Reducing Person Non-Response in Conversational Interviewing:

The Redesign of the Survey of Income and Program Participation

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Abstract: The Survey of Income and Program Participation is currently undergoing redesign to incorporate an Event History Calendar (SIPP-EHC). Both the 2010 and 2011 field tests had substantially higher person non-response and interview length than the 2008 SIPP. This research uses Kaplan-Meier survival curves to identify the point of saturation in a household interview. Cox regression analysis assessed the effect of interview length on person non-response relative to both household and respondent level characteristics. A saturation point was seen in the 2010 SIPP-EHC at approximately one hour and 50 minutes of interviewing and after two hours of interviewing in a household in the 2011 SIPP-EHC. In the 2011 SIPP-EHC, home ownership, interviewer experience with the SIPP-EHC, and the gender, race, and interview length of the householder were found to significantly impact person non-response rates. The implications of the two hour threshold, relevant respondent characteristics, and suggestions for survey improvement, are discussed.

The Survey of Income and Program Participation (SIPP) is currently undergoing redesign. Annual data collection—as opposed to three personal visits per year—has been made possible through the incorporation of an Event History Calendar (EHC). An EHC can be incorporated into a survey to reduce the seam bias usually present in longitudinal surveys, while utilizing recall memory to gather detailed information from respondents (Belli, 1998; Callegaro & Belli, 2007; Callegaro, Belli, Serrano, & Palmer, 2007). The computer-assisted personal interview version of the new, more conversational survey, the SIPP-EHC, has been through two field tests, one in 2010 and one in 2011.

The overall goal of redesigning the SIPP is to reduce the respondent burden as well as the financial burden of fielding the survey, while still collecting monthly data. Data quality is diminished when person non-response is high (O'Muircheartaigh & Campanelli, 1999; Rao, 2005). Therefore, the level of person non-response in the SIPP-EHC should be minimized as the SIPP-EHC becomes the production instrument in 2014. Currently, person non-response is approximately 10% higher in the SIPP-EHC than in the production SIPP[1]. Adjustments are being made to the SIPP-EHC instrument with the goal of producing the best possible version before it replaces the current SIPP instrument. As part of an evaluation process, this research will address the following research questions:

1. Is there a household interview length saturation point at which person non-response increases significantly;
2. Do household and/or householder characteristics impact person non-response;
3. Does the length of the first person's interview impact person non-response?

[1] Data available internally.

Answers to these questions can inform the continual effort to improve the survey instrument, field procedures, and the quality of the data collected.

While this research is of great importance to the Census Bureau, its impact can extend to both other data collection agencies and data users. Once evaluated and proved effective, innovative methods of data collection—such as the EHC—can also be used by other data collection. Since the SIPP-EHC will replace the current SIPP in 2014, SIPP data users are strongly interested in the data quality of the SIPP-EHC.

Data & Methods

The 2010 SIPP-EHC was conducted in six of the twelve regional offices with an initial sample size of 7,982 households. The 2011 SIPP-EHC was fielded in all twelve regional offices with an initial sample size of 4,051 households. Respondents over the age of 15 are considered adults for the purposes of the SIPP. Because child interviews are provided through proxy and are significantly shorter, only adults are included for this study. One adult must be present for an interview to take place; however, two adults are necessary if person non-response is to be assessed. After restricting the universe to households with two or more adults, and further restricting based on several household, householder, and interviewer characteristics, the remaining sample size was 3,741 households from the 2010 test and 1,431 households from the 2011 test. Both tests oversampled the low income stratum. In addition to having significantly longer interviews than production SIPP, the SIPP-EHC also had significantly higher person non-response rates.

To determine the saturation point—or the length of time in the interview at which respondents are no longer willing to participate—survival analysis and Cox regressions were used. In both types of analyses, time is measured in minutes of interviewing in the household, and was garnered from instrument audit trail files. In the survival analysis, the event is the refusal of a person to respond. This portion of the analysis was decomposed based on household size, participation in social welfare programs, presence of children, householder's employment status, marital status, and Hispanic origin. Table 1 displays the descriptive statistics of the sample, decomposed by type of respondent—the householder characteristics versus those characteristics reported by the householder about the non-respondent.

