THE LAST FIVE PERCENT: WHAT CAN WE LEARN FROM DIFFICULT/LATE INTERVIEWS?

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1. Introduction[1]

Over the past two decades, government agencies have witnessed a gradual but steady decline in survey and census participation rates (Atrostic, et al, 1999; de Heer 1999; Groves and Couper, 1998; Fay, Bates and Moore, 1991). Some theories behind this increase include growing privacy concerns, mistrust of government, increased time pressures, and a proliferation in telemarketing. To combat the decline, organizations have implemented a variety of techniques including respondent incentives, interviewer incentives, enhanced interviewer training, changes to field procedures, and experimentation with alternate modes of response (see Collins and Tsapogas 2000; Olson, Srinath, Burich 2000, Singer et al, 1999; Groves and McGonagle, 1998; Lauria, Smith and Scott, 1999; Schaefer and Dillman, 1998).

Assuming these strategies are successful, is the extra effort to keep response rates from declining a few percentage points worth the added time and money? According to the "continuum of resistance" theory, the answer is yes. This model of nonresponse postulates that people who require the most calls or contacts before participating are also the persons most resistant to the interview (Fitzgerald and Fuller, 1982; Lin and Schaeffer, 1995; Filion 1976). If we take the theory one step further, we arrive at the assumption behind it, that is, the more difficult it is to gain survey participation by an individual, the more he or she resembles individuals who actually refuse. If this thinking is accurate, then late cases are very important to reduce nonsampling bias in the estimates.

Alternatively, several studies cast doubt on the assumption that difficult interviews are necessarily indicative of nonrespondents (particularly refusers). For example, Fitzgerald and Fuller (1982) rejected the notion

when they failed to find many similarities between cases requiring a great number of callbacks and those who ultimately refused the survey. Similarly, Lin and Schaeffer (1995) report the continuum model was not successful in reducing the true degree of nonparticipation bias in estimates of child support. However, Fitzgerald and Fuller did find evidence of demographic differences between the sample at various callback periods and the full sample. Additionally, they report that reluctant respondents had significant effects on the relationships between variables in their study of community characteristics and social networks.

A handful of other studies have focused on nonresponse and the impact it has on survey estimates (Harris-Kojetin and Robison, 1998; Tucker and Harris-Kojetin, 1998; Groves and Couper, 1998). Some of these studies suggest the potential for small yet significant levels of nonresponse bias as a result of differential characteristics between responders and nonresponders. Similarly, a few studies have focused specifically on late interviews that comprise the last few percentage points of response (Kennickell, 1999; Voigt, Koepsell and Daling, 1999; Stoop and Louwen, 1999; Stapulonis, Kovac and Fraker, 1999; and Krenzke and Griffin, 1997). These studies report varying degrees of differences between demographic characteristics of early versus late respondents (sometimes referred to as the degree of *interim distributional bias* in a survey, see Hawkins, 1977). Based on these findings, however, it is difficult to draw conclusions whether the absence of late interviews contributes to nonsampling bias.

In this paper, we explore the impact of interim distributional bias by examining the characteristics of late interviews for the Current Population Survey (CPS)[2] – a continuing demographic survey conducted by the U.S. Census Bureau. Like other surveys, the CPS has documented incremental increases in nonresponse since the beginning of the decade. In 1990, the initial nonresponse rate for the CPS was 5.7 percent but by 1998, it was 8.8 percent (Atrostic, et al, 1999).

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[1]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.

[2] The study also examined late interviews in the National Crime Victimization Survey (NCVS). Space restrictions for this proceedings volume kept us from including it here. For a copy of the comprehensive paper, contact the authors.

The concern is twofold: first, since the CPS provides national indicators of critical social and economic value, a continual increase in nonresponse could translate into increased bias in the estimates. Second, declining budgets for statistical programs make it more difficult to justify the added costs and resources to keep nonresponse at these relatively low levels.

2. Methodology
2.1 Current Population Survey (CPS) Design

The CPS has operated continuously since 1940 and provides monthly estimates of employment and unemployment. The survey has a national monthly sample of approximately 60,000 designated addresses composed of eight panels that rotate on a schedule of 4 months in, 8 months out, 4 months in. The first month a unit comes into sample, interviewers conduct a personal visit interview using an automated instrument on a laptop computer. In the subsequent 7 survey periods, interviewers conduct both centralized and decentralized interviews by telephone. Following the first month of contact, most interviewing if by telephone, although the interviewer is required to attempt a personal visit in the 5th month, following the 8-month resting period.

