How could this have been avoided?

Today

- General sampling issues
- Quantitative sampling
  - Random
  - Non-random
- Qualitative sampling

In Other Words

- How many subjects are enough?
- Does it really matter how you choose research subjects?
- What difference does it make?
General Sampling Issues

- A study’s sample is one of the most important design elements.
- Failure to obtain a good sample can severely limit results & even lead to incorrect results
- Sample differences represent a common source of invariance between similar studies in education research

General Sampling Issues

- Issues
  - Nature of the sample
  - Size of the sample
  - Method of selecting the sample

General Sampling Issues

Terminology

- **Population** - all members of a specified group
  - Target population – the population to which the researcher ideally wants to generalize
  - Accessible population – the population to which the researcher has access
- **Sample** - a subset of a population
- **Subject** - a specific individual participating in a study
- **Sampling technique** - the specific method used to select a sample from a population
Quantitative Sampling

Terminology (cont.)

- **Representation** – the extent to which the sample is representative of the population
  - Demographic characteristics
  - Personal characteristics
  - Specific traits
  - Goal is for the sample’s characteristics to match those of the target population as closely as possible.
  - High representation = Higher confidence in results.

- **Generalization** – the extent to which the results of the study can be reasonably extended from the sample to the population
  - Generalization is directly related to representation

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Quantitative Sampling

**Sampling Error (unintentional & unavoidable)**

- The chance occurrence that a randomly selected sample is not representative of the population due to errors inherent in the sampling technique
  - Difference between the characteristics of the sample and the characteristics of the population
  - Random nature of errors
  - Controlled by selecting large samples
    - Census sample the only way to eliminate sampling error

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Quantitative Sampling

**Sampling Bias (intentional?)**

- Some aspect of the researcher’s sampling design creates bias in the data
  - Did the researcher take care to sample all subgroups within the target population?
  - Non-random nature of errors
  - Controlled by being aware of sources of sampling bias and avoiding them
  - Example) Presidential Approval Ratings will likely be inaccurate if based only on opinions from members of the opposing party.
Quantitative Sampling

Designing a Sample

- Three fundamental steps
  - Identify a population
  - Define the sample size
  - Select the sample

Identify a Population

- The population is the group you want to generalize your research findings to
- Populations don’t always have to be the general population
- Try and have a sense size and complexity of the population before designing a sample
  - This may not always be possible

Define the Sample Size

- General rules for sample size
  - As many subjects as possible
    - Upper limit subject to many factors, such as budget, access, and time.
  - Thirty (30) subjects per group for correlational, causal-comparative, and true experimental designs
    - Driven by statistical analysis
  - Ten (10) to twenty (20) percent of the population for descriptive designs
As a population size increases, samples constitute a smaller percentage of a population.

Selecting Random Samples

- Known as probability sampling
- Best method to achieve a representative sample
- Four techniques
  - Random
  - Stratified random
  - Cluster
  - Systematic

<p>| Table 4.2 Sample Sizes (N) Required for Given Population Sizes (N) |
|---|---|---|---|---|---|---|---|</p>
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Random sampling
- Selecting subjects so that all members of a population have an equal and independent chance of being selected
- Advantages
  - High probability of achieving a representative sample
  - Meets assumptions of many statistical procedures
- Disadvantages
  - Identification of all members of the population can be difficult
  - Example: How would you know how many teachers there are in Nevada?
  - Contacting all members of the sample can be difficult
Selecting Random Samples

- Random sampling (continued)
  - Selection issues
    - Use a table of random numbers
    - Need to list all members of the population
    - Assign consecutive numbers to all members
    - Ignore duplicates and number out of range when sampled
  - Use of SPSS
    - Data, select cases, random sample, approximate or exact
    - Need for an electronic SPSS data set

Example – Simple Random Sample

- Research Question
  - Do elementary school teachers support the recess policy?
- Population Size = 100 teachers
- Desired Sample Size = 80 teachers
- Use random number table to select subjects from the population

Example – Simple Random Sample

- Using Table of Random Numbers
  - Number each teacher in the population from 000 to 100.
    - All numbers must have the same number of digits
  - Consult the table to select subjects for the survey.
Subjects 070, 015, & 040 are the first three selected. The last three digits fall between 000 & 100.