The average *Household Size* after considering sample restrictions was between three and four adults[2]. As such, the size of the household was recoded by dividing the sample between households with less than four people (N=2,059; 1,076)[3] and households with four or more people (N=1,581; 712). Participation in SSI, Food Stamps, TANF, General Assistance, and WIC was combined as *Program Participation* (N=1,147; 568). Additional recodes include: households with *Children Present* (N= 1,500; 699) versus no children; *Married* (N= 1,623; 777) versus not married, which includes never married, divorced, separated, and widowed; householders of *Hispanic Origin* (N= 1,589; 672) versus non-Hispanic origin. At least one person in the household had to complete the employment section of the interview for a case to be considered complete. The status of the householder as *Employed* was recoded to receive a value of 1, showing those who reported some type of employment during the interview (N=2,333;

[2] The average household size for both the 2010 and 2011 SIPP-EHC tests was slightly over 2; for this research, the average household size is higher because the sample was restricted to households with at least 2 adults.
[3] Sample sizes are reported as (2010; 2011), and unless otherwise indicated, the N value is that of the positively coded sample.

1,081) relative to those who were unemployed during the entire reference period. These recodes enabled the decomposition of the survival analysis.

To evaluate household and householder effects on person non-response during a household interview, Cox regression models were used (Cleves et al, 2008; Singer & Willett, 2003). Four Cox regression models were run at the household level. In the first model, the probability of having at least one person non-response in the household was regressed on household characteristics. The household characteristics included in the model were provided by the household reference person at the beginning of the interview and include the recoded *Household Size*, *Program Participation*, home ownership recoded to represent *Renters*, and *Children Present*. Interviewer characteristics were also included in the household level model. Status as a *Supervisory Interviewer* was dichotomously recoded, as was prior *SIPP Experience*. Years of *Census Interviewing Experience*[4] were also included. In the 2011 analyses, *SIPP-EHC Experience* could also be included.

In the second Cox regression model of households, the demographic information of the householder was used to determine the probability of interview length resulting in person non-response. Age, race, gender, English as a Second Language (ESL), education, employment, marital status, and Hispanic Origin for the householder were included. The third model includes all of the previously mentioned householder characteristics and adds the length of the first person's interview as a covariate. The fourth and final model incorporates the household, interviewer, and householder characteristics to determine which, if any of the covariates are

[4] The data available with respect to interviewers is limited to protect interviewer confidentiality. The date the interviewer started working for the Census Bureau was available, but may not be all time spent working as an interviewer.

significant predictors of increased person non-response during the course of a household interview.

Results

The results of the 2010 SIPP-EHC survival analysis are displayed in Table 2. Log-rank and Wilcoxon tests for statistically significant differences were used to assess the impact of household size, program participation, presence of children, and householder employment status, marital status, and Hispanic origin. A statistically significant intra-characteristic difference was seen with respect to program participation, marital status, Hispanic origin, and the presence of children. Figure 1 depicts the Kaplan-Meier survival curves for the whole sample compared to those showing statistically significant differences. As you can see from the curves, a saturation point at which non-response becomes prevalent occurs after one hour 50 minutes of interviewing, an effect that is most prevalent among program participating households.

Table 3 displays the outcome of the 2011 SIPP-EHC survival analysis. The results of the Log-rank and Wilcoxon tests on the 2011 analysis demonstrated a statistically significant difference between household size, program participation, marital status, Hispanic origin, and the presence of children. Figure 2 depicts the Kaplan-Meier survival curves for the full sample, as well as those with statistically significant intra-characteristic differences. The highest non-response rate in 2011 was that of households with four or more adults present, while the lowest person non-response was found in households participating in social welfare programs. The curve for the full sample in 2011 is comparable to that of 2010, with the exception of the range,

which was less in 2011. A slight saturation point is seen after two hours of interviewing, though it is not as pronounced as the saturation point seen in 2010.

