Using Process Data to Predict Attrition from a Panel Survey: a Case Study

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Keywords: household panel surveys, attrition, process data, responsive survey design

1. Minimizing Attrition

A major concern with panel surveys is the increasing loss of respondents that occurs as the panel ages. Like cross-sectional surveys, panel surveys are subject to nonresponse at the initial wave. In addition, they are subject to nonresponse or attrition at subsequent waves. There are two reasons to be concerned about attrition. First of all, the loss of respondents has the effect of reducing the sample size. This reduces the precision of the estimates. The second negative effect of attrition is the possible introduction of bias into the results. This occurs when nonrespondents and respondents are systematically different in characteristics that are relevant to the topic of the survey or the research project. The presence of biasing attrition is the most potentially damaging and frequently mentioned threat to the value of panel data (Fitzgerald, Gottschalk & Moffitt, 1998).

There is a large literature on maintaining response and reducing attrition in panel surveys. The techniques to minimize nonresponse in panel surveys are focused on locating the respondent and establishing sufficient rapport with the respondents to secure their participation (Freedman, Thornston, and Camburn 1980). For example, panel surveys need to commit additional resources to tracking and tracing procedures to reduce nonresponse. Tracking procedures aim to maintain contact with panel members in the period between waves, and tracing procedures are adopted in an attempt to find the missing panel members (Trivellato 1999). Another fieldwork procedure that may be adopted to reduce nonresponse is using the same interviewer were possible. When the same interviewer returns every year, respondents are able to build a rapport with the interviewer, developing a relationship of trust between the interviewer and the respondent (Laurie, Smith, and Scott 1999). Sometimes panel members are encouraged to continue their participation in the panel survey by offering them more flexibility to decide whether to respond by one mode or another, for example, a choice to complete the interview by telephone or by mail, instead of having an interviewer visit the household (Dillman and Christian 2005).

Over the past decade panel surveys have adopted new data collection tools, and have expanded to new research domains. These factors have combined to present survey designers and survey researchers with uncertainty about the performance of any given survey design option at any particular wave of a panel survey, challenging their ability to control the quality of the resulting statistics.

2. Process Data and Responsive Survey Design

Process data or paradata are auxiliary information describing the survey process, and are distinguished from metadata, describing the data (Couper 2000: 393). A source of paradata is, for example, case management information such as response rates, number of contact attempts per case, and average interview length. Paradata enable survey researchers to analyze survey errors and costs, and to make mid-course decisions and design alternations (Couper 1998; Groves and Heeringa 2004; Heeringa and Groves 2004; Scheuren 2001). Using paradata to make mid-course decisions and design alternations to improve quality is termed responsive survey design (Groves and Heeringa 2004; Heeringa and Groves 2004). The entire survey process, from design through data collection, should be responsive to both anticipated uncertainties that exist before the survey data collection begins and to real time information obtained throughout the survey collection. For example, real time cost-related data and indicators of nonresponse can be used to make mid-course design alternations to reduce the final nonresponse error.

In household panel surveys a variety of paradata from earlier waves are available that can be used to inform cost/quality trade-off decisions in future waves. For example, Bates (2004) found that contact history records from personal-visit surveys may prove useful as a way to target potential nonrespondents in subsequent waves. The first waves of a panel survey contain, in addition to survey data, a large amount of paradata that could be used to predict attrition. Paradata from previous waves related to future participation can be used to alter the design during the course of the panel in order to improve panel survey quality by lowering the amount of attrition. In addition, survey data and process data could be used to tailor or

adopt the procedures used to minimize panel attrition to fit the particular characteristics of the respondent. In this paper we investigate if process data can be used to predict attrition from a general 11-wave household population panel survey in Belgium (1992-2002).

3. The Panel Study of Belgian Households (PSBH)

The Panel Study of Belgian Households (PSBH) is a national household panel survey of private households in Belgium. The PSBH began in 1992 and returned to re-interview households and individuals on an annual basis until 2002. The PSBH collects information at both the household and individual level. A household questionnaire is submitted to a reference person, usually the household head or the spouse or partner of the household head. Personal questionnaires are submitted to all eligible household members aged 16 years or over. At the household level the questionnaire covers subjects such as household composition, housing tenure and housing conditions, household income, and non-monetary poverty indicators. The individual questionnaire collects information on health status, social relations, leisure and education, employment, and income. The household questionnaire was conducted by face-to-face interviewing. For the individual questionnaire the respondents were given a choice between face-to-face interviewing and self-completion of the questionnaire, and more or less half of the interviews was collected face-to-face. While the aim is to gain a full interview for every eligible adult, for a small portion of the sample a short version of the questionnaire was used as a means to gain information about as many respondents as possible. For more information on the PSBH, we refer to Doutrelepont, Mortelmans, and Casman (2004).