A household respondent is interviewed for the labor force portion of the interview and an interview is completed for each household member age 15 and over. The CPS procedures permit a single household member to respond for everyone else. Most interviewing takes place during a one-week period (Sunday to Saturday) during the week containing the 19th of the month and refers to labor market activities for the prior Sunday to Saturday period. Since the survey produces monthly labor force estimates, we selected one month of data (May 1999) for the analysis. This included 47,613 interviewed households which yielded 92,899 interviews for persons 16 and older.

2.2 Operational Definitions of Difficult/Late Interviews

When constructing the operational definition of difficult/late interviews, we used the count of the number of actual and attempted contacts. However, there are several limitations to using this variable. First, in 1999 the CPS instrument recorded contacts only for *personal* visit interviews (data on the number of telephone attempts and contacts is not currently captured). This applies to all cases requiring personal visits (month-in-sample one and month-in-sample five) and cases that require personal visits in other months, when a telephone contact is unsuccessful.

The second, and perhaps more serious caveat to this indicator is the degree of between-interviewer variability with which it is recorded. For the counter to increase, the interviewer must access and open the case from the laptop, thus recording each personal visit made to the address. However, we have no way to confirm how often interviewers fail to actually open a case from the computer when visiting an address; that is, the interviewer could visit an address on several occasions, find no one home, but never activate the case prior to attempting contact. Such cases will understate the number of contacts. Nevertheless, we defined personal visit cases that required four or more contacts as 'difficult' cases, regardless of the date of interview.

Next, to decide the cut-off date for late cases, we examined the distribution for number of completed interviews by date. A clear pattern emerged whereby the number of interviews dropped off and became flat during the last two days of the data collection period (Tuesday or Wednesday of the second week). Using this and the number of contacts described above as criteria, the late/difficult cases comprised 4.6 percent of the May, 1999 interviews. As expected, we found a positive relationship between day of interview and the mean number of contacts required in personal visit cases. Personal visit late cases required an average of 3.0 visits while non-late personal visit cases averaged 1.2 visits.

3. Results
3.1 Characteristics of Late Interviews

We began our exploration of late cases by using person and household-level characteristics to try and distinguish late interviews from non-late interviews. To summarize the predictive power of the various person and household-based characteristics, we ran logit models using the CPS data. The response variable was coded=1 if the household was defined as late/difficult, otherwise it was coded= 0. Since date of interview is the same for all persons in the household, the response variable was the same for both person and household-level analysis. At the person level, we included race, relationship to householder, sex, age, education, Hispanic origin, and labor force status as explanatory variables (see Table 1).

We found that interviews about nonrelatives in the household are more likely to be late interviews and that late interviews are less likely to contain interviews with/about a spouse. This suggests that households with married couples are less likely to be late but households containing unrelated individuals are more likely to be late. We also found that, all other things held constant, if the interview

was with/about a person in an older age category, the likelihood of being a late interview decreased (with each increase in an age category, the odds of being a late interview decrease by around 14 percent. Age categories are 16-24/25-54/55+).

Once other characteristics are held constant, Blacks were found more likely to be interviewed late in the field period compared to Whites (64 percent more likely). Compared to non-Hispanics, interviews for persons reporting a Spanish origin were almost 30 percent more likely to have been obtained during a late interview.

Finally, we found interesting associations between labor force status and the likelihood of being a late interview. Compared to those who were employed and currently at work, persons who were not in the labor force for 'other' reasons or who were employed but currently absent were both more likely to be late interviews. Conversely, retirees and those who are disabled are significantly less likely to be late, compared to those currently working (50 percent and 39 percent less likely, respectively). This follows since retirees and disabled workers should theoretically be easier to find at home and thus overrepresent interviews completed during the early stages of data collection. Neither sex nor education are significant predictors of late interviews.

At the household level we found significant relationships between interview mode, tenure, income, region, number of household members, and interview outcome from the previous interview cycle. Late interviews were less likely to be telephone (58 percent less likely compared to personal visit) and more likely to reflect renting households than owners. Compared to the lowest household income category, all other categories (medium, high and income missing) were more likely to be late interviews. This is particularly true for households for whom an income value is missing (94 percent more likely to come from a late interview compared to low income households). The larger the number of people in the household, the more likely the interview is to be late -- this is likely due to a self response supplement on tobacco use administered during May 1999.