Several household, interviewer, and householder characteristics were statistically significant in the Cox regression analysis of the 2010 SIPP-EHC. The results of the 2010 SIPP-EHC analyses are displayed in Table 4. Households with four or more adults present are 10.3% more likely to have person non-response than those with less than four adults. Households participating in means-tested social welfare programs are only 10% as likely as those not participating in such programs to have a non-respondent. Renters are 21% more likely than homeowners to have a non-respondent.

With respect to interviewer characteristics' effects on person non-response over the course of the household interview, supervisory interviewers are 54% more likely to experience person non-response while those with SIPP experience are 60% as likely to do the same. Each year of Census interviewing experience results in a 5.2% increased likelihood of person non-response. When interpreting the results associated with interviewer characteristics, it is important to note the way in which cases are typically assigned. Supervisory interviewers are usually assigned more difficult cases, specifically household refusals. Also, Census experienced interviewers are aware that partial interviews can be transmitted and considered completed cases for the purposes of interviewer evaluations.

In 2010, households headed by individuals self-identifying as black were 61% more likely than white householders to have person non-response as the interview progressed. Those with some college are the least likely to have person non-response, being 64.7% as likely as those with a high school diploma. With each additional minute spent interviewing the first

person, the likelihood of subsequent non-response decreases by 3.5%. While this may seem counterintuitive, one explanation may be that once respondents feel an investment of time has been made, they are more likely to complete the interview. When the household characteristics are added to the final model, the age of the householder—which was significant in both the second and third models—is no longer significant. Married respondents and respondents of Hispanic Origin are 30% less likely than non-married and non-Hispanic respondents to have person non-response over the course of a household interview. Households headed by both Black and other[5] races are more likely to have non-respondents than white householders by 37.6 and 28.8%, respectively.

The Cox regression analyses of the 2011 SIPP-EHC are displayed in Table 4. Renters were 39.5% as likely as home owners to have at least one non-respondent over the course of an interview. SIPP-EHC experienced interviewers were only 14.4% as likely as those without SIPP-EHC experience to have non-response. Male headed households were more than twice as likely as female headed households to have non-response. The householder characteristics were able to mediate for the effect of household size. Households headed by respondents classified in the other race category are almost three times more likely than white respondents to have person non-response. The implications of these findings and the directions for further improvement of the SIPP-EHC are discussed in the following section.

Discussion & Conclusions

[5] People identifying as more than one race, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or a race not included, are classified as 'Other' in this analysis.

While the results of the 2010 analyses are important, the comparison with the 2011 demonstrates the progress that has been made. The extension of the saturation point is encouraging; the point at which households are no longer willing to participate is increasing and the rate of non-response is decreasing. Additionally, the reversal of the effect of program participation on exiting the sample through person non-response is indicative of beneficial instrument changes from 2010 to 2011 with respect to programs. The survival curves were relatively similar between 2010 and 2011 for the full sample, and the decreased range of the curve in 2011 is also a positive result.

Modifications to the instrument between the 2010 and 2011 tests resulted in a decrease in interview length of approximately 10 minutes per person, which may be contributing to the decrease in person non-response seen in the range of the 2011 curve (author, forthcoming). The presence of the saturation point, while not prominent, still provides insight as to an interview length response threshold. Household interview length should not exceed two hours to maintain minimum person non-response and missing data. Additional research is necessary to determine the implication of household size on person non-response. The higher non-response could be the result of the presence of more people to be non-respondents, or it may be the case that the total length of the interview for larger households encourages non-response.

If the latter is the case, the copying of data provided by one household member for additional members should be utilized to a greater extent where applicable for larger households. A conservative copying approach was used in the 2011 SIPP-EHC and could be expanded to save time in larger households. The expansion of copying data is being analyzed to determine feasibility as well as the impact to estimates before it is taken to a larger scale. Household,

interviewer, and householder characteristics do contribute to the person non-response throughout a household interview.

While the 2010 SIPP-EHC was impacted significantly by most of the covariates, the 2011 SIPP-EHC instrument demonstrated greater stability. The 2010 SIPP-EHC instrument was affected by nearly every covariate in the analysis. In the 2011 SIPP-EHC instrument, however, gender, race, and home ownership were the only respondent characteristics affecting person non-response throughout the interview. Interviewers can be apprised of the increased likelihood of person non-response of male headed households, as well as of home owners. Increased training on the importance of every adult household member's participation in the survey is the key to success in these households.

