Strategic Sampling for Better Research Practice

Survey Peer Network
November 18, 2011

Thomas Lindsay, CLA Survey Services
John Kellogg, Office of Institutional Research
Tom Dohm, Office for Measurement Services
# Sampling vs. Census

<table>
<thead>
<tr>
<th>Census</th>
<th>Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Entire population is surveyed</td>
<td>• (Small) subset of population is surveyed</td>
</tr>
<tr>
<td>• Results are not statistic – they are the population</td>
<td>• Results may or may not be generalizable to the full population</td>
</tr>
<tr>
<td>• Results can be heavily skewed by non-response by certain segments of population</td>
<td>• Smaller numbers should reduce challenges of non-response bias</td>
</tr>
<tr>
<td>• Generally very costly and difficult</td>
<td>• Generally less costly than census</td>
</tr>
</tbody>
</table>
Sampling Types

• Probability
  – Every member of the population has a known, non-zero chance of selection
  – Sample’s representativeness of population (sample error) can be precisely calculated
  – Population must be well defined

• Non-Probability
  – Some members of the population are selected by non-random means
  – Sample’s representativeness cannot be calculated (is unknowable)
  – Likely to introduce systematic bias
  – Understanding of population is not required
Sampling Methods

Probability Sampling
- Simple Random
- Stratified

Non-Probability Sampling
- Convenience
- Quota

(This chart is also on the back of your pink handout)
Simple Random Sampling

• Most common method of probability sampling
• One sample is selected from entire population
• All members of population must have exactly the same odds of selection
Stratified Sampling

- Entire population is divided systematically into two or more groups by some criterion
- Different groups must be weighted if not directly proportional to population
- Simple random samples are drawn separately from each group
- Stratification criterion must be significant factor in research expectations
Convenience Sampling

- Easiest sampling method
- Participants are chosen based on availability or ease of recruitment
- High risk of non-response bias
- Sample error cannot be calculated – representativeness is unknowable
Quota Sampling

• Researcher uses judgment to choose participants based on some population characteristic (usually demographic)
• Participants are chosen within each quota group by convenience, until quota is reached
• Researcher can ensure that important, harder-to-reach groups are present in sample
• Sample error cannot be calculated – representativeness is **unknowable**
Quota Sampling is NOT Stratified Sampling

- Quota sampling may reduce response and coverage bias of convenience sampling but sampling error remains unknowable.
- Researcher’s judgment, not random selection, determines makeup of sample.
- All members of population do not have a known, nonzero chance of participation.
Response Rates

- Adjusting for projected low responses
- Increase Sample Size?
- Risks:
  - Survey Fatigue
  - Does not solve the response RATE problem
    - Can simply give you more non-representative responses
- Solution:
  - Increase your response rates
  - Collaboration
Other Considerations

- Numbers Needed for Analysis
  - Descriptive statistics
    - no real minimum
  - Multiple Regression / Analysis of Covariance
    - 200-500 depending on number of variables
  - Comparative Analysis of Subgroups
## Sample Size for 95% Confidence Interval

<table>
<thead>
<tr>
<th>Population Size</th>
<th>±5%</th>
<th>±3%</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>80</td>
<td>92</td>
</tr>
<tr>
<td>200</td>
<td>132</td>
<td>169</td>
</tr>
<tr>
<td>400</td>
<td>196</td>
<td>291</td>
</tr>
<tr>
<td>1,000</td>
<td>278</td>
<td>517</td>
</tr>
<tr>
<td>10,000</td>
<td>370</td>
<td>965</td>
</tr>
<tr>
<td>100,000</td>
<td>383</td>
<td>1,056</td>
</tr>
<tr>
<td>1,000,000</td>
<td>384</td>
<td>1,066</td>
</tr>
<tr>
<td>10,000,000</td>
<td>384</td>
<td>1,067</td>
</tr>
<tr>
<td>100,000,000</td>
<td>384</td>
<td>1,067</td>
</tr>
</tbody>
</table>
Types of Survey Errors

- **Sampling Error** – inadequate sample size/nonrandom sample
- **Measurement Error** – imperfect survey questionnaire (e.g., unreliable)
- **Coverage Error** – inability to contact some types of people in the population
- **Nonresponse Error** – the condition where people of a particular type are systematically not represented in the sample because such people are alike in their tendency not to respond
Types of Validity

- **External Validity** – examines whether or not observed findings/results should be generalized across different measures, persons, settings and times.
  - Generalized to a well-specified population (i.e., we can safely conclude that the results in our sample reflect how the population would respond)
  - Generalized across subpopulations (i.e., conceptual replicability/robustness)- can results from one subpopulation be generalized to another subpopulation?

