Ethnic/Race Differences in the Attrition of Older American Survey Respondents: Implications for Health-Related Research

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Objective. To compare models of attrition across race/ethnic groups of aging populations and discuss implications for health-related research.

Data Sources. The Health and Retirement Study (1992–2008).

Study Design. A competing risks model was estimated using a multinomial logit model when respondents faced competing types of risks, such as dying, being lost from the study, and nonresponse in some years for different groups of elderly. Key explanatory variables were foreign birth, health insurance, and health status.

Principal Findings. Variables describing foreign birth, health insurance, and health status differed in their prediction of attrition across ethnic groups of aging populations.

Conclusions. Differences in the predictors of attrition across ethnic groups of elderly could potentially lead to biased estimates in health-related research using longitudinal data sources.

Key Words. Attrition, race, ethnicity, health, insurance, health status

A large literature is devoted to the investigation of race/ethnic health disparities relying on data analysis. While the minority population is growing (U.S. Census Bureau 2008; Arias 2010), quite often past and current data have small samples of Mexican Americans, Latinos including Mexican Americans, blacks, and others, especially when stratified by basic demographic characteristics, such as age and gender (Dunlop et al. 2002). Representativeness of the participating respondents of the population of interest and nonrandom loss from the study are one of the biggest concerns leading to bias estimates and nongeneralizability of some results (Hausman and Wise 1979; Diehr and Johnson 2005). While representativeness of the sample is difficult to test due to lack of information about nonparticipants, attrition has been analyzed and

addressed in some studies on health disparities. However, none of the studies have compared models of attrition across different ethnic and racial groups of aging populations. Using the Health and Retirement Study (HRS) 1992–2008, this study compares models of attrition for Latinos including Mexican American, Mexican American separately, black, and white elderly Americans. The main hypothesis is whether variables describing foreign birth, health insurance, and health status are associated with attrition and whether these associations differ across racial/ethnic groups of elderly.

This study falls into the strand of literature about determinants of attrition among elderly individuals (Mihelic and Crimmins 1997; Van Beijsterveldt et al. 2002; Chatfield et al. 2005; Kapteyn et al. 2006; Tyas et al. 2006; Stimpson and Ray 2010). A recent literature review of attrition among elderly found that age, cognitive impairment, and poor health were associated with high attrition rates (Chatfield et al. 2005). However, none of the studies provided a comparison of determinants of attrition across different races and ethnicities. Such attrition is essential to the assessment of race/ethnic health disparities. Kapteyn et al. (2006) analyzed attrition in the HRS and found that being born outside of the United States, being Hispanic, being in poor/fair health, or having the onset of a health condition was associated with a higher probability of attrition than remaining in the HRS, depending on the type of model estimated. However, their analysis did not address the question of whether Hispanics and blacks with certain characteristics, for example, being in poor health, were more likely to attrite compared to similar whites. Rather than estimating a separate model for each race/ethnicity or interacting race/ethnicity with other covariates, the authors estimated a multinomial logit model for the pooled sample of whites, blacks, and Hispanics while introducing binary variables for each race/ethnicity category. This approach imposes a "common-effect" assumption when effects of other covariates on attrition are the same across different groups of elderly, which is relaxed in our study (Jha et al. 2007). Documenting differences in the attrition by race/ethnicity is also

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relevant to the literature on the "Hispanic paradox," a concept that describes a mortality advantage among Hispanics compared to similar whites and African Americans (Markides and Coreil 1986). Among other explanations, some researchers have argued that this phenomenon is a result of the selective return migration to the country of origin by older people in poor health, the so-called salmon bias hypothesis (Markides and Eschbach 2005). However, we cannot test this hypothesis due to lack of data on migration.

A competing risks model was estimated using a multinomial logit model when respondents of the study faced competing types of risks, such as dying, being lost from the study, and nonresponding in some years (Kapteyn et al. 2006). That is, when respondents entered the HRS in 1992, some of the participants were still present in 2008, the latest year available. However, some of the respondents died, others were in and out of the study during this period, while the rest of the respondents were lost from the study. Only one event/failure, such as death, nonresponse, or loss, can take place exclusively to the others with some probability, which defines a "competing risks" situation. The main assumption is the independence of risks of each event/failure type conditional on explanatory variables. The key explanatory variables are foreign birth, health insurance, and health status.

Given the substantial financial and human resources dedicated to the issue of racial/ethnic health disparities, this study may assist in developing future studies on health disparities in aging populations. Moreover, differential attrition by race/ethnicity in panel surveys has significant negative implications for health research in general due to growing ethnical diversity of the U.S. population.