SIPP-EHC experience is an interviewer characteristic that reduces person non-response. Experience with this more conversational style of interviewing in 2010 was clearly beneficial to interviewers in 2011. While only half of the regional offices and 26% of the interviewers had experience with the SIPP-EHC in 2010, SIPP-EHC experienced interviewers were only 14% as likely as those without experience to have a non-respondent during an interview.

It was originally thought that the longer length of the household's first person interview resulted in higher person non-response. However, for each additional minute spent interviewing the first respondent, subsequent person non-response is decreased by 3%. It is possible that once the first respondent is committed to providing information, either the household respondent will finish the other household member interviews via proxy, or encourage other household members to participate.

Like the interviewer characteristics from the Cox regression model, this information can be used to tailor interviewer training. Currently in interviewer training and in the advanced letter mailed to respondents prior to the interviewing period, the focus of the use of SIPP statistics is primarily participation and benefits in government programs. Education is positively correlated with income. That is, most people with a bachelor's degree or higher do not qualify for government assistance because of their income level.

While both the collection instrument and interviewer training continue to be improved, future research should be done to continually assess the progress of reengineering. Reducing the non-response rate and decreasing the interview length continue to be important. More recent research has focused on the use of paradata[6] in limiting non-response and creating adaptive designs. With additional research and feedback from stakeholders, interviewers, and respondents, the SIPP-EHC can continue to be improved and will serve as a high quality replacement to the current SIPP when introduced as production in 2014.

The SIPP-EHC instrument is improving with subsequent testing. Even when using a more conversational style of interviewing, households have an interview length threshold of two hours. While additional research is necessary to gain a more comprehensible understanding of how this threshold applies to different households with different characteristics, this general frame of reference provides a starting point for improving the quality of survey data collected. The new and innovative EHC method of data collection will be most beneficial if all respondents in the household can be interviewed in under two hours. Also, it is important for data users to be cognizant of the order in which the data was collected to ensure appropriate inferences are made.

[6] Paradata is a term used to describe data that are automatic by-products of computer-assisted interviewing like keystrokes, audit trails, etc. (Couper, 2000).

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Table 1. Descriptive Statistics.

Characteristics	2010 Mean	2010 S.E.	2011 Mean	2011 S.E.
Household Characteristics *(N=3,741; 1,431)* [a]				
Household Size	3.541	0.027	3.408	0.036
Program Recipients	0.315	0.465	0.318	0.466
Renters	0.638	0.481	0.622	0.485
Avg.# of Children per House (0 to 14)	0.974	1.221	0.817	1.135
Interviewer Characteristics *(N=301; 218)*				
Supervisor	0.126	0.333	0.169	0.376
SIPP-Exp	0.415	0.494	0.671	0.471
SIPP-EHC Exp	†	†	0.261	0.440
Census Years	3.326	5.095	3.390	4.455
Householder Characteristics *(N=3,741; 1,431)*				
Interview Length	61.412	28.221	47.188	26.748
EHC Length	21.244	12.203	6.663	11.478
Age	43.417	15.684	43.281	16.178
Males	0.404	0.491	0.405	0.491
ESL	0.548	0.498	0.463	0.499
Employed	0.641	0.480	0.605	0.489
Married	0.446	0.497	0.487	0.500
Hispanic Origin	0.480	0.500	0.422	0.493
Race				
Black	0.221	0.415	0.271	0.444
Asian	0.064	0.245	0.054	0.227
Other	0.305	0.461	0.210	0.408
Education				
< High School	0.357	0.479	0.318	0.466
Some College	0.215	0.411	0.257	0.437
Bachelor's+	0.147	0.354	0.153	0.360
Non-Respondent Characteristics *(N=1,216; 547)*				
Age	36.303	0.497	37.013	1.682
Males	0.524	0.014	0.548	0.021
ESL	0.502	0.014	0.395	0.021
Married	0.469	0.499	0.280	0.449
Hispanic Origin	0.488	0.500	0.383	0.486
Race				
Black	0.231	0.012	0.327	0.020
Asian	0.068	0.007	0.066	0.011
Other	0.349	0.014	0.236	0.018
Education				
< High School	0.480	0.014	0.059	0.010
Some College	0.141	0.010	0.029	0.007
Bachelor's+	0.081	0.008	0.015	0.005
Sample Characteristics				
Interview Length (N=9,605)	39.975	27.070	29.724	24.411
Individual EHC Length	15.802	12.354	4.712	9.545

† Not applicable in the 2010 SIPP-EHC.