Compared to the Midwest, interviews from all other regions are more likely to be late. The model revealed no significant association between level of urbanization and likelihood of being late once the other variables are controlled for. Finally, compared to households that were interviewed during the previous interview wave, households that were previously noninterviews were more likely to be late interviews in the current month.

Previously noninterview households were close to 3 times more likely to be late (2.8 times more likely). This finding suggests similarities between a portion of the very last interviews and the nonrespondent subpopulation.

3.2 Estimates with and without Late Interviews

We arranged to have a selected set of labor force estimates re-run for the 1999 May CPS excluding the cases we defined as difficult/late. These cases were redefined as nonresponse households and the datafile was re-edited and re-weighted accordingly. When conducting tests for significant differences between CPS estimates with and without late cases, the survey design effects were considered in the parameters of the generalized variance functions.

From table 2 we see the absolute difference between unemployment rates with and without late interviews is small in most cases (less than 1 percent). However, it is important to note that differences in the unemployment rate are reported to one-tenth of one percent, thus seemingly minor differences still have significant impact on policy-making.

A consistent pattern emerges where these differences are significant -- the unemployment rates are slightly higher without them. Several factors could be influencing the degree of differences seen First, unemployment rates were very low and stable during 1999. There was very little variation in labor rates before and after the cross-section of data examined here, even among the age, race, sex and ethnicity subgroups shown (Bureau of Labor Statistics, 1999). Had labor rates been more volatile at the time, we might have expected a larger number of significant differences. Similarly, our data reflect national totals – had we examined smaller geographic areas such as states, we might have seen greater discrepancies between estimates with and without late cases. Despite these potentially suppressing factors, we still found about one-third of the estimates to be statistically different without the representation of late interviews.

4. Conclusions and Discussion

Our general research question of interest is whether the extra time and resources currently being devoted to late interviews is worth the added cost. This extra effort is often defended on a generally held assumption that the last few interviews serve as approximations for survey nonrespondents. This assumption purports that late interviews reflect reluctant households and therefore are similar to households that ultimately refuse to participate

in surveys. This premise is difficult to explore because we lack information about the characteristics of nonresponding households. Consequently, we approach it somewhat indirectly by seeing to what degree the characteristics of late interviews differ from early interviews.

At the person-level, the odds of being a late interview increase significantly if the interview is with/about a younger person or someone who reports their race as Black. Late interviews are less likely to have respondents who are retired or disabled compared to earlier interviews. However, late interviews are more likely to have respondents who report being employed but currently absent from work or not in the work force for 'other' reasons.

At a household-level, the odds of being a late interview are significantly higher for renter households, larger households, households located outside the Midwest, households with medium or high incomes or those missing data for income, and households that were nonrespondents during the previous interviewing cycle.

Our findings offer mixed support for the continuum of resistance assumption that late interviews resemble nonrespondents. In support of the theory we note the relationship between late interviews in the current month and noninterviews in the previous survey cycle. This suggests that some percentage of late interviews (around 8-9 percent) are very similar to nonrespondents (in fact, these cases previously *were* nonrespondents). We also found that higher income households tend to be late interviews. In their study of nonrespondents for six demographic surveys (which included the CPS), Groves and Couper (1998) report a general decline in cooperation as socio-economic status increases. Consequently, the positive relationship between income level and propensity to be a late interview also supports the continuum of response theory.

However, other findings (or lack thereof), appear contrary to the theory. For example, Groves and Couper did not find that race was a significant predictor of cooperation rates once other household and environmental factors are controlled. Groves and Couper also did not find renters more likely to refuse a survey. We measured age at the person level in the logit models and found that late interviews tend to reflect younger persons compared to early interviews; Groves and Couper used a household age indicator not readily comparable to ours. Finally, we did not find that urbanicity was a predictor of late interviews once other household variables are held constant. Since numerous studies have noted higher nonresponse in urban areas compared to suburbs and rural areas, this is also contrary to the continuum theory.