Methods

Data Source and Sample

This study analyzed data from the HRS. The HRS is the most current, comprehensive, longitudinal study of aging (Juster and Suzman 1995). The HRS is a multistage clustered area probability sampled study of 51- to 61-year-old individuals that started in 1992 by collecting information about 12,600 people born between 1931 and 1941 and their spouses. These data were supplemented with individuals born before 1923 as part of the Study of Asset and Health Dynamics among the Oldest Old (AHEAD) in 1993 and combined with younger cohorts in 1998 and 2004. All individuals were re-interviewed every 2 years with a response rate of more than 80 percent across all waves

(Juster and Suzman 1995; Institute for Social Research 2010). The HRS contains detailed information on demographics, health status, and health care utilization that is uniform across all ethnic/racial groups and perfectly suited for the analysis of race/ethnic differential in attrition.

To maximize the Latino sample, our analysis includes all individuals from the HRS who were observed at age 51 or older resulting in a sample of 1,492 Mexican Americans, 2,487 Latinos including Mexican Americans, 4,367 blacks, and 21,845 whites. Table 1 reports the distribution of the birth cohort in the sample. Samples of whites, Mexican Americans, Latinos, and blacks have 1.5, 2.5, 2.2, and 2.4 percent of observations with missing values for one or more variables respectively and were excluded from the analysis.

Table 1:   Sample Size and Means for All the Variables by Race and Ethnic Groups When the First Time Observed, Health and Retirement Study (HRS) 1992–2004

Variable	Whites	Blacks	Mex. Amer.	Latinos, All
Age	64	62	60	60
Female (%)	55	60	54	56
Married (%)	72	50	72	67
Born outside the U.S. (%)	5	5	44	56
Less than high school (%)	24	47	73	65
Some college plus (%)	41	26	13	18
No insurance (%)	7	15	32	28
Medicaid (%)	3	15	16	17
Household income (U.S. $)	69,077	39,859	42,471	41,751
Household wealth (U.S.$)	329,795	91,819	114,910	116,693
No. of health conditions	1.14	1.43	1.03	1.04
No. of ADLs	0.23	0.42	0.45	0.42
Birth cohort (%)				
Born before 1931	44	34	28	30
Born 1931–1941	34	41	39	39
Born 1941–1954	22	25	33	31
Final status (%)				
Always in	56	49	57	55
Died	22	24	17	15
Ever out	8	14	15	16
Attritors	13	13	11	14
Number of observations	21,845	4,367	1,492	2,487

Notes. About 70 percent of respondents entered the HRS in Waves 1 and 2 across all ethnic and racial groups, the rest of the respondents were allowed to enter between Waves 3 and 7 to maximize the size of the minority population. Samples of whites, Mexican Americans, Latinos, and blacks have 1.5, 2.5, 2.2, and 2.4 percent of observations with missing values for one or more variables, respectively, and were excluded from the further analysis.
ADL, activities of daily living.

Measures

The outcome variable is the vital status of each HRS respondent in 2006. The status of each respondent can fall in four exclusive categories. We labeled "always in" those respondents that responded in each wave up to 2006; "died" those respondents who were reported dead between the first wave they were interviewed and 2006; "ever out" those respondents who did not respond in some years; and "attritor" those who entered the study at some point but were continuously absent from the study up until 2008. Since 2008 data are already available, we used the status in 2008 to determine whether nonresponding individuals in 2006 or earlier were attritors or if they were back in the study in 2008.

The set of explanatory variables included continuous variables such as age, age squared, and binary variables for being female, married, for not completing high school, completing high school, having some college or higher, being foreign born, being born before 1931, and being born after 1941. We also controlled for lack of health insurance and being on Medicaid. Health status was described by the number of self-reported health conditions (high blood pressure, diabetes, cancer, heart problems, stroke, lung problems, and arthritis) and number of activities of daily living (ADLs) (dressing, walking, bathing, eating, getting in and out of bed, and using the toilet). Since severity of health conditions may vary significantly across individuals and ethnicities, we controlled for self-reported health with a binary variable for reporting poor or fair health status. Controls for financial well-being were measured by the log of household income in the HRS.

Analytic Approach

We estimated a multinomial logit model of the status of each respondent by 2008 as a function of baseline characteristics—characteristics when observed for the first time—of those who are 51 and older across all groups of elderly combined and later by race/ethnicity to determine whether predictive effects of covariates vary across race/ethnicity. We also tested our model to insure that it satisfies the Independence of Irrelevant Alternatives assumption using the Hausman test (Hausman 1978; Long and Freese 2006). Since the sample of Mexican Americans in the HRS includes only 168 attritors total across seven waves, we did not estimate wave-by-wave determinants of transition across race/ethnicity due to significant loss of power.

Table 1 reports summary statistics and sample sizes. Table 2 reports relative-risk ratios and 95 percent confidence intervals by race/ethnicity, while Table 3 reports predicted probabilities for selected variables based on race/ethnic-specific models.