[a]Sample sizes are presented as (2010; 2011).

For dichotomous variables, the variable name is indicative of a value of 1, so the reported value is that of proportion of respondents with that particular characteristic. Continuous variables are reported as the average across all respondents.

Table 2. 2010 SIPP-EHC Survivor Function Estimates for Person Non-Response by Household and Householder Characteristics.

	All	Household Size		Programs[1]*		Employed		Married*		Hispanic Origin*		Children Present*	
Time		<4	≥4	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
20	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
40	0.968	0.966	0.970	0.962	0.982	0.994	0.995	0.993	0.995	0.991	0.998	0.965	0.969
60	0.925	0.920	0.931	0.905	0.980	0.933	0.960	0.937	0.959	0.936	0.960	0.909	0.937
80	0.870	0.870	0.869	0.835	0.979	0.882	0.900	0.864	0.916	0.869	0.910	0.847	0.885
100	0.829	0.828	0.829	0.786	0.974	0.844	0.856	0.816	0.879	0.817	0.878	0.806	0.843
120	0.797	0.797	0.797	0.749	0.967	0.800	0.829	0.780	0.850	0.784	0.845	0.774	0.812
180	0.680	0.704	0.671	0.618	0.565	0.692	0.704	0.649	0.740	0.664	0.725	0.648	0.703
240	0.528	0.553	0.519	0.451	0.402	0.593	0.523	0.459	0.628	0.433	0.627	0.506	0.543
300	0.495	--	0.484	0.418	0.402	0.492	0.523	0.439	0.579	0.373	0.608	0.506	0.489
360	0.371	--	0.363	0.279	--	0.328	--	0.292	--	--	0.456	0.506	--
Obs.	8,932												
N	3,741	3,720		3,720		3,619		3,275		3,275		3,309	
Event	675	308	367	645	30	205	369	339	235	319	255	365	302

Log-rank and Wilcoxon tests showed the function was significantly different at the 0.01 level.

[1]Household participation in social welfare programs.

Table 3. 2011 SIPP-EHC Survivor Function Estimates for Person Non-Response by Household and Householder Characteristics.

	All	Household Size*		Programs[1]*		Employed		Married*		Hispanic Origin**		Children Present*	
Time		<4	≥4	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
20	0.975	0.989	0.956	0.968	0.991	0.999	0.997	0.998	0.997	0.999	0.996	0.983	0.978
40	0.932	0.984	0.868	0.911	0.987	0.961	0.948	0.932	0.970	0.945	0.957	0.923	0.948
60	0.864	0.967	0.755	0.826	0.978	0.895	0.879	0.862	0.878	0.868	0.896	0.844	0.886
80	0.806	0.952	0.672	0.756	0.973	0.845	0.814	0.798	0.842	0.797	0.851	0.767	0.845
100	0.774	0.952	0.626	0.716	0.973	0.819	0.777	0.764	0.811	0.767	0.814	0.735	0.812
120	0.740	0.937	0.588	0.677	0.957	0.795	0.736	0.715	0.792	0.731	0.781	0.703	0.777
180	0.650	0.916	0.494	0.570	0.957	0.674	0.660	0.603	0.723	0.661	0.674	0.573	0.714
240	0.614	--	0.457	0.525	--	0.622	0.630	0.603	0.659	0.617	0.642	--	0.654
Obs.	4,265												
N	1,830	1,725		1,724		1,724		1,570		1,570		1,572	
Event	309	36	273	298	11	91	175	156	110	166	100	176	119

*Log-rank and Wilcoxon tests showed the function was significantly different at the 0.01 level in 2011.

