Nonresponse Bias in a Mail Survey of Physicians

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In this Presentation

- Background on nonresponse bias in physician survey
- Objectives of this study
- Methods
- Results
- Conclusion and Discussion
- Limitations
- Future Directions
Problem Statement

- Response rates are even lower for physicians than general population (Asch, Jedrziewski, & Christakis 1997).
- Despite the low response rates, it is unclear to what extent nonresponse bias exists in studies with physicians.
Only 18% of studies with physicians analyzed potential nonresponse bias (Cummings, Savitz, and Konrad, 2001).

Results from the published studies suggest that nonresponse bias is less of a concern for surveys with physicians than the general public.” (Kellerman and Herold, 2001)
Many studies found no or only minimal amounts of response bias

- slight bias towards females, younger physicians, and non-specialty members (Cull, Karen, O’Connor, Sharp and Tang 2005), US Medical graduates and recently licensed physicians (Guadagnoli and Cunningham, 1989).

- Response bias not associated with Response Rate (Barton et al. 1980, McCarthy, Loval, and MacDonald 1997; Thomsen 2000).
Differences Between Early and Late Responders, (Kellerman and Herold, 2001).

Most found no differences in any demographic variables such as income, area, type of practice, and gender between early responders and late responders.

Some found that early responders were more likely to live in suburban areas and have higher annual incomes than late responders.
Study Objectives

1. Factors associated with nonresponse bias and direction of nonresponse bias
2. Consequences of nonresponse bias on survey estimates
3. Relationship between response rates and nonresponse bias
Physician survey is one component of the America’s Best Hospitals rankings

- Random sample of 3,400 board certified physicians stratified into 4 region and 17 specialties
- Physicians are surveyed and asked to nominate up to 5 hospitals that provide “the best care...” associated with their medical specialty
- Random 25% of sample received some additional questions
Methods: Short Form

Front

America’s Best Hospitals

This survey of physicians’ judgments provides the basis for the reputation component of the annual ranking of hospitals for U.S. News & World Report.

Please list in the spaces below the five hospitals (and/or affiliated medical schools) in the United States that you believe provide the best care for patients with the most serious or difficult medical problems associated with neurology and neurosurgery, regardless of location or expense (we’ve provided space for the hospitals and/or affiliated medical schools in hopes that will make it easier to provide your answer):

<table>
<thead>
<tr>
<th>Hospitals and/or affiliated medical schools that provide the best care</th>
<th>City</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please turn the page

Back

Thank you again for your participation.

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3640 Cornwallis Road, P.O. Box 12194
Research Triangle Park, NC 27709-12194
Methods: Long Form

Front

America’s Best Hospitals

This survey of physicians’ judgments provides the basis for the reputation component of the annual ranking of hospitals for U.S. News & World Report.

RTI
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1. Please list in the spaces below, the five hospitals (and/or affiliated medical schools) in the United States that you believe provide the best care for patients with the most serious or difficult medical problems associated with neurology and neurosurgery, regardless of location or expertise (we’ve provided space for the hospitals and/or affiliated medical schools in hopes that will make it easier to provide your answer):

Hospitals and/or affiliated medical schools that provide the best care City State

a. 

b. 

c. 

d. 

e. 

Please turn the page →

Back

6. Please indicate how much you Strongly Agree, Agree, Neither Agree nor Disagree, Disagree, or Strongly Disagree that each of the following was an important influence in choosing the hospitals you named above:

For each of the following influencing factors, circle the appropriate response, 1-5.

a. Your own direct knowledge of these hospitals

b. Experiences of your own patients at these hospitals

c. Experiences of your colleagues or your colleagues’ patients at these hospitals

d. Published rankings of these hospitals on various indices of performance

e. Direct knowledge about specific physicians on staff at these hospitals

f. Publications or presentations by physicians or researchers at these hospitals

g. Knowledge of sophisticated medical technology utilized by these hospitals

h. Where you went to medical school

i. Where you did your internship or residency training

j. Some other factor (please specify)

Thank you again for your participation.

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Methods: Number of Contacts

The 2005 Survey used four waves of data collection

<table>
<thead>
<tr>
<th>Wave</th>
<th>Description</th>
<th>Cumulative RR* after each mailing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cover letter, survey, BRE sent via 1st class mail</td>
<td>16.8%</td>
</tr>
<tr>
<td>2</td>
<td>Reminder letter or postcard</td>
<td>26.4%</td>
</tr>
<tr>
<td>3</td>
<td>Cover letter, survey, BRE sent via Priority Mail</td>
<td>36.9%</td>
</tr>
<tr>
<td>4</td>
<td>Cover letter, survey, BRE sent overnight via Federal Express</td>
<td>47.3%</td>
</tr>
</tbody>
</table>

*Standard AAPOR Response Rate 2
Methods: Independent Variables

- Variables available on the sampling frame that may be related to the survey estimates.
  - Gender
  - Region (Midwest, Northeast, South, West)
  - Urbanicity (PMSA, MSA, Non-Metropolitan)
  - Survey Length (Long versus Short)
  - Specialty (17 medical specialties)*