At wave one, 10940 households were sampled. Of these, 778 households have been identified as ineligible. Among the remainders, 4438 households were successfully interviewed. A household response rate of 43.7 percent was achieved, calculated as the product of the contact rate of 92.9 percent and the cooperation rate of 47.0 percent (American Association of Public Opinion Research 2004). Of the 11565 individuals who belonged to these cooperating households, 2600 were younger than 16 and 8965 were 16 or older. 8741 eligible adults were interviewed, giving a response rate of 97.5 percent.

Since the beginning of the panel, the original households have undergone substantial changes and individuals enter and exit the PSBH in a variety of ways. Individuals enter the panel by being born to sample members, while others attach themselves to sample members in a different way, for example, through marriage. Some individuals leave the panel because they are not eligible for follow-up any more; they have died, moved outside the country, or their household does not contain sample members any more. A second group leaves because of attrition.

4. Attrition from the PSBH

A central problem when analyzing data from a household panel survey is that the family or household is a changing entity over periods of time. In this study, we largely ignore the family dimension and focus on individuals. Calculating longitudinal response rates is more complicated than calculating response rates for each cross-sectional wave. For carrying out substantive panel analyses, the respondents with continuous interview records provide the core longitudinal information. We will look at the original interviewed sample of 1992 and follow them through the panel until they attrite.

We define attrition as unit nonresponse of eligible cases that occurs after the first wave of the panel survey. The distinction between non-participation due to ineligibility and attrition of eligible cases is important, since movements due to ineligibility essentially reproduce the dynamics of the panel, while those due to attrition may cause selection problems for the representative sample. Eligible cases for which no interview is obtained consist of three types of nonresponse: (1) refusals, (2) non-contacts, and (3) other non-interviews. The other non-interviews represent instances in which no interview is obtained because the respondent is physically and/or mentally unable to do an interview, because of language problems, or because of a number of miscellaneous other reasons.

Table 1 shows response and attrition rates of the original 1992 adult sample members. We look for each respondent at the first occasion of nonresponse. Because of the following rules adopted in the PSBH, nonrespondents can re-enter the panel, however, this happens in only a minority of the cases. The first column in the table shows the number of individuals remaining in the sample by year, with the response rate for each wave shown in parentheses next to each count. Of the 8741 respondents of the first wave of the survey, 7151 or 81.8 percent were re-interviewed in the second wave. By 2002, only 32.4 percent of the original sample was still interviewed. The table also shows the distribution of attritions by reason. Columns 3 until 6 show the actual number of attritions, with the attrition rates shown in parentheses. The most important reason for attrition is refusal to participate again in the panel survey. The attrition rate is

especially high in wave two and wave three, respectively 12.0 percent and 9.8 percent. The non-contact rates and other non-interview rates are smaller and more constant in time. The non-contact rate is 3.2 percent in wave two, and stays around 1 percent from wave 2 until the end of the panel. The other non-interview rate is 2.2 percent in wave two, and only 1 percent in later waves. The last column of table 1 shows the number of individuals that became ineligible, in total 544 respondents became ineligible.

5. Methods and Variables

When studying nonresponse we need to take into account that nonresponse is not a homogeneous phenomenon. Groves and Couper (1998) describe the nonresponse process as the outcome of two sequential events: firstly, the contact between the interviewer and the respondent, and, secondly, when the contact was successful, cooperation of the respondent. Contacted respondents can refuse an interview, or can be unable to perform an interview. The authors stress that these different types of nonresponse are influenced by different social, economic, psychological, and situational factors. For this reason, we separately fit models for refusals, non-contacts, and other non-interviews. Individuals that became ineligible during the duration of the panel survey are not taken into account.