**Log-rank and Wilcoxon tests showed the function was significantly different at the 0.05 level in 2011.

[1]Household participation in social welfare programs.

Table 4. Cox Regression Models of Person Non-Response in 2010 SIPP-EHC (Hazard Ratios).

	Household		Householder		HH Interview Length		All	
Characteristics	B	S.E.	B	S.E.	β	S.E.	β	S.E.
Household								
Household Size ≥4	1.108***	0.028					1.103***	0.034
Program Recipients	0.132***	0.026					0.098***	0.030
Renters	1.425***	0.115					1.156	0.106
Children Present	0.754**	0.073					0.982	0.107
Interviewer								
Supervisors	1.759**	0.336					1.540*	0.316
SIPP Exp	0.656***	0.066					0.595***	0.065
Census Years	1.050***	0.012					1.052***	0.013
Householder								
Age			0.992**	0.003	0.994*	0.003	0.996	0.003
Male			1.124	0.099	0.956	0.083	1.033	0.091
ESL			0.902	0.115	1.072	0.136	1.025	0.135
Employed			0.850	0.078	1.144	0.106	1.058	0.098
Married			0.700***	0.063	0.758**	0.069	0.696***	0.066
Hispanic Origin			0.689**	0.100	0.715*	0.103	0.683**	0.100
Race								
Black			1.300*	0.158	1.457**	0.177	1.376**	0.172
Asian			1.072	0.219	0.872	0.177	0.834	0.172
Other			1.320**	0.148	1.307*	0.149	1.288*	0.147
Education								
< High School			0.883	0.093	0.882	0.093	0.891	0.094
Some College			0.630***	0.079	0.659***	0.083	0.647***	0.082
Bachelor's+			0.769	0.106	0.862	0.119	0.844	0.119
Interview Length					0.963***	0.003	0.965***	0.003
N Observations	8,560		8,466		5,193		5,193	
N Households	3,369		3,276		3,276		3,276	
N Events	667		574		574		574	

* p-value ≤ 0.05; ** p-value ≤ 0.01; *** p-value ≤ 0.001

Table 5. Cox Regression Models of Person Non-Response in the 2011 SIPP-EHC (Hazard Ratios).

	Household		Householder		HH Interview Length		All	
Characteristics	B	S.E.	B	S.E.	B	S.E.	B	S.E.
Household								
Household Size ≥4	1.384***	0.118					1.156	0.155
Program	0.546	0.220					0.870	0.512
Rent	0.814	0.247					0.395*	0.165
Children Present	0.627	0.239					0.870	0.421
Interviewer								
Supervisor	1.220	1.311					0.000	--
SIPP-Exp	1.230	0.550					1.119	0.619
SIPP-EHC Exp	0.184**	0.113					0.144*	0.119
Census Years	0.962	0.054					0.969	0.068
Householder								
Age			0.993	0.004	0.100	0.004	0.979	0.014
Male			1.394**	0.179	1.199	0.154	2.181*	0.879
ESL			0.913	0.179	1.033	0.205	1.135	0.673
Employed			1.119	0.152	1.378*	0.187	1.949	0.868
Married			0.770*	0.103	0.763*	0.103	1.287	0.571
Hispanic Origin			0.835	0.181	0.873	0.196	0.389	0.261
Race								
Black			1.481*	0.243	1.630**	0.263	0.791	0.412
Asian			0.816	0.291	0.824	0.293	0.538	0.636
Other			1.363	0.241	1.501*	0.270	2.876*	1.547
Education								
< High School			0.793	0.133	0.799	0.134	1.956	1.001
Some College			0.916	0.149	0.985	0.161	1.539	0.775
Bachelor's+			0.862	0.172	0.961	0.192	0.652	0.457
Interview Length					0.965***	0.005	0.970*	0.013
N Observations	2,978		4,026		2,432		1,710	
N Households	1,267		1,594		1,594		1,100	
N Events	46		266		266		31	

