpose of apportioning US Representatives.
- *US Dept of Commerce v US House of Representatives* (1999) : Cannot use additional sampling to correct census errors.
- *Utah v Evans* (2003): “Hot deck” imputation (a method for correcting data collection errors in samples) can be used to correct census errors.

Elements of a Sample

- Key elements to understanding properties of sample include:
  - *Target Population* - collection of observations we want to study (e.g. possible voters in NH).
  - *Sampled Population* – all possible observation units that might have been sampled.
  - *Sampling Frame* – list of all sampling units (e.g. list of telephone numbers.
  - *Sample* - subset of population.
  - *Sampling Unit* - unit we actually sample (e.g. household).
  - *Observational Unit* - element to be measured (e.g. individual).

Schema

Target Population



Does Sample Represent Population?

- "Representativeness" comes from

  (a) match between target population and sampled population.

  (b) method for drawing sample.

- Two kinds of errors:
  - Non-sampling – *can be reduced by careful design of the survey*
  - Sampling – *can be quantified by statisitcs, reduced by increasing sample size*

Two Kinds of Errors

- *Non-sampling errors*:
  - Selection bias - part of target population is not in sampled population.
  - Measurement bias - measuring instrument has tendency to differ from true value in one direction.
- *Sampling error* - results from taking a sample instead of whole population.
  - The method of sampling determines whether & how statistics can be useful in quantifying (and reducing) sampling error!
  - The "best" way to select a sample by using *probability methods*, because this gives us a valid statistical basis for inference.

Methodological Features of Examples

- What can we say about:
  - population of interest
  - frame/list
  - sampling technique
  - sample size
  - response rate
  - mode of interview
  - possible sources of selection bias and inaccuracy
  - other details on methodology relevant to inferences of interest

Summary of Today's Lecture

- Review Quiz.
- Project groups
- Project proposals
- Key elements of sampling
- What makes a sample representative?