Target population: The group of people to whom we want our research results to apply
Study population: The people who meet our operational definition of the target population
Research sample: The members of the study population from whom we collect our data

Example: Field Research Conducted in Elementary School
- Target population: 6–10 YO children, (Students in Grades 1–5)
- Study population – Elementary school children in Detroit area suburbs
- Participant sample: Students in particular elementary school(s) who have consented to participate in research study

Populations and Samples
- Generalizability: Extent to which findings from chosen schools describe the behavior of other elementary school children in those grades
  - Representativeness
    - If the study population suffers from sampling error, the study population will not correctly represent the target population
    - If researchers’ operational definitions of the target population differ, findings might differ across studies
    - Leads to apparent contradictions among results of studies

Sampling
- Two techniques can be used to draw a research sample from a study population
  1. Probability sampling: Every member of the study population has a known probability of being selected for the research sample
  2. Nonprobability sampling: The probability of a person being selected is unknown

Probability Sampling
- Simple random
  - equal and independent probability of being chosen
  - Leaves selection to chance so COULD theoretically end up with distorted sample
- Sampling with Replacement
  - Once individual is selected, returned to pool
- Sampling without Replacement
  - Once individual selected, removed from pool
  - Ensures no individual appears more than once in single sample
  - Probability of being selected changes with each selection
Probability Sampling
- Stratified random representation based on subgroups in population
  Identify specific subgroups (strata) to be included in sample
  Select equal random samples from each of pre-identified subgroups, using simple random sampling procedures
  Combine subgroups into one overall sample

Stratified Sample
- 20 Christians
- 20 Muslims
- 20 Buddhists
- 20 Atheists
- 20 Jews
  - Good technique for examining and comparing subgroups
  - But subgroup(s) may get overrepresented in sample

Probability Sampling
- Proportionate Stratified Random Sampling
  Identify set of subgroups
  Determine what proportion of population corresponds to each subgroup
  Obtain sample so that proportions in the sample exactly match proportions in overall population

Proportionate Stratified Sample
- 60 Christians
- 15 Muslims
- 10 Buddhists
- 8 Atheists
- 7 Jews
  - Problems?

Quota Matrix

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heterosexual</td>
<td>Lesbian</td>
</tr>
<tr>
<td>Young Adult</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older Adult</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Randomly select 3 of 15 administrators, 5 of 25 staff physicians, and so on.

Legend:
- The sample random sample represents nurses, nursing assistants, and medical technicians but underrepresents administrators, staff physicians, maintenance staff, and cleaning staff. The stratified sample gives an accurate representation of staff position.
**Probability Sampling**

- **Systematic sampling:** Researcher starts with a sampling frame and selects every \( nth \) name after random start
  - \( n = \) the proportion of the frame to be sampled
  - Sampling interval
    - Inverse of sampling ratio
  - Begins like simple random, but no longer random after selection of first participant
  - Ensures high degree of representativeness but principle of independence is violated
  - Can also be stratified (e.g., selecting every \( nth \) woman and \( nth \) man)

**Probability Sampling**

- **Must avoid periodicity bias**
  - Occurs when some characteristic appears with the same pattern as the sampling interval
  - E.g., \( N = 80, n = 10 \), every \( 8^{th} \) unit is a corner unit

**Probability Sampling**

- **Cluster sampling:** Groups or clusters of people meeting definition of the study population are identified
  - Random sample of clusters is taken
  - Can also use multistage cluster sampling
  - Clusters are sampled within clusters

**Nonprobability Sampling**

- **Purposive sampling:** Researchers use their judgment to select the membership of the sample based on research goals
  - Used when researchers want to study typical or critical cases

**Nonprobability Sampling cont.**

- **Hidden Populations**
  - Chain-referral methods
    - Snowball Sampling
    - Target group members provide names of others
  - Key Informant Sampling
    - Information from knowledgeable individuals
  - Targeted Sampling
    - Where do they congregate?
    - Respondent-driven Sampling
    - Incentives