A simple approach to relate the incidence of different types of attrition to a set of covariates is by means of a logit model, in which the binary dependent variable indicates whether attrition occurred within the eleven waves of the panel survey or not. However, such an approach has important drawbacks (Yamaguchi 1991). First of all, this approach leads to a loss of information, since information on the timing of attrition, or non-occurrence of attrition from the panel survey is not used. Secondly, time variation of time-dependent covariates cannot be taken into account, and it also does not allow the covariate effects to vary by time. A better approach to study attrition is by means of event history analysis. The main characteristic of event history analysis is that it analyses information on the times at which individual transitions between a number of discrete states occurred (Vermunt 1996). When the time variable is discrete, it is best to use a discrete-time logit approach. In a discrete time logit approach the time variable is modeled as any other explanatory variable and testing duration dependence is possible. To test whether attrition changes with the duration of the panel survey time-covariate interaction terms should be included in the models.

Since we want to predict attrition in one wave by looking at paradata from the current or previous wave, the possibility to include time-dependent covariates is essential. The discrete-time logit approach is particularly effective at handling covariates that change their values during the observation period. An example of a covariate that can change its value during the period of the panel is someone's position in the household. Looking at information on the household position of an individual closer to the moment of attrition might be more interesting than information at the beginning of the panel. With this approach it also becomes possible to include covariate-time interactions. Suppose for example that the effect of someone's household position changes with time and has only a positive effect on attrition in the first waves of the panel.

The process or paradata variables available in the PSBH data set include the following: (1) the mode of data collection in the previous wave, distinguishing between face-to-face interviewing, self-completion of the questionnaire, and a shorter version of the questionnaire or a proxy interview; (2) the number of item nonresponses on a set of core questions in the previous wave; (3) if the respondent was a reference person or his or her partner in the previous wave; (4) the number of contacts attempts in the previous wave; and (5) the fieldwork team in the previous wave, distinguishing between the team of the University of Antwerp and the one from the University of Liege. We look at the values for these variables in the previous wave to estimate the probability of attrition in the next wave. We also include in the analysis the following two variables: (1) if the household to which the respondent belongs has moved since the previous wave or is a newly formed household; and (2) if the respondent was contacted by another interviewer in the previous wave than in the current wave. For these two variables, we look at information from the current wave to predict attrition, since the information on these variables is available to the interviewers before the household is contacted. In the PSBH, the population register is used to update the maintenance data base in between waves, because of this, information on household moving or household change is available before the actual contact with the household.

Respondents' background characteristics such as age, gender, education, occupational status, and place of residence are part of most models of attrition (e.g., Fitzgerald, Gottschalk, and Moffitt 1998; Lepkowski and Couper 2002; Loosveldt and Carton 2001; Nicoletti and Buck 2004; Watson and Wooden 2004). In a previous analysis of attrition, we demonstrated that age and education were important to predict panel

attrition in the PSBH (De Keulenaer 2004). For this reason, age and educational attainment are included in the analysis as control variables.

6. Results

Table 2 shows the coefficients of the three models of year-by-year attrition, comparing refusals, non-contacts and other nonrespondents with respondents that stay in the panel. We first performed a 'chunk' test for each type of attrition in which the fit of the model with all two-way interaction terms included is contrasted with the fit of the model with none of the interaction terms. Application of the chunk test for all three models reveals a nontrivial difference in model fit, this suggests that at least one interaction term is important to retain. At this point, we systematically evaluate each interaction. Testing of individual interaction terms capitalizes on chance, but we corrected for multiple testing. We added interaction terms for educational attainment, mode of data collection, household sample type, interviewer change, and fieldwork team in the non-contact model. In the refusal model, we added interaction terms for educational attainment, mode of data collection, interviewer change, and fieldwork team. For the other non-interview model we only found significant interaction effects for the educational attainment variable and the fieldwork team variable.

In the last column of table 2 we calculated the odds ratios by exponentiating the logistic regression coefficients. The first set of odds ratios for each covariate that interacts with time compares the odds for attrition and not participation for the reference category and a non-reference category at the time of wave two. The odds ratios for the interaction terms indicate the multiplicative factor by which the odds ratio comparing the reference category and a non-reference category changes given one additional wave of participation in the panel. In order to be able to compare the effects of the different covariates on attrition for different waves in the panel, we need to calculate the corresponding odds ratios. In table 3, we repeat the odds ratios for wave two and calculate the odds ratios for wave seven and wave eleven.

