



Types of Studies

- **Surveys:** describe population characteristics ⇒ §2.1
- **Comparative studies:** determine relationships between variables ⇒ §2.2

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graph TD
    Studies --> Surveys
    Studies --> Comparative_studies[Comparative studies]
    Comparative_studies --> Experimental
    Comparative_studies --> Nonexperimental["Nonexperimental ("observational")"]
  
```

2.1 Surveys

- **Goal:** describe *population* characteristics
- Normally based on a **sample** (or subset) of the population
- Types of samples
 - Probability sample (e.g., simple random sample)
 - Non-probability sample (e.g., convenience sample)

Illustrative Example: Youth Risk Behavior Surveillance (YRBS). The Youth Risk Behavior Surveillance System monitors health behaviors in youth and young adults in the United States. Six categories of health-risk behaviors are monitored. These include: (1) behaviors that contribute to unintentional injuries and violence; (2) tobacco use; (3) alcohol and drug use; (4) sexual behaviors; (5) unhealthy dietary behaviors; and (6) physical activity levels and body weight. The 2003 report used information from 15,240 questionnaires completed at 158 schools to infer health-risk behaviors for the public and private school student populations of the United States and District of Columbia.^a The 15,240 students who completed the questionnaires comprise the sample. This information is used to infer the characteristics of the several million public and private school students in the United States for the period in question. ■

Sampling

- **Probability samples** use chance mechanisms to select individuals
- The most basic type of probability sample is the **simple random sample (SRS)**
- **SRS** ≡ a sample of size n selected so that all possible combinations of n individuals from the population are equally likely to comprise the sample

SRS Method

1. Identify each population member with the numbers $1, 2, \dots, N$
2. Pick a random spot to enter Table A
3. Select n tuples, discarding inappropriate tuples

Alternatively, use a random number generator (e.g., www.random.org) to generate n random numbers between 1 and N

Keep in mind: the objective of an SRS: every possible subset is equally likely!

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Illustrative Example: Selecting a simple random sample. Suppose a high school population has 600 students and you want to choose three students at random from this population. To select an SRS of $n = 3$:

1. Get a roster of the school. Assign each student a unique identifier 1 through 600.
2. Enter Table A at (say) line 15. Line 15 starts with these digits:
76931 95289 53809 19381 56686
3. The first six triplets of numbers in this line are: 769, 319, 528, 955, 809, and 193.
4. The first triplet (769) is excluded because there is no individual with that number in the population. The next two triplets (319 and 528) identify the first two students to enter the sample. The next two triplets (955, 809) are not relevant. The last student to enter the sample is student 193.

The final sample is composed of students with the IDs: 319, 528, and 193. ■

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Other Types of Probability Samples (More Advanced Methods)

- **Stratified random sample:** randomly sample strata (subsets) with the population
- **Cluster sample:** randomly sample clusters comprising varying numbers of observations
- **Multistage sampling:** randomly sample random samples in multiple stages

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Cautions

- ♦ **Undercoverage:** groups in the source population are left out or underrepresented sampling frame
- ♦ **Volunteer bias:** self-selected participants (volunteers) are atypical population members
- ♦ **Nonresponse bias:** a large percentage of individuals refuse to participate or cannot be contacted

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§2.2 Comparative Studies

- Objective: to determine the relationship between an **explanatory** and **response variable**
- **Experimental designs** \Rightarrow assign subjects to treatment or exposure groups and compare outcomes
- **Nonexperimental design** \Rightarrow classified subjects in exposure groups (no intervention) and compare outcomes

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