- **Statistical Conclusion Validity** – concerns the power to detect relationships that exist and determine the magnitude of these relationships.
• **Internal Validity** – refers to the adequacy of the study design (*not the survey instrument*) and the degree of control we have exercised in data gathering. By *control* we mean that all variables except the dependent variable are controlled by the experimenter.

• **Test Validity** – does the survey instrument measure what it purports to measure?
# Type of Error and Impact on Validity

<table>
<thead>
<tr>
<th>Types of Validity\Types of Errors</th>
<th>Sampling</th>
<th>Measurement</th>
<th>Coverage</th>
<th>Nonresponse</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External</strong></td>
<td>Major Impact if sample is non-probabilistic /non-random or sample size too small</td>
<td>If reliability low, can’t trust results, can’t generalize</td>
<td>Results can’t be generalized to non-covered individuals</td>
<td>Results can’t be generalized to non-participating groups</td>
</tr>
<tr>
<td><strong>Statistical Conclusion</strong></td>
<td>Inadequate sample size has major impact</td>
<td>If reliability low, can’t trust results, can’t trust conclusions</td>
<td>Conclusions can’t be applied to non-covered individuals</td>
<td>Conclusions can’t be generalized to non-participating groups</td>
</tr>
<tr>
<td><strong>Internal</strong></td>
<td>Major Impact If sample is non-probabilistic /non-random or sample size too small</td>
<td>If Reliability low, results from survey instruments will be invalid</td>
<td>Bias can be introduced into design</td>
<td>Bias can be introduced into design</td>
</tr>
<tr>
<td><strong>Test</strong></td>
<td>No real impact</td>
<td>If Reliability low, results from survey instruments will be invalid</td>
<td>Doesn’t impact validity, per se, but does impact norms and interpretation of results</td>
<td>Doesn’t impact validity, per se, but does impact norms and interpretation of results</td>
</tr>
</tbody>
</table>
Small Group Exercise 1

How do you put together respondent pools?
Small Group Exercise 2

Scenario A:
You have a community organization of 7,500 (and email addresses for 5,000 of them) and need feedback about X. How do you go about getting your information? What would your sampling plan look like?

Scenario B:
You are conducting a survey and want to ensure representativeness of an underrepresented population. How will this affect your sampling plan and subsequent data analysis?

Scenario C:
You want to conduct a survey around a sensitive issue with an unknown or hard-to-identify population (examples: those who identify as GLBTA, or a population who has experienced sexual harassment/violence). How do you go about identifying your sample?
References


Thank you for attending!

To join the Survey Peer Network email list, email opa@umn.edu with “Join SPN” in the subject line.


Our next SPN session will be in February—check your inbox in January for more information!
Types of Test (Survey) Validity

- **Face** – Do items appear to measure what they are intended to measure – If so, compliance and response rates will be higher
- **Content** – Subject matter experts agree items adequately measure the topic for which the content of the survey is intended to measure
- **Criterion** – measures how well your survey instrument compares to similar instruments measuring the same content OR how well your survey predicts criterion
## Summary of Internal and External Validity

<table>
<thead>
<tr>
<th>Population</th>
<th>Random Sample → Good External Validity</th>
<th>Non-Random Sample → Reduced External Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>Random Assignment → Good Internal Validity</td>
<td>Subjects Matched → Good Internal Validity</td>
</tr>
<tr>
<td>Good External Validity</td>
<td>Results will Generalize</td>
<td></td>
</tr>
<tr>
<td>Reduced External Validity</td>
<td>Results will NOT Generalize</td>
<td></td>
</tr>
<tr>
<td>Good Internal Validity</td>
<td>Groups are equal at the start, and you can attribute changes to the independent variable</td>
<td></td>
</tr>
<tr>
<td>Reduced Internal Validity</td>
<td>Groups are unequal at the start, and thus changes could be due to initial differences, NOT the independent variables</td>
<td></td>
</tr>
</tbody>
</table>