Our second research question asks: are survey estimates biased without late interviews? To answer this we converted late cases to unit nonresponse cases, re-ran selected unemployment rates, and then compared the new rates to rates produced from all respondents. Due to several factors, however, our analysis has somewhat limited generalizability. Because our analysis is at a national level, uses cross-sectional data, and happens to reflect statistics that have been relatively low and stable over recent months, our discovery of significant bias may be understated. Additionally, we did not explore the data quality of late interviews -- it is possible such interviews exhibit a high degree of item nonresponse and response error that compromise their usefulness and contribution toward full sample estimates. But, despite these limitations, our simulation helps us understand some probable effects of two closely related concepts, 1) the decision to reduce resources devoted to obtaining late/difficult interviews, and 2) a decrease in unit response rates of approximately 5 percent (from 93 percent to 88 percent). Our reproduction of estimates without late cases also helps us understand whether the standard nonresponse adjustments, weights, and imputation procedures adequately adjust for the absence of late cases.

We found that the absolute difference between unemployment rates calculated with and without late cases is small. Nonetheless, unemployment rates tend to be higher without late interviews. This suggests that despite their small percentage of total interviews (5-6 percent), late interviews are sufficiently different from earlier interviews so as to influence critical estimates. Our results suggest (subject to all limitations) that these data are less precise without the "last 5 percent" and that dropping them would have negative consequences on our goal to provide definitive national statistics. Consequently, we recommend that the extra time and resources required to obtain late interviews is worth the effort. Late cases may or may not be reflective of nonrespondents, but their input is still critical to producing unbiased rates and minimizing nonsampling error.

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TABLE 1.
Probability of Being a Late/Difficult Interview: Person and Household Models for CPS May, 1999

	Person Model			Household Model		
Independent Variable	Estimate	Adjusted Odds Ratio	Independent Variable	Estimate	Adjusted Odds Ratio
Respondent Characteristics:			*Household Characteristics*:		
Age	-0.15***	0.86	Mode (telephone)	-0.86***	0.42
Education	-0.01	0.99	Tenure (owners)		
Relation (reference person)			Renter	0.28***	1.32
Spouse	-0.23***	0.85	No payment for rent	-0.33	0.72
Child	-0.21***	0.87	Household size	0.07***	1.08
Parent	-0.11	0.96	Income (low income)		
Sibling	0.17	1.27	Medium income	0.21***	1.23
Other Relative	0.28*	1.41	High Income	0.28***	1.33
Non Relative	0.17**	1.27	Income missing	0.66***	1.94
Sex (male)	-0.01	0.99	Poverty	-0.18	0.98
Race (white)			Region (Midwest)		
Black	0.20**	1.64	South	0.18*	1.19
American Ind/Alaska Nav.	-0.00	1.35	West	0.37***	1.45
Asian/Pacific Islander	0.10	1.49	Northeast	0.25**	1.20
Hispanic Origin	0.24	1.27	Urbanicity (Urban)		
			Suburban	-0.09	0.92
Labor Force Status (employed/at work)			Rural	-0.09	0.91
Employed - currently absent	0.28**	1.06	Previous outcome (interview)		
Unemployed	0.10	0.90	Noninterview	1.04***	2.84
Retired	-0.49***	0.50	Ineligible	0.49***	1.64
Disabled	-0.23***	0.61			
Not working - other reason	0.23***	1.02			
*p<.10, **p<.01, ***p<.001 level					

TABLE 2. Unemployment Rates by Sex, Age, Black and Hispanic (May, 1999)

	Both Sexes		Men		Women	
	All cases	Excluding late cases	All cases	Excluding late cases	All cases	Excluding late cases
Total 16+	4.05%	4.10%**	4.01%	4.08%**	4.09%	4.12%
16-24	9.92%	10.07%*	10.25%	10.42%*	9.56%	9.67%*

25-54	2.99%	3.02%	2.90%	2.94%*	3.08%	3.10%
55+	2.66%	2.70%	2.65%	2.67%	2.67%	2.74%**
Black 16+	7.69%	7.93%***	7.79%	7.99%*	7.61%	7.87%***
16-24	15.55%	18.15%**	19.42%	20.03%*	15.93%	16.59%**
25-54	5.83%	5.97%*	5.66%	5.78%	5.98%	6.15%*
55+	3.80%	4.00%*	3.25%	3.34%	4.30%	4.74%
Hispanic 16+	6.23%	6.28%	5.75%	5.86%	6.90%	6.88%
16-24	10.94%	10.90%	11.07%	11.14%	10.76%	10.53%
25-54	4.94%	5.01%	4.24%	4.33%	5.90%	5.94%
55+	5.36%	5.53%**	4.81%	5.02%	6.09%	6.21%

Difference significant at the *.10, **.01, ***.001 level.