*pooled for some analyses*
Methods: Outcome Variables

- **Response Outcomes**
  - Overall response
  - Early versus late responders

- **Target Estimates**
  - *OneTopHospital*: at least one top hospital in physician’s specialty nominated
  - *TwoTopHospitals*: at least two top hospitals in physician’s specialty nominated
  - *HospInRegion*: only hospitals in physician’s region nominated
**Results 1: Response Rates for Region and Sex**

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Response Rates</th>
<th>Logistic Regression Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>44.8%</td>
<td>$F = 1.70, p = .17$</td>
</tr>
<tr>
<td>Northeast</td>
<td>49.6%</td>
<td>No significant response bias</td>
</tr>
<tr>
<td>South</td>
<td>49.8%</td>
<td>No difference between early and late responders</td>
</tr>
<tr>
<td>West</td>
<td>45.7%</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td>$F = 8.01, p = .01$</td>
</tr>
<tr>
<td>Male</td>
<td>48.7%</td>
<td>Relative response bias for males = 3%</td>
</tr>
<tr>
<td>Female</td>
<td>42.1%</td>
<td>Men more likely to be early responders</td>
</tr>
</tbody>
</table>
## Results 1: RR for Urbanicity and Survey Length

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Response Rates</th>
<th>Logistic Regression Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urbanicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PMSA</td>
<td>48.7%</td>
<td>( F = 2.97, p = .052 )</td>
</tr>
<tr>
<td>MSA</td>
<td>45.2%</td>
<td>No significant response bias</td>
</tr>
<tr>
<td>Non-metropolitan</td>
<td>48.8%</td>
<td>No difference between early</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and late responders</td>
</tr>
<tr>
<td><strong>Survey Length</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Form</td>
<td>41.0%</td>
<td>( F = 15.35, p = &lt;.001 )</td>
</tr>
<tr>
<td>Short Form</td>
<td>49.3%</td>
<td>Relative response bias for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>short form= 4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No difference between early</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and late responders</td>
</tr>
</tbody>
</table>
### Results 2: Consequences of Gender and Length on Survey Estimates

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>% Nominating \textit{OneTopHospital}</th>
<th>% Nominating \textit{TwoTopHospitals}</th>
<th>% Nominating \textit{HospInRegion}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>83.2%</td>
<td>59.4%</td>
<td>13.2%</td>
</tr>
<tr>
<td>Female</td>
<td>73.3%</td>
<td>44.4%</td>
<td>24.9%</td>
</tr>
<tr>
<td><strong>Survey Length</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short</td>
<td>81.1%</td>
<td>57.4%</td>
<td>15.9%</td>
</tr>
<tr>
<td>Long</td>
<td>81.6%</td>
<td>52.7%</td>
<td>14.6%</td>
</tr>
</tbody>
</table>
Results 2: Consequences on Survey Estimates

Logistic Regression Results

- Men are more likely to nominate at least one or two top hospitals in their specialty ($F = 17.21$, $p = <.001$; $F = 23.62$, $p = <.001$).

- Women are more likely to nominate hospitals only in their region ($F = 26.17$, $p = <.001$).

- Physicians who received the short form are slightly more likely to nominate at least two top hospitals ($F = 2.71$, $p = .10$).
Results 3: Response Rate by Specialty
Results 3: Bias for Males

- Overall mean response bias of 2.3 percentage points ($t=2.904$, $p=.01$)

- Larger response rates were associated with lower gender response bias, but this correlation was not statistically significant ($R = -.3656$, $p=.15$)
Results 3: Bias for Short Form

- Overall mean response bias of 3.4 percentage points ($t=2.951$, $p=.01$)
- Larger response rates not correlated to lower response bias for survey length ($R = -.2769$, $p=.28$)
Conclusions and Discussion

• Are nominations potentially biased toward top 5 hospitals and against hospitals in physicians’ region?

• Larger response rates not significantly correlated with smaller response bias
  • However, subsequent waves of data collection reduced gender response bias
  • Response bias is more severe in some specialties than others
Limitations

- Other factors associated with response bias were not explored, such as age of physicians or years since receiving medical degree.
- Correlations between response rates and nonresponse bias was limited to a comparison of 17 observations:
  - Highest response rate examined was 61%. Even higher response rates might perform differently.
- Present study did not include a nonresponse follow-up, so there is no way to determine how nonresponders would have actually responded.
Future Directions

- Conduct follow-up studies with nonresponders
- Stratify by gender and apply population weights
- Use a richer sampling frame with more information
- Use subsequent years of data to repeat analyses with a larger sample size
For more information on the “America’s Best Hospitals” project:
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Relative Bias and Bias

\[
\text{Rel } B(\tilde{y}_r) = \frac{B(\tilde{y}_r)}{\tilde{y}_r}
\]

*Where:*

\[
B(\tilde{y}_r) = \tilde{y}_r - \tilde{y}_t,
\]

\(\tilde{y}_r\) is the mean for respondents (using base weights), and

\(\tilde{y}_t\) is the mean for the full sample (using base weights).