WHO KNOWS WHO LIVES HERE?
WITHIN-HOUSEHOLD DISAGREEMENTS AS A SOURCE OF SURVEY COVERAGE ERROR

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Keywords: roster, questionnaire design, undercount, proxy reporting

Who lives in a sampled household is the first and most fundamental information a survey or census must determine, if interviews with its members are to represent a population completely. Yet, little systematic attention has been given to sources of measurement error in compiling household rosters. I will examine, and challenge, the assumption made in surveys that household residents are reliably and consistently reported by household respondents.

The Census Bureau attempts to enumerate each person at his or her "usual residence," defined as the place where he or she lives and sleeps most of the time. Although residence is not in question for most people, listing errors are not negligible. They account for about a third of gross census omissions, and contribute to relatively high net undercounts of males, young adults, and minorities (Hogan, 1992).

My paper examines the hypothesis that a person's lifestyle may give rise to erroneous assumptions and disagreements which result in omissions. My analysis is based on an experimental pilot survey designed to improve coverage by building more inclusive household rosters. The Living Situation Survey (LSS) was fielded by RTI in the summer of 1993. Personal interviews were conducted in 999 households oversampled in areas with high concentrations of minorities and renters. The response rate was 79.5 percent (Lynch et al., 1993).

- **Step 1** in the survey was to ask household respondents to identify all persons with any attachment to the sample households during a two month reference period. Extensive cues targeted tenuously attached persons and others at risk of omission. Respondents were asked to mention persons who stayed the previous night, for whom a room was kept, who received mail or messages there or had a key, and so on. A total of 3,537 people were rostered—almost one person added per household on average, compared to the census.
- **Step 2** was to determine the usual residence of each person on the list. About three-quarters were reported to be usual residents of the sample units, and one-quarter lived somewhere else.
- **Step 3** was to follow up a subsample of the rostered persons to collect more information about their living situations. Casual visitors, who had stayed a week or less and lived somewhere else, were not followed up. The most stable residents were subsampled. Followup interviews were conducted for 85 percent of eligible individuals–one third with the individuals themselves, and the remainder with knowledgeable proxies.

Hypotheses

I hypothesize that

1. *Respondents infer usual residence (in part) from an individual's presence in a household,*
2. *Absence leads to the (sometimes incorrect) inference that an individual has another residence, and hence reduces the reliability of reporting and increases the level of disagreements.*

Hypothesis 2 is based on anthropological research. Gerber (1994) found that lack of knowledge and transiency led her respondents to erroneously assume that a person 'must have' a residence of his own somewhere else. For this reason, persons with no stable place of residence may not be included in census rosters in any of the places they stay. Sweet and Alberti's (1994) analysis of LSS data also suggests that disagreement is indicative of ambiguous or atypical residence situations, such as more than one residence, staying at a place most of the week while working, and so on.

3. *Related individuals are more likely to be reported as usual residents and are reported more consistently with fewer disagreements and hence better coverage.*

Hypothesis 3 is consistent with prior research by Fay (1989) and by Ellis (1994) showing that unrelated persons are more likely to be omitted from rosters.

4. *Disagreements introduce bias, because they differentially increase the risk of omission of persons (erroneously) reported as nonresidents.*

In the followup interviews, individuals (or their proxies) were asked which, if any, of the places they'd stayed during the reference period were their usual residences. These data allow us to compare residence reports given in the original and followup interviews for the subject individual.

I examine the interrelations among 5 variables:

- AGREEMENT between household respondent and followup reports of an individual's usual residence (1= reports agree, 2=disagree)

Reports agree if both indicate an individual was a usual resident of the sample unit, or both indicate he was not. They disagree if one but not the other reports him as a resident.

- HOUSEHOLD RESPONDENT'S REPORT of an individual's usual residence (1=is a UR, 2=is not a usual resident of the sample unit)
- PRESENCE in the household (1=present in the household all but 0-7 nights of the 2 month reference period, 2= away more than a week)
- PROXY STATUS of followup interview (1=followup interview conducted with individual him/herself, 2= knowledgeable proxy)
- RELATIONSHIP to household respondent (1=related, 2=unrelated)

Results

Table 1 presents the cross-classification of the first 4 variables. In each subtable, the row variable is the household respondent's report of a person's usual residence, and the column variable is agreement between reports. Percents in the four cells of each subtable sum to 100, with standard errors in parentheses. Data are weighted to national household totals, and to account for oversampling, nonresponse, and subsampling of persons for followup.

Table 1, part A shows that the usual residence of persons who were continuously present was not in question. Their status was clearcut and known to them and to others reporting for them. Household respondents declared all such individuals to be usual residents, and reports given in followup interviews almost universally agreed for both self and proxy interviews. (Keep in mind, though, the two interviews were not necessarily independent.) This result corresponds to the assumption that rosters are reliably reported and unproblematic, and in fact describes most of the population (about 159 million people, according to this survey).

