Use of Interviewer Judgments About Attributes of Selected Respondents in Post-Survey Adjustment for Unit Nonresponse: An Illustration with the National Survey of Family Growth

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1. Introduction

Postsurvey adjustments based on propensity models are increasingly popular in survey sampling (Little and Vartivarian, 2000). After examining the how weighting classes based on discretized estimated propensities can act to reduce the mean square error of respondent-based estimates, it is straightforward to focus on the covariance of the estimated propensity, *p*, and the survey variables, *y*'s. When propensities are related to the *y* variables, then adjustments are likely to alter the expected value of the adjusted estimates.

Because of this fact, it is desirable to examine ways to collect on both respondents and nonrespondents information predictive of the *y* variables. We refer to these variables as *z* variables. This paper reports on one initial attempt to do so, in the context of the National Survey of Family Growth. It reviews the paradata structure of the National Survey of Family Growth and presents initial efforts to model such paradata in a useful way for postsurvey adjustment.

2. The National Survey of Family Growth

2.1Sample

The National Survey of Family Growth is a multistage area probability sample of households, in which one person aged 15-44 is selected for an interview of 60-80 minutes. The interview uses CAPI and ACASI. The focus of the questionnaire is fertility and sexual experience. The interviewing is continuous throughout the year, divided into four replicate samples within a national sample of approximately 33 primary areas. Each year 25 non-self-representing primary sampling units are rotated out of the sample and 25 new ones are rotated into the sample. Resident interviewers each quarter are asked to do listing of sample segments for the next quarter, conduct short "screener" interviews, and when an age-eligible person is identified, to seek the "main" interview with the selected age-eligible person.

The design oversamples females, younger persons, African-Americans, and Hispanics. Each of the four replicates has a 12 week data collection period. The first 10 weeks (Phase 1) is followed by a second phase sample of nonrespondents (Phase 2). The weighted response rates of the design average about 75%.

2.2 Paradata Design

Paradata were designed for the National Survey of Family Growth to inform a survey production model that tracks effort of interviewers (hours worked, calls made, focus peak calling hours) in relation to the difficulty of the remaining cases (contacts made, extent of locked buildings, resistance encountered) and the final output of the production process (screener interviews, main interviews, and costs).

In order to enrich the production monitoring, we have asked the interviewer to make observations on the segment level (systematic samples of housing units within selected blocks), the address level, the call level (visits attempting contact with the household), and the contact level. In addition, we have measures at the interviewer level. This produces the nested data structure illustrated in Figure 1.

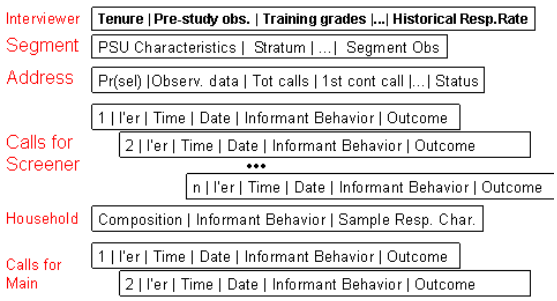


Figure 1. Paradata structure for the National Survey of Family Growth

In an effort to extend the paradata to improve postsurvey adjustment power, we asked the interviewer to make observations about the selected age-eligible sample person. Many of the important variables in the National Survey of Family Growth concern current and past sexual activity (marital status, pregnancies, live births, co-

resident and non co-resident children). Hence, we sought observations that were predictors of those attributes as auxiliary variables, *z*. We were limited to variables and measurement techniques that could be applied to both respondents and nonrespondents.

The variable that was collected was an "interviewer checkpoint," an observation that did not require the interviewer to say anything to a household member:

> *Do you think the selected respondent is in an active sexual relationship with an opposite-sex partner?*
>
> *Yes.....1*
> *No.....5*

This observation was made at the end of the screener CAPI application. At this point a household informant has completed a household roster, listing all persons in the household, with their age, sex, and race documented. In this rostering step it is common that the household informant provides additional information about each person (e.g., "Then there's my daughter-in-law, Jane, who lives with us and my son.").

Thus, the analytic question in this paper is whether an interviewer's guess about an active sexual relationship for the sample person can be effectively employed in post-survey adjustment.

3. Measurement Characteristics of the Auxiliary Variable and Relationship to the *Y* Variable

We first examine only those successfully interviewed in the National Survey of Family Growth. We ask whether the interviewer observation on their sexual activity agrees with their self-reports in the main interview. Table 1 shows that agreement rates are in the high 70% range. It is useful to note that the self-reports produce about a 75-80% report of current sexual activity. Thus, the *z* variable is biased in the sense of overestimating the percentage of sample persons in an active relationship.

Female Self-Report	Interviewer Observation		Agreement Rate
	Yes	No	
Yes	85%	47%	79%
No	15	53	
Total	100%	100%	
Male Self-Report			
Yes	85%	55%	77%
No	15	45	
Total	100%	100%	

Table 1. Percentage of Interviewer Observations on Sexual Activity by Self-Report among National Survey of Family Growth Respondents by Gender

However, the interviewer observation shows fair agreement also. There is higher agreement for those respondents who report they're in a relationship than for those who report that they are not in a relationship. Thus, the *z* variable is biased in the sense of overestimating the percentage of sample persons in an active relationship. If one would compute a correlation coefficient on the data from Table 1, for females the correlation would be 0.36 and for males, 0.29.