**Nonprobability Sampling**

- More common than probability sampling

**Convenience sampling** (also called haphazard sampling)
- Researchers study whoever is accessible
  - Are easy to acquire
  - Are inexpensive
  - However, researcher does not know the degree to which the sample represents the target population
  - So results may not apply to that target group
  - 1936: F.D. Roosevelt Defeats Landon
Focuses on Type II (beta) error
- The probability of incorrectly concluding that the IV had no effect
- Power is represented by 1 - beta
- The probability of not making a Type II error
- Tests with insufficient power increase the chances of erroneously concluding IV had no effect
- Power can be increased by ensuring you have an adequate sample size

Statistical Power

Sample Size
- To determine adequate sample size, it is necessary to know:
  - what effect size you are trying to detect
  - what alpha level you will use
  - whether you will use a one-tailed or a two-tailed test
  - what level of power you want

Sample Size
- N needed for power of .80 with two-tailed tests assuming $\alpha = .05$
- One–sample Tests
  - $7.85 / d^2$
- Two–sample Tests
  - $7.85 / r^2$
  - $d = $ effect size, standardized mean difference between two groups or between sample and population
  - $r^2 = $ proportion of variance accounted for

Approaches to Determining Effect Size
- Find your minimum critical effect size
- What is the smallest effect you consider important to the theory or application?
- Use average effect size found in previous research
- Can often be found in meta–analyses
- If you cannot estimate effect size, default to estimating medium effect size ($d = .5$)

How large should a sample be?

Table 9.3: Sample Size of a Random Sample for Different Populations with a 99 Percent Confidence Level

<table>
<thead>
<tr>
<th>Population Size</th>
<th>Sample Size</th>
<th>% Population in Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>171</td>
<td>85.5%</td>
</tr>
<tr>
<td>500</td>
<td>312</td>
<td>70.8%</td>
</tr>
<tr>
<td>1,000</td>
<td>543</td>
<td>54.3%</td>
</tr>
<tr>
<td>2,000</td>
<td>863</td>
<td>33.0%</td>
</tr>
<tr>
<td>5,000</td>
<td>960</td>
<td>19.2%</td>
</tr>
<tr>
<td>10,000</td>
<td>1,098</td>
<td>8.6%</td>
</tr>
<tr>
<td>20,000</td>
<td>1,221</td>
<td>5.6%</td>
</tr>
<tr>
<td>50,000</td>
<td>1,649</td>
<td>2.5%</td>
</tr>
<tr>
<td>100,000</td>
<td>1,773</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

Rule of thumb: ~ 50 cases for each subsample

Setting Alpha
- The smaller the alpha
  - the lower the statistical power
  - the larger the sample needed to achieve given level of statistical power
- Two–tailed tests have lower statistical power than one–tailed tests
Participant Recruitment

- Passive recruitment methods
  - Study is made available and researcher waits for participants to discover it
  - Appropriate if privacy is a concern
  - Also useful if it is difficult to identify potential participants
  - May not know who has characteristics of interest
  - Can advertise website on sites frequented by respondents one hopes to recruit
  - Can also use search engine features to increase chances that respondents find your site

- Active recruitment
  - Researcher identifies people who have particular traits or interests and contacts them
  - Can post a research announcement about research on a listserv, newsgroup, or social media site
  - Best to get approval of site moderator, if one exists

Email recruitment

- Participants are sent an email and asked to participate
- More effective if
  - Comes from university address
  - Is preceded by short email requesting participation
  - Nonresponders receive follow-up
- Trolling (e.g., using a computer program to gather email) is considered unethical
  - Invades privacy
- However, can use public directories
- Can also use organizational email lists
  - Need to request permission

Use of Incentives

- For participants not receiving course or extra credit, can use other incentives to increase participation, such as
  - Access to electronic information
  - Games
  - E-books
  - Gift certificates
  - Lottery (chance to win cash or prizes)
- Paying incentives requires collecting at least some identifying information
  - May reduce willingness to participate in study on sensitive issues

Participant Recruitment

- Web researchers have less control over recruitment than do traditional researchers
  - URLs can be shared without the experimenter knowing it
  - Sometimes study sites "go viral"
  - May result in more diverse sample
  - Can increase chances of sabotage

- Websites should include an “expiration date”
  - The last date on which data will be collected
  - Prevents frustrating potential participants
  - If site is listed on a research directory, notify administrator when data collection has ended

  Mturk through Amazon (issues with repeat IPs)