Sampling

Populations and Samples

- 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?

Probability Sampling

- Proportionate Stratified sampling

EXAMPLE BOX 8.4

Illustration of Stratified Sampling

Sample of 100 Staff of General Hospital, Stratified by Position

POSITION	POPULATION *N*	POPULATION Percent	SIMPLE RANDOM SAMPLE *n*	PROPORTIONATE STRATIFIED SAMPLE *n*	ERRORS COMPARED TO THE POPULATION
Administrators	15	2.88	1	3	−2
Staff physicians	25	4.81	2	5	−3
Intern physicians	25	4.81	6	5	+1
Registered nurses	100	19.23	22	19	+3
Nurse assistants	100	19.23	21	19	+2
Medical technicians	75	14.42	9	14	+5
Orderlies	50	9.62	8	10	−2
Clerks	75	14.42	5	14	+1
Maintenance staff	30	5.77	3	6	−3
Cleaning staff	25	4.81	3	5	−2
Total	520	100.00	100	100	

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

Note: Traditionally, *N* symbolizes the number in the population and *n* represents the number in the sample. The simple random sample overrepresents nurses, nursing assistants, and medical technicians but underrepresents administrators, staff physicians, maintenance staff, and cleaning staff. The stratified sample gives an accurate representation of each position.

Quota Matrix

	Women			Men		
	Hetero-sexual	Lesbian	Bisexual	Hetero-sexual	Gay	Bisexual
Young Adult						
Middle Age						
Older Adult						

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
    - = N/sample size
    - 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 8th unit is a corner unit

TABLE 8.1 Problems with Systematic Sampling of Cyclical Data

CASE	
1	Husband
2[a]	Wife
3	Husband
4	Wife
5	Husband
6[a]	Wife
7	Husband
8	Wife
9	Husband
10[a]	Wife
11	Husband
12	Wife

Random start = 2; Sampling interval = 4.
[a]Selected into sample.

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

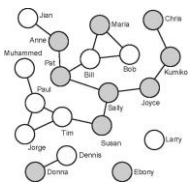
- More common than probability sampling
- **Convenience sampling** (also called haphazard sampling)
- Researchers study whoever is accessible
  - Are easy to acquire
  - Are inexpensive
  - However, researcher does not know the degree to which the sample represents the target population
  - So results may not apply to that target group
  - *1936: F.D. Roosevelt Defeats Landon*

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

Non-probability 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



Snowball sampling

Statistical Power

- 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

How large should a sample be?

- Increasing size of probability sample reduces sample variance
- But, as sample variance for nonprobability sample cannot be computed, concern about bias grows as sample gets larger b/c larger sample size will magnify any bias due to errors in sample selection
  - Think navigation error – as distance travelled increases, so does magnitude of error
- The smaller the population, the larger the sampling ratio has to be
- The law of large numbers = as the size of a sample increases, any estimated proportion rapidly approaches the true proportion that the estimate represents

TABLE 8.3 Sample Size of a Random Sample for Different Populations with a 99 Percent Confidence Level

POPULATION SIZE	SAMPLE SIZE	% POPULATION IN SAMPLE
200	171	85.5%
500	352	70.4%
1,000	543	54.3%
2,000	745	37.2%
5,000	960	19.2%
10,000	1,061	10.6%
20,000	1,121	5.6%
50,000	1,160	2.3%
100,000	1,173	1.2%

Rule of thumb - ~ 50 cases for each subsample

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

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 ($d = .5$)

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

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

Participant Recruitment

- 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

Participant Recruitment

- 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)