Because time is just another variable in the discrete-time logit models, we can specify the dependence of the hazard on time as different functions. We each time compared the fit of the model with an unrestricted effect of wave on the log-odds of attrition and a model where we constrained the effect of year to be linear on the log-odds of attrition. The linear model is each time acceptable, and since it has fewer coefficients than the unrestricted model, it has the edge of parsimony. A likelihood-ratio Chi-square test showed no significant difference between that model and the more restricted linear version. The effect of duration in the panel is highly significant in all three models. Each additional wave in the panel is associated with a decrease between 22 and 30 percentage points in the odds of attrition.

In the remaining part of this paragraph, we focus on the interpretation of the effects relating to the process variables.

Data Collection Mode
There is a difference in the odds for non-contact versus participation when comparing face-to-face interviewing in the previous wave and a self-completion questionnaire, a shorter interview or a proxy interview in the previous wave. The effect of the mode of administration, however, is dependent on the wave of the panel. The difference in odds for non-contact in wave two are ignorable, but in the last wave of the panel the odds for non-contact are a lot smaller after a self-completion questionnaire, a proxy interview, or a shorter interview instead of a face-to-face interview in the previous wave. The differences in odds between the different modes of administration in the previous wave for the refusal model are opposite of the effects in the non-contact model. The odds for refusal in wave two are smaller after a self-completion questionnaire, a proxy interview, or a shorter interview in the previous wave, however, by the time of wave eleven the odds for refusal are higher after a self-completion questionnaire, a proxy interview, or a shorter interview in the previous wave. In the model for other non-interviews the effect of mode of administration is not significant.

Item Nonresponse
Respondents with item nonresponse on a set of core questions in the previous wave have a higher chance to be a nonrespondent in the next wave, but the effect is only significant in the refusal model. A respondent who had missing values on the core questions in the last wave is 1.3 times more likely to refuse to participate in the next wave.

Position in the Household
Individuals that were not the reference person of a household or the partner of the reference person in the previous wave are 1.4 times more likely to be non-contacted, and 1.6 times more likely to refuse than the reference persons and their partners. The effect of household position is, however, the strongest in the model for other non-interviews. Individuals that are not the reference person of a household or the partner of the reference person are 2.7 times more likely to be

a nonrespondent for another reason than the reference persons and their partners.

Number of Contact Attempts
The effects of number of contacts show that with each additional contact in the previous wave, the odds for non-participation become larger. When five or more contacts where necessary in the previous wave, the odds for non-participation versus participation are more or less three times larger than when only one contact was necessary.

Fieldwork Team
In wave two, the odds for non-contact are two times smaller for the team in Liege, while by the time of wave eleven, the odds for non-contact are 5 times larger for the team in Liege versus the team in Antwerp. The interaction between fieldwork team and time shows that the difference in odds for refusal between the team in Liege and the team in Antwerp is similar as in the non-contact model, but the change in odds is smaller. Looking at the other non-interviews, fieldwork team also interacts with duration. At the beginning of the panel there was no difference between the two field work teams in the odds for other non-interviews versus participation, however, by the time of wave 11, the odds for other non-interviews are 2 times higher for the fieldwork team in Liege than for the team in Antwerp.

Household Sample Type
Respondents belonging to a split-off household or a household that moved since the previous wave have less chance to be contacted compared to members from original households. The effects of household sample type on the odds for attrition decrease with each additional wave in the panel. The odds for non-contact in the second wave are five times higher for a new household and twelve times higher for a moved household compared to the odds of an original household. By the time of wave eleven the corresponding odds have dropped to more or less two. The effects of household sample type on the odds for refusal and other non-interviews do not change with duration of the panel. Respondents belonging to a split-off household in the previous wave are 1.2 more likely to refuse, compared to members from the original households. Belonging to a household that moved before the current wave, makes you 2.5 times more likely to refuse. Respondents belonging to a split-off household in the previous wave are 5.9 times more likely to be a nonrespondent for another reason compared to members from original households, and members belonging to a household that moved before the previous wave are 4.9 times more likely to be a nonrespondent for another reason.

Interviewer Change
Respondents contacted by a different interviewer in the previous wave are more likely to be a nonrespondent than respondents contacted by the same interviewer. The effect of being contacted by a different interviewer for non-contacts and refusals are larger in later waves of the panel. For example, while respondents contacted by a different interviewer in wave two are 1.3 times more likely to refuse to participate, respondents contacted by a different interviewer in wave eleven are 3 times more likely to refuse to participate again. The effect does not change with duration of the panel for other non-interviews.

