open.michigan

UNIVERSITY OF MICHIGAN

Sampling

Contributors
Sonia A. Duffy, PhD, RN
Lisa Kane Low, PhD, CNM, FACNM
Huey-Ming Tzeng, PhD, RN

Sampling Theory Concepts

- Population
- Sampling criteria
- Sampling frame

Population

- Target population
  - Example: The customer satisfaction survey for all patients that went through the University of Michigan Health System in 2006

- Accessible population
  - Example: All patients that lived

- Elements of a population
  - Subjects could be people or units

Sampling (Eligibility) Criteria

- **Inclusion criterion**
  - Who is in?
  - Need to specify demographic and clinical characteristics

- **Exclusion criterion**
  - Who do you want to keep out to avoid bias because they would provide poor data, be likely lost, or have ethical concerns?

An Example of Inclusion and Exclusion Criterion

- **Inclusion criteria**
  - Example: All patients admitted to and discharged from University of Michigan Health System (inpatient care units) during 2006

- **Exclusion criterion**
  - Examples:
    - Under 18 years
    - Non-English speaking
    - Cognitively impaired
    - Deceased

Sampling Frame

- List of potential candidates to be in your study

  ○ Example: Get a list of all patients discharged from the inpatient car settings of the University of Michigan Health System to do the inpatient satisfaction survey

Probability (Random) Sampling Methods

- Simple random sampling
- Systematic sampling
- Stratified random sampling
- Cluster sampling

Simple Random Sampling

- Example: Randomly select 1,200 of 12,000 patients (10%) that were discharged from University of Michigan Health System (inpatient care units) during 2006
  - Use a random number table or use a random number generator (like pulling from hat) to sample subjects

- Purposes
  - Every person has similar chance of entering the study
  - Reduces bias

Systematic Sampling

- Use an ordered list
- Randomly draw a number between 1 and 10 (e.g., 3)
  - Example: Start with patient 3 and take every nth (e.g., 10th) patient

Stratified Sampling

- Stratify by unit
- Example:
  - 1,200 participants from a total of 6 units; 200 patients per unit
  - Then, we may do random sampling or systematic random sampling
  - On unit X, we may sample every 6th patient. On the other units, we may sample every 18th patient

Nested or Hierarchal Sampling

- Each stratum is treated as an extraneous variable because people in that stratum are similar
  - Example: Patients, treated by doctors, on units, in hospitals

Cluster Sampling

- Randomly pick clusters to sample
  - Example: Randomly pick states, then zip codes, then neighborhoods, then blocks, then survey everybody on that block

- Makes better use of surveyors' time than doing a random sample of US population and finding everyone all over the place
- Provides a bigger sample at a lower cost

Sampling Theory Concepts

- The subject acceptance rate or response rate
  - The percentage of individuals consenting to be subjects
- Representativeness
- Generalizability

Response Rate

- Want to go for a high response rate
  - A higher response rate increases the representativeness of sample and generalizability of the study results

- The characteristics of the responders can be different than the ones of the non -responders

Factors Affecting Response Rates

- Length of survey
- How intense is the intervention?
- Is there any incentive for the participants?

- Is it an RCT?
  - People do not usually like to be randomized

Representativeness

- Does the sample represent the general population of the persons with the specified problem?

  - Example: Does my sample of 1,200 inpatients discharged from University of Michigan Health System compare to the total population of 12,000 patients on age, gender, cancer site and stage, etc.?

Generalizability

- Who is the sample generalizble to?
- The results are generalizable to the sampling frame
  - Example: The research results from the random sample of 1,200 inpatients would be generalizable to the population of 12,000 inpatients, who were discharged from University of Michigan Health System

Nonprobability (Nonrandom) Sampling

- Convenience (accidental) sampling
- Quota sampling
- Purposive sampling
- Network sampling

Convenience Sampling

- Subjects who are available and very approachable
  - Example: All patients who are hospitalized in my working unit

Quota Sampling

- Want to have a certain number of participants per group
  - Example: For an end-of-life focus group study, we would want equal numbers of 5 ethnic groups in each focus group

Purposive Sampling

- Seek out selected people to interview
  - Example: Homeless people

Network Sampling (Snowballing)

- Used for difficult to reach populations
  - Example: The researchers talk to one person from the target population. This person may lead the researchers to the next potential participant

Sample Size

- Factors influencing sample size:
  - Effect size
  - Type of study conducted
  - Number of variables studied
  - Measurement sensitivity
  - Data analysis techniques

Power Analysis

- Standard power of 0.8
- Level of significance
  - The alpha value can be set at .05, .01, .001
- Effect size
  - Small = .2
  - Medium = .5
  - Large = .8
- Sample size

Effect Size

- Small, medium, or large effect of dependent (outcome) variable
  - Example: Change on the blood pressure. Do we want to get a change of 10mg., 20mg., or 30mg. mercury?

- Look at other studies to see what kinds of effect sizes they get and what kind of sample sizes they had to get those

Example Sample

- A convenience sample of
  - 55 adults scheduled for first time elective CABG surgery without cardiac catheterization
  - Who had not had other major surgery within the previous year
  - Who were not health professionals
  - Were randomly assigned to one of two instruction conditions

- Based on a formulation of 80% power
  - A medium critical effect size of 0.40 for each of the dependent variables, and a significance level of .05 for one-tailed t-tests means
  - A sample size of 40 was deemed sufficient to test the study hypotheses

Critique The Sample

- What was the sampling frame?
- Were the inclusion and exclusion criteria identified?
- What sampling methods were used?
- Was there rationale for the sampling method?
- What was the response rate?
- Was there a power analysis?
- Was the sample large enough?
- Were the characteristics of the sample described?
- Was the sample representative of the population they were studying?
- Who is the sample generalizable to?

How Do I Deal With Sample Size In the Real World?

- Know that to detect a small effect, you need a larger sample
- Know that for every extraneous variable, you need a bigger sample
- Know that if you have a small sample, you may be underpowered

- Look to see if your results are in the expected direction

Sample Section for Your Research Proposal

- What is your sampling frame?
- What are the inclusion and exclusion criteria?
- What sampling methods will be used?
- What is the rationale for the sampling method?
- About how big will the sample be?
- Explain how subjects will be assigned to groups
- Who is the sample generalizable to?
- Discuss strengths and weaknesses of sampling method