It is important to note that the utility of examining the relationship between *z* and the *y* variable of reporting sexual partnership is in its inference to the full sample. If among nonrespondents to the National Survey of Family Growth, the correlation is different, the utility of the *z* for postsurvey adjustment is affected.

4. Relationship of the Auxiliary Variable to Propensities

To be an effective postsurvey adjustment tool we are searching for a auxiliary variable that is correlated with both the *y* variable and the response propensity.

For each sample person we know whether or not they responded to the survey. The correlation between this response variable and the auxiliary variable is 0.25, a modest correlation.

5. Using the Auxiliary Variable in Postsurvey Adjustment

The earlier cycle of the National Survey of Family Growth used a propensity model-based adjustment. As described in Lepkowski, Mosher, Davis, et al. (2006), 18 age by gender by race/ethnicity domains were recognized, and separate propensity models built in each. The estimated propensity

Separate models were estimated for screener propensity and main propensity. The screener model included the following predictors:

- Any contact with resistance
- Any contact with informant questions
- Any contact
- Number of calls to first contact, if contact
- Any contact with time delay outcome
- Any access impediments
- Any uninhabited structures in neighborhood
- Any evidence of non-English speakers in HH
- Evidence of predominance of Blacks in neighborhood

- Any evidence of Spanish speakers in neighborhood
- Urban area
- Multi-unit structure
- Percentage of calls made in evening hours
- Sample line release indicators

The main interview propensity model included the following predictors:

- Any contact with resistance from R
- Any contact with questions from R
- Any contact with time delay outcome
- Any contact
- Screener taken in Spanish
- Single-person household

In the current sample design for the survey, only 9 age by gender by race/ethnicity groups were used as domains. We separated sample cases into the 9 groups, estimating one main interview propensity model for those respondents judged to be in an active sexual relationship and another for those judged not to be in a relationship. (Note: this is equivalent to a single propensity model with all two way interactions involving the auxiliary variable.)

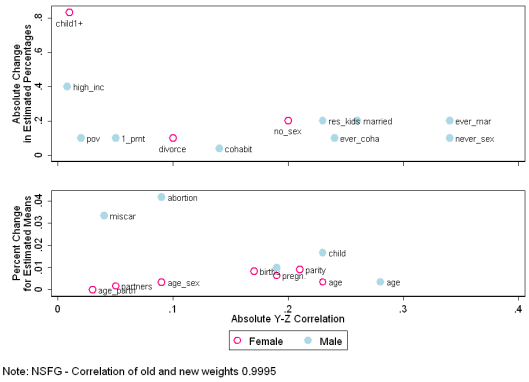
For each sample case, therefore, we have estimated propensities with and without the auxiliary variable. It is of interest to measure whether the new auxiliary variable has independent predictive power for response propensities, conditional on the above predictors. The correlations of the sexual activity observation and the estimated propensities is 0.23. The correlation between the estimated propensities using the old models with that from the new models is 0.9995. That is, there is little evidence of independent predictive value.

	Corr (Z,y)	Postsurvey Adjustment			
		None	**Old** Sel. Wt, P	**New** Sel. Wt, Z	**New** Sel. Wt, P, Z
Females					
Mean Age	-0.23	28.6	28.7	29.1	28.8
Percent with more than one living child	-0.01	7.1	6.0	7.2	6.8
Males					
Percent never had sex	0.34	16.6	20	18.7	19.9
Percent in highest income bracket	-0.008	23.1	28.2	29.2	28.6

Table 3. Illustrative Comparisons of Alternative Adjustments of Sample Means from the National Survey of Family Growth

Table 3 presents a set of illustrations of the effects of different weighting schemes on four estimates, two for each of the sex groups. The first column provides the estimated correlation among respondents of the auxiliary variable and the row variable. For example, the correlation between age of the respondent and the observed sexual activity variable is -0.23. The second column is the fully unweighted estimates. The third column is the postsurvey adjusted estimate based on selection weights and the old propensity weights. The last column adds to the prior adjustment the new auxiliary variable (as in the 18 models described above). The penultimate column uses only the auxiliary variable observed about sexual activity as the adjustment variable, in a weighting class adjustment.

Table 1 shows very little evidence of practical effect of such adjustments on the point estimates.



Note: NSFG - Correlation of old and new weights 0.9995

Figure 2. Graphical Presentation of Absolute and Percentage Change in Estimates Associated with Including the Auxiliary Variable in the Postsurvey Adjustment

Figure 2 presents the estimates of change in estimates due to the adjustments, both absolute values and percentage change. Again, there are only modest impacts of adjustment.

6. Summary and Conclusions

We attempted to construct an interviewer observation on respondents and nonrespondents that would be correlated with key survey variables in the National Survey of Family Growth. We then examined alternative postsurvey adjustments based on the paradata variable.

We found that the auxiliary variable had relatively low correlations with key survey variables among the respondents to the survey. We found that it had relatively low correlations with response propensity.

Following this, we found that there was little impact of the variable when used in postsurvey adjustments on key estimates of the survey.

We speculate that a paradata variable that had a less skewed distribution could have performed better on the above criteria.

Acknowledgements

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