7. Discussion and Conclusions

In this paper we study attrition from the Panel Study of Belgian Households (PSBH) and test whether attrition probabilities are related to process data from previous waves. We considered the panel over its 11-year history from 1992 to 2002. In order to explain why certain households or individuals are at a higher risk to attrite from the panel, we estimated year-by-year attrition probabilities using discrete-time logit models. The discrete-time logit approach is particularly effective at handling time-dependent covariates and covariate-time interactions. This makes it possible to incorporate changing characteristics and to test if attrition behavior changes with the duration of the panel.

We explored the notion of using process data as a tool for responsive survey design for panel surveys. Our analyses revealed that the process variables in our models do assert a significant influence on attrition, and can be used to adjust the design of the survey during the course of the panel or to target potential attritors in later waves. For example, information on number of contact attempts in previous waves could be used to identify potential attritors, and interviewers could begin to work these cases sooner, use customized advance letters or incentives.

When studying nonresponse we need to take into account that nonresponse is not a homogeneous phenomenon by fitting separate models for refusals, non-contacts, and other non-interviews. The effects of the process variables on the different types of attrition were not the same, suggesting that different factors are playing when contacting respondents and when asking respondents to cooperate with the survey. We found, for example, that the number of item nonresponses on a set of core questions in the previous wave is a significant predictor of a refusal, but not of a non-contact or an other non-interview.

We studied attrition from the panel over its 11-year history, and adding interaction terms to the models showed that attrition behavior changes with duration of the panel. Some of the effects of the process variables decrease with each additional wave in the panel, while the effects of other variables increase with each additional wave in the panel. For example, we found that the effect of being contacted by a different interviewer for non-contacts and refusals are larger in later waves of the panel survey. Consequently, design alternations made in the beginning of the panel may not prove as effective in later waves of a panel, and different process information may be used in the beginning of the panel than in later waves of the panel to target attritors.

The process data in the PSBH were not collected with the purpose of using them to minimize attrition, and were also not used to alter the design of the panel or to target potential attritors. However, from our results we recommend that more attention is given to collecting process data in still running or new panel surveys so that the information can be used as a tool for responsive survey design, and thus to minimize attrition.

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Table 1: Response and attrition rates in the PSBH, 1992 adult sample members

Year	Remaining in sample	Attritions				Out of scope
		Total	Non-contact	Refusal	Other	
1992	8741 (-)	-	-	-	-	-
1993	7151 (.826)	1502 (.174)	274 (.032)	1037 (.120)	191 (.022)	88
1994	6162 (.869)	925 (.131)	124 (.017)	697 (.098)	104 (.015)	64
1995	5592 (.919)	493 (.081)	68 (.011)	360 (.059)	65 (.011)	77
1996	5115 (.922)	430 (.078)	61 (.011)	300 (.054)	69 (.012)	47
1997	4612 (.911)	448 (.089)	54 (.011)	339 (.067)	55 (.011)	55
1998	4127 (.905)	435 (.095)	38 (.008)	340 (.075)	57 (.012)	50
1999	3726 (.915)	347 (.085)	43 (.011)	270 (.066)	34 (.008)	54
2000	3425 (.928)	267 (.072)	34 (.009)	198 (.054)	35 (.009)	34
2001	3050 (.902)	330 (.098)	51 (.015)	241 (.071)	38 (.011)	45
2002	2831 (.937)	189 (.063)	30 (.010)	125 (.041)	34 (.011)	30
Total	2831 (.345)	5366 (.655)	777 (.095)	3907 (.477)	682 (.083)	544

Note: Figures in parentheses show response and attrition rates (AAPOR, 2004).

Table 3: Odds ratios for attrition compared to participation across waves 2, 7, and 11

	Non-contact			**Refusal**			**Other**		
	Wave2	*Wave7*	*Wave11*	*Wave2*	*Wave7*	*Wave11*	*Wave 2*	*Wave 7*	*Wave11*
Education: no or primary vs.									
- lower secondary	.60	.63	.66	.52	.76	1.04	.34	.63	1.02
- higher secondary	.62	.68	.74	.50	.70	.92	.31	.57	.93
- advanced	.27	.52	.88	.31	.50	.73	.24	.37	.52
- student	.26	.97	2.76	.37	.45	.53	.56	.51	.47
Mode: face-to-face vs.									
self, short quest. or proxy	1.16	.81	.60	.80	1.29	1.89			
Fieldwork team:									
Antwerp vs. Liege	.55	1.82	4.73	.69	1.11	1.63	1.14	1.68	2.28
Household type: original vs.									
- new household	5.31	3.31	2.27						
- moved household	12.27	4.28	1.84						
Interviewer change:									
No change vs. change	1.46	2.35	3.44	1.25	1.96	2.95			