RESULTS

Table 1 provides summary statistics of the key variables, sample size, and percent of people who died, ever were out, or were lost by race and ethnicity from the HRS between 1992 and 2006. Compared to whites and blacks, Latinos were younger, with fewer years of schooling, more likely to be foreign born, and less likely to have health insurance. Blacks and Latinos were more likely to be on Medicaid compared to whites. Blacks had a greater number of health conditions, while the number of ADLs was most prevalent among blacks and especially Mexican Americans despite their younger age. According to Table 1, 22 percent of whites, 24 percent of blacks, and only 17 percent of Mexican Americans died by 2006. Surprisingly, Mexican Americans had the lowest percent of respondents being lost from the study.

Table 2 presents estimates for the multinomial logit model predicting the relative-risk ratios for being dead, ever out, or being an attritor by 2006 compared to being "always in" as a function of baseline characteristics. The first column reports the result for the combined sample of white, black, Latino, and other race elderly populations. Consistent with the well-documented "Hispanic paradox" literature, Hispanics faced a smaller probability of dying compared to whites. Foreign born were also less likely to be attrited due to death. As we would expect, lack of health insurance, greater number of health conditions, and ADLs were associated with greater probability of dying, while higher income protected from greater mortality. Blacks, Latinos, those who were foreign born, and those without health insurance were more likely to nonrespond in some waves; that is, to be "ever out." Surprisingly, estimates of the combined sample shows that Mexican Americans were less likely to attrite from the study. On the other hand, foreign born were more likely to attrite. As it was previously documented, those in poor health were more likely to attrite than to remain in the study, although respondents having an additional health condition or reporting being in fair/poor health were more likely to die than to attrite.

Columns 2 through 5 report estimates of a similar model by race/ethnicity. Foreign-born Latinos had a smaller probability of dying, while lack of

Table 2: Multinomial Logit Model, Base Outcome "Always in," Health and Retirement Study (HRS) All 51+

Variable	All RRR/CI	Whites RRR/CI	Blacks RRR/CI	Mex. Amer. RRR/CI	Latinos, All RRR/CI
Died					
Black	1.076	—	—	—	—
	[0.972,1.190]	—	—	—	—
Mexican American	0.801**	—	—	—	—
	[0.666,0.964]	—	—	—	—
Latino, other	0.700***	—	—	—	—
	[0.550,0.889]	—	—	—	—
Born outside the U.S.	0.855**	0.932	0.806	0.647**	0.764*
	[0.741,0.986]	[0.771,1.126]	[0.508,1.278]	[0.449,0.931]	[0.582,1.002]
No insurance	1.270***	1.296***	1.485***	1.095	0.976
	[1.105,1.459]	[1.084,1.550]	[1.113,1.982]	[0.685,1.751]	[0.655,1.455]
Medicaid	1.078	1.053	1.460***	0.829	0.971
	[0.936,1.242]	[0.850,1.304]	[1.135,1.877]	[0.520,1.320]	[0.681,1.386]
Log of household income	0.932***	0.898***	0.976	0.974	1.001
	[0.906,0.959]	[0.864,0.932]	[0.915,1.040]	[0.879,1.079]	[0.923,1.085]
No. of health conditions	1.313***	1.301***	1.304***	1.422***	1.408***
	[1.271,1.357]	[1.253,1.352]	[1.201,1.415]	[1.208,1.673]	[1.235,1.604]
Number of ADLs	1.139***	1.157***	1.163***	1.149*	1.079
	[1.092,1.187]	[1.096,1.221]	[1.066,1.269]	[0.982,1.345]	[0.954,1.221]
Poor/fair self-reported health	1.825***	1.972***	1.497***	1.548**	1.483**
	[1.676,1.988]	[1.782,2.181]	[1.219,1.839]	[1.055,2.271]	[1.095,2.009]
Ever out					
Black	1.748***	—	—	—	—
	[1.564,1.953]	—	—	—	—
Mexican American	1.382***	—	—	—	—
	[1.150,1.661]	—	—	—	—