The situation was quite different for individuals who spent more than a week away from the household, shown in Part B. They were less likely to be reported as usual residents, and disagreements were more common. The level of disagreement was also higher for proxy interviews: 6 percent of self-reports, and 17 percent of proxy reports contradicted the original report. Persons for whom proxy interviews were given may have lifestyles that make them both difficult to locate and to report accurately about.

The level of agreement is higher for persons initially claimed as usual residents. To illustrate, the bottom left subtable shows that the odds on the second report agreeing were over 30 to 1 for persons initially reported as usual residents, but only 4.8 to 1 for those reported as non-residents. That is, a report that an individual was a usual resident was 6.3 times more likely to be confirmed in a second interview than a report that a person was not a resident. A more extreme version of the same pattern also holds for proxies. The evidence suggests that survey researchers should not place too much confidence in respondents' reports that someone does not live in a household.

Table 2 compares various models fitted to the cross-classification of all 5 variables. Log linear models were fitted using RASCHPLX (Fay and Turner, 1989), which takes into account the complex sample design. In A, the goodness of fit of various models is assessed by comparing observed frequencies with frequencies expected under the model (Goodman, 1971).

Model 1, which includes all pairwise associations among the 5 variables, provides an acceptable fit to the data. Models 2-4 each drop one of the associations: Presence x agreement, presence by HHR report, or agreement X HHR report. In B, models were compared to test hypotheses 1-4. The first three comparisons in B show that all three of these associations are statistically significant and cannot be dropped from model 1. Comparison of models 1 and 5 tests the influence of relationship on residence report and agreement. Relationship is not significantly associated with either variable controlling for the effects of other variables.

Model 6, the best fitting model describing these data, includes an association between presence and relationship, indicating that related persons tend to be present more than unrelated ones. Thus, relationship has an indirect effect: unrelated individuals are less likely to be continuously present, and therefore less likely to be regarded as usual residents or to be reported consistently. The best-fitting model also includes a significant association between proxy status and agreement. Table 3 provides parameter estimates for Model 6.

These findings may help explain the dynamics of undercoverage within households. I assert that persons reported as nonresidents in the original interview and as residents in the second are at risk of omission. This inference seems clearcut when the second interview is self-reported, since we assume an individual is most knowledgeable about his own living situation. When both interviews are given by proxy, it is less clear which is closer to truth. Regardless, disagreements between a household respondent and a second proxy, are likely to result in omissions. Both respondents are reporting, in effect, "He lives there, not here" and neither is counting the person as a household resident. If we assume persons in the lower right cells of each subtable are likely to be missed, the survey yields an estimate of about 4.6 million persons at risk of omission nationally. They are balanced by an estimated 741,000 persons (corresponding to the top right cells) at risk of erroneous inclusion. The difference implies a potential net undercoverage of

almost 4 million people. Though based on a small sample and large standard errors, this result suggests that errors made in compiling household rosters do not balance out, but may lead to the exclusion of large numbers of individuals whose residence is in question.

In summary, the results support hypotheses 1, 2, and 4, but not hypothesis 3. The results suggest that respondents infer residence from an individual's presence, and that absences are associated with higher levels of disagreement between household respondents and individuals or their proxies. The results further suggest that absences increase the risk of erroneous omissions due to household respondents' inferring that individuals have residences elsewhere. When absence is controlled, unrelated individuals are at no greater risk of omission than others, according to this analysis.

Conclusions

Surveys almost uniformly accept as reliable respondent reports of who lives in a household. For most American households, this assumption is appropriate. But for persons with uncertain household attachments, household respondents may not be able to provide accurate information, and may be biased toward excluding individuals who are not continuously present and about whose living arrangements they have incomplete information.

The results point to several areas for future research. First, some situations may strongly indicate likely misreporting. In this survey, persons away for more than a week during a 2 month period appear to be at considerable risk of inconsistent reporting and potential omission. The data strongly suggest that a household respondent's report that a person does not live in a sample unit should not be accepted at face value in these circumstances. Knowing this, survey designers may add questions to identify persons whose circumstances are vulnerable to misreporting and follow them up separately to confirm their residence.

Second, the results support the hypothesis that uncertain or ambiguous residential arrangements are a potentially important cause of omissions. These results are not fully consistent with the conclusion reached by Tourangeau et al. (1997) that concealment, not confusion, is the major explanation for roster omissions. The LSS reveals there are many people whose living situations give rise to inconsistent reports by different respondents. Yet these people were not concealed, though they were not reported as residents.