Table 2: Coefficients of the discrete-time logistic models predicting nonresponse

	Non-Contact			Refusal			Other Non-Interview		
	Estimate	*S.E.*	*OR*	*Estimate*	*S.E.*	*OR*	*Estimate*	*S.E.*	*OR*
Intercept	-1.93 ***	.27		-1.19 ***	.12		-3.23 ***	.28	
Wave	-.37 ***	.04	.70	-.25 ***	.02	.78	-.26 ***	.03	.77
Age									
<25	-	-	-	-	-	-	-	-	-
25-64	-.38 *	.17	.69	-.14	.08	.87	-.07	.19	.93
>64	-.40	.20	.67	.11	.10	1.11	.97 ***	.21	2.69
Educational attainment									
No or primary education	-	-	-	-	-	-	-	-	-
Lower secondary	-.51 *	.25	.60	-.66 ***	.11	.52	-1.08 ***	.25	.34
Higher secondary	-.48 *	.23	.62	-.69 ***	.10	.50	-1.17 ***	.24	.31
Advanced education	-1.31 ***	.24	.27	-1.16 ***	.11	.31	-1.41 ***	.27	.24
Student	-1.33 ***	.37	.26	-.99 ***	.20	.37	-.55	.43	.56
D lower secondary*wave	.01	.05	1.01	.08 ***	.02	1.08	.13 ***	.04	1.13
D higher secondary*wave	.02	.05	1.02	.07 ***	.02	1.07	.12 ***	.04	1.13
D advanced*wave	.13 **	.05	1.14	.09 ***	.02	1.10	.08	.05	1.09
D student*wave	.25 ***	.07	1.30	.04	.04	1.04	-.02	.10	.98
Mode									
Face-to-face	-	-	-	-	-	-	-	-	-
Self, short quest. or proxy	.15	.17	1.16	-.22 **	.08	.80	-.10	.10	.97
D self-short-proxy *wave	.07 *	.03	.93	.05 ***	.01	1.05			
Number of missing									
No missings	-	-	-	-	-	-	-	-	-
1 or more	.110	.10	1.11	-.25 ***	.04	1.28	-.20	.19	1.22
Household position									
Reference or partner	-	-	-	-	-	-	-	-	-
Other	.32 *	.14	1.38	.45 ***	.06	1.57	.99 ***	.12	2.69
Number of contacts									
1	-	-	-	-	-	-	-	-	-
2	.07	.10	1.07	.15 ***	.04	1.16	.11	.10	1.10
3	.39 **	.12	1.48	.42 ***	.05	1.52	.54 ***	.13	1.68
4	.68 ***	.16	1.98	.65 ***	.07	1.91	.92 ***	.17	2.45
5 or more	1.11 ***	.16	3.03	.99 ***	.08	2.68	1.20 ***	.18	3.26
Team									
Antwerp	-	-	-	-	-	-	-	-	-
Liege	-.59 ***	.17	.55	-.37	.08	.69	.10	.18	1.14
D Liege*wave	.24 ***	.03	1.27	.09 **	.01	1.10	.18 *	.03	1.08
Household type									
Original household	-	-	-	-	-	-	-	-	-
New household	1.67 ***	.25	5.31	.20 *	.09	1.22	1.77 ***	.13	5.88
Household moved	2.51 ***	.33	12.27	.92 ***	.11	2.52	1.59 ***	.19	4.83
D new household * wave	-.09	.05	.91						
D household moved*wave	-.21 **	.07	.81						
Interviewer change									
No change	-	-	-	-	-	-	-	-	-
Change	.38 *	.16	1.46	.22 ***	.08	1.25	.70 ***	.09	1.98
D change*wave	.09 **	.03	1.10	.10 ***	.01	1.10			
Number of person years	30052			42063			29976		
LR Chi² test of global H0	869.79 (df=27) p<.0001			1544.14 (df=25) p<.0001			821.30 (df=22) p<.0001		
Pseudo R^2	.14			.08			0.15		

* 0.05 > p ≥ 0.01; ** 0.01 > p ≥ 0.001; *** p < 0.001 Note: Probability modeled is nonresponse. Sample weights used, these weights reflect the sample design of the PSBH.