* p-value ≤ 0.05; ** p-value ≤ 0.01; *** p-value ≤ 0.001

Figure 1. Kaplan-Meier Survival Curve Analyses from the 2010 SIPP-EHC

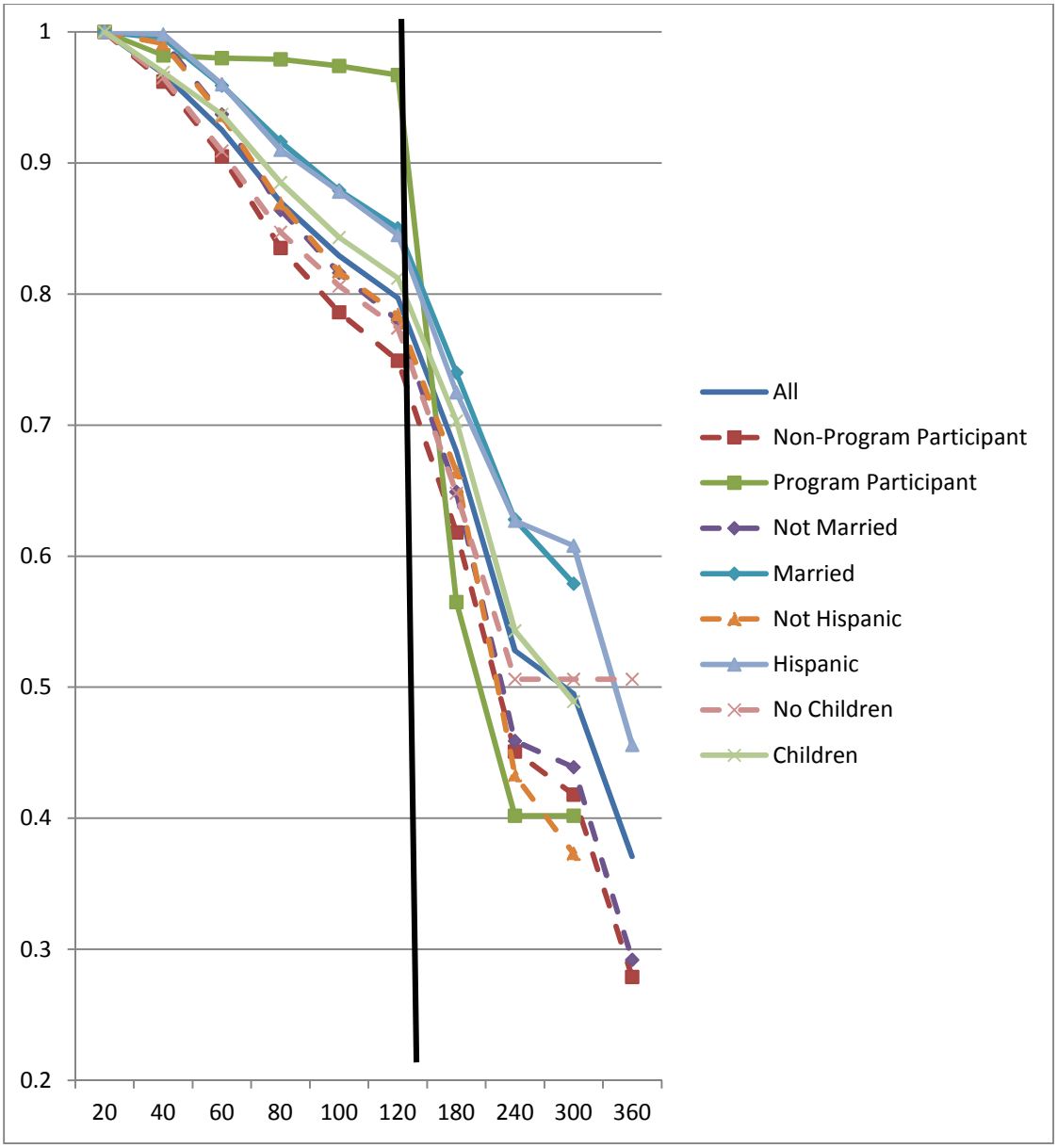

Figure 2. Kaplan-Meier Survival Curve Analyses from the 2011 SIPP-EHC