Third, the results point to the need to evaluate current rostering methods and adapt them to changes in Americans' living situations and family arrangements. In some Government surveys, terminology and procedures have remained basically the same for 50 years; it's time research was devoted to this neglected topic to update and improve this fundamental component of all surveys: the household roster.

Note: This paper reports the results of research and analysis undertaken by Census Bureau Staff. It has undergone a more limited review than official Census Bureau publications. This report is released to inform interested parties of research and to encourage discussion. Thanks to Lynne Casper for very useful comments, to Paul Siegel and CSMR staff for helpful editorial suggestions, and to Bob Fay for informative statistical advice.

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Table 1. Agreement between Original (Household Respondent) and Followup Reports of Individuals' Residence, by Duration of Individuals' Presence in Household and Proxy Status of the Followup Interview

Presence of individual in sample unit		Agreement between original and followup reports of individual's residence: Self report in followup interview — Agrees with HHR report	Disagrees	Total	Odds on agree	Proxy report — Agrees with HHR report	Disagrees	Total	Odds on agree
A. ABSENT NO MORE THAN A WEEK DURING REFERENCE PERIOD									
HHR's report in original interview	Individual is a usual resident of sample unit	99.9% (.1)	.1 (.1)	100.0	**1000**	99.9% (.1)	.1 (.1)	100.0	**1000**
	Not a usual resident	0	0	0	–	0	0	0	–
	Total	99.9	.1	100 N=43		99.9	.1	100 N=96	
B. AWAY MORE THAN A WEEK									
HHR's report	Usual resident	78.7% (5.5)	2.6 (1.4)	81.4 (5.5)	**30.3**	66.3% (10.2)	1.8 (.9)	68.1 (9.9)	**36.8**
	Not a UR	15.4 (5.6)	3.2 (1.7)	18.6 (5.5)	**4.8**	16.6 (6.6)	15.4 (11.6)	31.9 (9.9)	**1.1**
	Total	94.2 (2.7)	5.8 (2.7)	100 N=115		82.9 (12.0)	17.1 (12.0)	100 N=188	
Odds on usual resident		**5.1**	**.8**		**6.3**	**4.0**	**.1**		**34.2**

Excluded are household respondents and casual visitors who were not followed up in individual interviews. Standard errors are given in parentheses.

Table 2. Comparisons of Log-Linear Models fitted to the Cross-Classification of Agreement, HHR report, Presence, Proxy status, Relationship

A. Goodness of Fit

Model	Description	Goodness of fit		
		X^2	d.f.	p
1	All 2-ways	.27	16	.35
2	All 2-ways, except Presence x Agreement	.66	17	.22
3	All 2-ways, except Presence x HHR report	4.46	17	.00
4	All 2-ways, except Agreement x HHR report	3.49	17	.00
5	All 2-ways, except Agreement x Relationship, HHR report x Relationship	.16	18	.39
6	Presence x Agreement, Presence x HHR report, Agreement x HHR report, Agreement x Proxy, Presence x Relationship, Proxy x Relationship	-.02	20	.46

B. Comparisons of Models

Models compared	Parameters tested	Difference X^2	d.f.	P
1 versus 2	Presence x Agreement	2.62	1	.004
1 versus 3	Presence x HHR report	5.28	1	<.0001
1 versus 4	Agreement x HHR report	4.05	1	<.0001
1 versus 5	Agreement, HHR report x Relationship	-1.41	2	>.5
1 versus 6	Agreement x Relationship, HHR report x Relationship, HHR report x Proxy, Presence x Proxy	-.10	4	.44

Jackknifed Pearson X^2 used to evaluate model fit. Jackknifed Likelihood ratio X^2 used to compare models.

Table 3. Parameter Estimates for a Log linear Model Fitting Five Variables

	Parameter Estimates		
Effect	λ	S. e.	Standardized value
Grand mean	4.057	.330	12.284
Agreement between HHR and followup reports (1=reports agree, 2=disagree)	2.010	.377	5.330
HHR report of individual's usual residence (1=UR, 2=not UR)	1.795	.202	8.892
Individual's presence (1=continuously present, 2=away more than a week)	-2.148	.340	-6.317
Proxy (1=self for followup interview, 2=proxy)	-.421	.198	-2.12
Relationship to HHR (1=related, 2=nonrelated)	1.647	.184	8.944
Agreement x HHR report	.819	.214	3.825
HHR report x presence	1.888	.146	12.900
Agreement x presence	.836	.318	2.631
Agreement x proxy	.458	.198	2.311
Presence x relationship	.354	.172	2.057
Proxy x relationship	-.135	.170	-.792
Jackknifed Pearson X^2 =-.02, d.f. =20, p = .46			

Note: Following Goodman (1978) and others, the single parameter shown for each effect is the difference between the effect for the first level of a variable and the average effect.