Selecting Random Samples

- Stratified random sampling
  - Selecting subjects so that relevant subgroups in the population (i.e., strata) are guaranteed representation
  - Proportional and non-proportional
    - Proportional – same proportion of subgroups
    - Non-proportional – different, often equal, proportions of subgroups
  - Advantage – representation of subgroups in the sample

- Disadvantages
  - Identification of all members of the population can be difficult
  - Identifying members of all subgroups can be difficult
  - Selection issues
    - Identification of relevant strata
      - Often identified by theory & previous research
    - Coding subjects regarding strata
    - Selecting randomly from within each level of the strata
Selecting Random Samples

- Cluster sampling
  - Selecting subjects by using groups that have similar characteristics and in which subjects can be found
  - School districts
  - Schools
  - Classrooms

- Advantages
  - Addresses some limitations of random sampling and stratified random sampling
  - Very useful when populations are large and spread over a large geographic region
  - Convenient and expedient

Selecting Random Samples

- Cluster sampling (continued)
  - Disadvantages
    - Representation is likely to become an issue
    - Assumptions of some statistical procedures can be violated

- Selection issues
  - Identify logical clusters and the average number of population members per cluster
  - Determine the number of clusters needed
    - \# Clusters = Desired Sample Size \div Average Size of Cluster
  - Randomly select necessary clusters
  - Multi-stage sampling

Selecting Random Samples

- Systematic sampling
  - Selecting every \( K \)th subject from a list of the members of the population
  - Advantage – very easily done
  - Disadvantages
    - Susceptible to systematic inclusion of some subgroups
    - Some members of the population don’t have an equal chance of being included
### Selecting Random Samples

- **Systematic sampling (continued)**
  - Selection issues
    - Listing all members of the population can be difficult
    - Determining the value of $K$
      - $K = \frac{\text{Size of Population}}{\text{Desired Sample Size}}$
    - Starting at the top of the list again if the desired sample size is not reached

### Selecting Non-Random Samples

- Known as non-probability sampling
- Use of methods that do not have random sampling at any stage
  - A source of sampling bias in educational research
- Useful when the population cannot be described
- Three techniques
  - Convenience
  - Purposive
  - Quota

### Selecting Non-Random Samples

- **Convenience sampling**
  - Selection based on the availability of subjects
    - Volunteers (Ex, Psych. 100 Students)
    - Pre-existing groups
  - Concerns related to representation and generalizability
    - i.e., results only apply to those who are willing to volunteer as research subjects
Selecting Non-Random Samples

- Purposive sampling
  - Selection based on the researcher’s experience and knowledge of the group being sampled
  - Need for clear criteria for describing and defending the sample
  - Concerns related to representation and generalizability
    - What if the researcher’s knowledge about the population is inaccurate?

- Quota sampling
  - Selection based on the exact characteristics and quotas of subjects in the sample when it is impossible to list all members of the population
  - Concerns with accessibility, representation, and generalizability
    - Ex: Phone survey samples are limited to those who have telephones, listed phone numbers, and a willingness to answer questions. These subjects may not accurately reflect the general population

Quantitative Sampling:

Real World Example

- General Research Question
  - How much time do school psychologists spend administering standardized tests?

- Important issue from existing research
  - Doctoral vs. non-doctoral school psychologists

- Population = School Psychologists
  - Defined as the membership registry of the National Association of School Psychologists
  - What are some potential limitations of this?

- Sampling Strategy?
  - Stratified random sample with proportional allocation.
  - Stata = Doctoral S.P. & Non-doctoral S.P

- How many subjects?
  - 500 sampled, 365 responded to survey
  - Was this a sufficient sample size?

- What are the limits to Generalization?
Qualitative Sampling

- Unique characteristics of qualitative research
  - In-depth inquiry
  - Immersion in the setting
  - Importance of context
  - Appreciation of participant’s perspectives
  - Description of a single setting
  - The need for alternative sampling strategies

Qualitative Sampling

- Purposive techniques – relying on the experience and insight of the researcher to select participants
  - Intensity – compare differences of two or more levels of the topics
  - Students with extremely positive and extremely negative attitudes
  - Effective and ineffective teachers

Qualitative Sampling

- Purposive techniques (continued)
  - Homogeneous – small groups of participants who fit a narrow homogeneous topic
  - Criterion – all participants who meet a defined criteria
  - Snowball – initial participants lead to other participants
Qualitative Sampling

- Purposive techniques (continued)
  - Random purposive – given a pool of participants, random selection of a small sample
  - Inherent concerns related to generalizability and representation