Nonresponse in Sample Surveys

Professor Ron Fricker
Naval Postgraduate School
Monterey, California
Goals for this Lecture

• Define nonresponse
  – Unit nonresponse and item nonresponse
  – Ignorable vs. nonignorable
• Define nonresponse bias
• Discuss explanatory theories of nonresponse and strategies to minimize nonresponse bias
• Define how to calculate response rates, including complications
• Discuss trends in nonresponse rates
• The issue is nonresponse bias
  – Nonrespondents have systematically different view/answers to the survey than respondents
• Response rates often used as a measure of the likelihood of nonresponse bias
  – But low response rates do not necessarily mean there is nonresponse bias
  – Conversely, high response rates do indicate smaller chance of nonresponse bias
• Really a function of both proportion of nonrespondents and difference between the statistics of respondents and nonrespondents
Terminology

• **Item nonresponse**: Respondent refuses to answer one or more survey questions
  – Interviewer: “What was your total family income last year?”
  – Response: “I don’t know, my spouse keeps those records.”

• **Unit nonresponse**: Respondent refuses to take the survey at all
  – Sampled person: “I don’t take surveys – please do not contact me again.”
Type of Unit Nonresponse

• Unit: The element of analysis
  – E.g., household, person

• Types of nonresponse
  – Failure to deliver the survey request
    • I.e., failure to locate the sampled unit
  – Refusal to participate
    • I.e., person contacted declines the survey
  – Inability to participate
    • I.e., respondent does not speak the language the instrument is written/given in
Unit Nonresponse Due to Failure to Deliver Survey Request

Figure 6.1 Causal influences on contact with sample household.

Figure excerpted from *Survey Methodology* by Groves et al.
Each Contact Attempt Garners Fewer and Fewer Respondents

Figure 6.2 Percentage of eligible sample households by calls to first contact, for five surveys. (Source: Groves, Wissoker, Greene, McNeely, and Montemarano, 2001.)

Figure excerpted from Survey Methodology by Groves et al.
Why Telemarketers Annoy You During Dinner During the Week

Figure 6.3 Percentage of households contacted among those previously uncontacted, by call number by time of day. (Source: National Survey of Family Growth, Cycle 6.)

Figure excerpted from Survey Methodology by Groves et al.
Unit Nonresponse Affected By...

- Persistence at contact
- Use of incentives
- Frequency of experience
  - I.e., how often potential respondent is approached to complete surveys
- Level of public knowledge
  - I.e., "name recognition" of survey organization
- Nature of request
  - Surveys asking for some or respondent’s time and information (vice money)

See previous "Dillman" lectures
Unit Nonresponse Due to Refusals

- Many reasons why people refuse to take surveys
- Summed up in various theoretical perspectives
  - Opportunity cost
  - Social isolation
  - Topical interest
  - Over-surveying
  - Leverage-salience
Leverage-Salience: Respondents Weight Survey Attributes Differently

Figure 6.4 Two sample persons with different leverages for attributes of a survey request.

Figure excerpted from *Survey Methodology* by Groves et al.
Unit Nonresponse Due to Inability to Provide Requested Data

• Able to contact a potential respondent, but they cannot provide the data
  – E.g., language barrier

• As long as these effects are random, little to worry about

• But if systematically related to survey topic(s), potential response bias
  – E.g., A survey on immigration reform given only in English
How Does Nonresponse Affect the Quality of Survey Statistics?

Figure 6.5 Percentage nonresponse bias for estimated proportion of single person households, by number of calls required to reach the household, for four surveys. (Source: Groves, Wissoker, Greene, McNeeley, and Montemarano, 2001.)

Figure excerpted from Survey Methodology by Groves et al.
Ignorable vs. Nonignorable Nonresponse

- **Ignorable nonresponse**: If cause of nonresponse known, sampling strategy can be adjusted to eliminate/mitigate nonresponse bias
- **Nonignorable nonresponse**: Even if cause is known, cannot eliminate nonresponse bias from results

**Figure 6.6** Causal diagrams illustrating ignorable and nonignorable nonresponse from influences on decision to participate.

Figure excerpted from *Survey Methodology* by Groves et al.
Computing Response and Nonresponse Rates

Figure 6.7 Illustration of effect of unit nonresponse on estimated regression line.

Figure excerpted from Survey Methodology by Groves et al.
Nonresponse Bias

- Nonresponse bias is \( \bar{y}_r - \bar{y}_s \)
- Can be expressed as
  \[
  \bar{y}_r - \bar{y}_s = \frac{m_s}{n_s} (\bar{y}_r - \bar{y}_m)
  \]
- Note it’s a function of fraction nonrespondents and difference between observed & unobserved statistics

Figure excerpted from *Survey Methodology* by Groves et al.
Possible Response Rate Calculation Complications

• When must screen frame members to determine sample eligibility
  – Hard then to determine denominator for response rate calculation

• When sample frame consists of clustered elements and full cluster nonrespondent
  – Unclear how many sample elements were really nonrespondent

• When using unequal sampling probabilities
  – Unclear whether to use weights in response rate calculation
One Approach

Response rate = \( \frac{I}{I + R + NC + O + e \times U} \)

where

- \( I \) = complete survey
- \( R \) = refusal or breakoff
- \( NC \) = noncontact
- \( O \) = other eligible
- \( U \) = unknown eligibility
- \( e \) = estimated proportion of eligibility
Trends in Response Rates (1)

Figure 6.8 Household nonresponse rate, household refusal rate, and person refusal rate for the National Crime Victimization Survey by year. (Source: US Census Bureau, 2003.)

Figure excerpted from *Survey Methodology* by Groves et al.
Trends in Response Rates (2)

Figure 6.9 Nonresponse and refusal rates for the Current Population Survey by year. (Source: US Census Bureau.)

Figure excerpted from *Survey Methodology* by Groves et al.
Trends in Response Rates (3)

Figure 6.10 Nonresponse rate and refusal rate for the Survey of Consumers by year. (Source: Surveys of Consumers.)

Figure excerpted from *Survey Methodology* by Groves et al.
Trends in Response Rates (4)

Figure 6.11 Median nonresponse rate across states, Behavioral Risk Factor Surveillance System, 1987–2001. (Source: BRFSS.)

Figure excerpted from *Survey Methodology* by Groves et al.
Figure 6.12 Beatty-Herrmann model of response process for item-missing data.

Figure excerpted from *Survey Methodology* by Groves et al.
Design Features to Reduce Unit Nonresponse (1)

• In general, as in Dillman:
  – Number and timing of attempts
  – Prenotification
  – Incentives
  – Persuasion letters

• Also:
  – Data collection period
  – Mode switches
  – Survey burden
  – Respondent rules
• For interviewer-assisted surveys:
  – Interviewer workload
  – Interviewer observations
  – Interviewer introductory behavior
  – Interviewer/household matching
  – Interviewer switches
Figure 6.13 Tools for reducing unit nonresponse rates.

Figure excerpted from *Survey Methodology* by Groves et al.
What We Have Covered

• Defined nonresponse
  – Unit nonresponse and item nonresponse
  – Ignorable vs. nonignorable
• Defined nonresponse bias
• Discussed theories of nonresponse and strategies to minimize nonresponse bias
• Defined how to calculate response rates, including complications
• Discussed trends in nonresponse rates