Comparing the Selection of One Person per Household to the Selection of All Household Members: Can Less be More?

Vincent G. Iannacchione
Bonnie E. Shook-Sa

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One Person versus All Persons in a HH

Intra-HH Correlation

Unequal Weighting
Unequal Weighting Example

Within-Household Probability of Selection:

<table>
<thead>
<tr>
<th></th>
<th>1-Person Household</th>
<th>2-Person Household</th>
<th>3-Person Household</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-Persons Design</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>One-Person Design</td>
<td>1</td>
<td>$\frac{1}{2}$</td>
<td>$\frac{1}{3}$</td>
</tr>
</tbody>
</table>
Components of Design Effects

The overall design effect may be approximated as:

\[ DEFF_T = DEFF_C \times DEFF_W \]

Where:

\[ DEFF_C = \text{Design effects attributable to clustering} \]
\[ DEFF_W = \text{Design effects attributable to unequal weighting} \]
The NCVS uses a stratified, four-stage sampling design to estimate crime victimization rates for the national civilian non-institutionalized population age 12 and older:

1. Select PSUs
2. Select segments
3. Select all HHs in a sampled segment
4. **Select all persons 12 and older in a selected HH**
Victimization Rates

Personal Crimes are committed against individuals:
- Rape/sexual assault
- Robbery
- Assault
- Personal theft

Property Crimes are committed against households:
- Burglary
- Motor vehicle theft
Design Effects Attributable to Clustering

In a four-stage sample design:

$$DEFF_c = 1 + (m_1 - 1)\rho_1 + (m_2 - 1)\rho_2 + (m_3 - 1)\rho_3$$

where

\(\rho_1, \rho_2, \) and \(\rho_3\) are the intracluster correlations for persons within PSUs, segments, and households; and

\(m_1, m_2, \) and \(m_3\) are the average number of sampled persons per PSU, segment, and household.
Research Question

How does selecting one respondent per HH affect the design effects associated with personal victimization rates?
Simulation Study

2008 NCVS Public Use Data:
- 88,700 respondents in 48,111 HHs
- 78% are in HHs with 2 or more respondents
- Selecting one respondent per HH would reduce the total number of respondents to 48,111 (54%)
Assumptions:
- Existing data for multi-person HHs is not biased for intra-familial crimes such as domestic violence.
- Response propensities among persons in multi-person HHs are not affected.
- One person is always selected for interview from a sampled HH.
Simulation Study

- 88,700 Rs in 48,111 HHs
- 69,007 Rs in 28,418 multi-R HHs
- 19,693 Rs in single-R HHs
- Select 1 R per HH
  - Adjust wts
- Repeat for 1000 replicates
- Est. VRs & DEFFs
- Est. VRs & DEFFs across 1,000 reps

Est. VRs & DEFFs
### Median Design Effects*

<table>
<thead>
<tr>
<th></th>
<th>$DEFF_c$</th>
<th>$DEFF_w$</th>
<th>$DEFF_T$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Sample</td>
<td>1.26</td>
<td>1.09</td>
<td>1.38</td>
</tr>
<tr>
<td>One-Person Sample</td>
<td>1.16</td>
<td>1.53</td>
<td>1.77</td>
</tr>
</tbody>
</table>

*Victimization rates associated with rape/sexual assault, robbery, assault, and personnel theft.*
Simulation Study

Results:

- The one-person design is likely to significantly increase the design effects of victimization rates.

- Selecting one person from each of the current number of sampled HHs will result in a loss of precision.

- A drastic increase in the current number of sampled HHs is needed to maintain current precision levels.
Alternative Designs

‘Walk away’ from some single-person HHs:
- Advantage: Reduces unequal weighting
- Disadvantage: Increased HH screening required

Select one parent and one child per HH:
- Advantages: Reduces unequal weighting, Avoids selecting both spouses
- Disadvantage: Increased HH screening required
A field study is needed to estimate the effects of a one-person per HH design on:

- Response propensities
- Response bias
- Survey costs
More Information

Vince Iannacchione
202.728.1960
vince@rti.org