Table 2. *Continued*

Variable	All RRR/CI	Whites RRR/CI	Blacks RRR/CI	Mex. Amer. RRR/CI	Latinos, All RRR/CI
Latino, other	1.647***	—	—	—	—
	[1.328,2.042]				
Born outside the U.S.	1.325***	1.395***	1.518**	1.242	1.237*
	[1.145,1.533]	[1.119,1.738]	[1.041,2.214]	[0.878,1.756]	[0.966,1.584]
No insurance	1.281***	1.324***	1.431***	1.148	1.023
	[1.125,1.457]	[1.108,1.583]	[1.091,1.878]	[0.787,1.675]	[0.764,1.369]
Medicaid	0.900	1.287	1.100	0.429***	0.567***
	[0.741,1.092]	[0.948,1.749]	[0.788,1.536]	[0.233,0.791]	[0.369,0.869]
Log of household income	0.961**	0.952**	1.038	0.918**	0.947*
	[0.932,0.991]	[0.907,0.998]	[0.964,1.118]	[0.855,0.986]	[0.896,1.001]
No. of health conditions	0.991	0.978	0.963	1.198**	1.092
	[0.948,1.035]	[0.926,1.033]	[0.872,1.062]	[1.007,1.427]	[0.955,1.250]
Number of ADLs	0.976	0.983	0.985	0.936	0.974
	[0.915,1.041]	[0.897,1.076]	[0.869,1.117]	[0.763,1.148]	[0.842,1.127]
Poor/fair self-reported health	1.117*	1.225***	0.841	1.423*	1.188
	[0.997,1.250]	[1.056,1.421]	[0.661,1.071]	[0.988,2.049]	[0.895,1.576]
Attritors					
Black	0.996	—	-	—	—
	[0.891,1.114]				
Mexican American	0.731***	—	—	—	—
	[0.601,0.891]				
Latino, other	1.119	—	—	—	—
	[0.902,1.388]				

Table 2. *Continued*

Variable	All RRR/CI	Whites RRR/CI	Blacks RRR/CI	Mex. Amer. RRR/CI	Latinos, All RRR/CI
Born outside the U.S.	1.401***	1.257**	2.129***	1.306	1.610***
	[1.221,1.608]	[1.036,1.524]	[1.434,3.160]	[0.881,1.935]	[1.230,2.107]
No insurance	1.004	0.913	1.079	1.688**	1.291
	[0.875,1.153]	[0.760,1.097]	[0.769,1.514]	[1.065,2.674]	[0.931,1.790]
Medicaid	0.758***	0.938	0.833	0.765	0.559***
	[0.639,0.898]	[0.732,1.201]	[0.600,1.157]	[0.431,1.357]	[0.370,0.844]
Log of household income	0.967**	0.948**	1.043	0.923*	0.998
	[0.938,0.998]	[0.909,0.988]	[0.957,1.136]	[0.849,1.002]	[0.934,1.065]
No. of health conditions	1.188***	1.178***	1.179***	1.449***	1.304***
	[1.145,1.233]	[1.128,1.229]	[1.069,1.301]	[1.205,1.742]	[1.140,1.493]
Number of ADLs	1.139***	1.144***	1.174**	1.216**	1.152**
	[1.087,1.194]	[1.077,1.214]	[1.060,1.301]	[1.018,1.452]	[1.012,1.310]
Poor/fair self-reported health	1.312***	1.459***	1.064	0.820	0.854
	[1.191,1.446]	[1.299,1.638]	[0.832,1.360]	[0.534,1.257]	[0.630,1.158]
Pseudo R2	0.1413	0.1433	0.1357	0.1553	0.1313
No. of Obs.	28,523	21,286	4,225	1,427	2,388

Note: Estimates are not reported for female, age, age squared, married, educational attainment variables, cohort variables, and variable for "other" race. Shading indicates whether relative-risk ratios for being an attritor are statistically significantly different from the relative-risk ratio of dying: dark gray: statistically significant at 0.01 level; medium gray: statistically significant at 0.05 level; light gray: statistically significant at 0.1 level. Hausman test does not reject the IIA for the samples of Mexican Americans, Latinos including Mexican Americans, blacks, and for the sample of white and pooled sample for the "Dead" and "Ever out" categories and rejects hypothesis for the "Attritors" category for the pooled and white samples.
***Statistically significant at 0.01 level;
**Statistically significant at 0.05 level;
*Statistically significant at 0.1 level.
ADL, activities of daily living.

health insurance was associated with greater probability of dying for whites and blacks but not for Mexican Americans and Latinos in general. While the number of health conditions and self-reported poor/fair health was associated with higher probability of dying across all groups, the number of ADLs was significant only for whites and African Americans. The number of health conditions and ADLs was a significant predictor of being an attritor across all groups of aging populations as well. Surprisingly, being foreign born was not significant for Mexican Americans, while it was significant for others. However, Mexican Americans with no health insurance had a greater probability of dropping out of the study.

Interestingly, separate models demonstrated that chances of attrition associated with health conditions were greater for Mexican Americans than for white counterparts. That is, according to estimates, Mexican Americans having an additional health condition had almost similar chances of dying and dropping out of the study. However, white elderly having an additional health condition had greater chances of dying than being lost from the study. Different shades of gray indicate whether relative-risk ratios for becoming an attritor were statistically different from the relative-risk ratios of dying. For whites and African Americans these ratios are significantly different, while for Mexican Americans and Latinos in general these ratios are statistically the same.

To facilitate interpretation of the results, Table 3 presents predicted probabilities for selected variables based on race/ethnic-specific model estimates that were applied to the whole sample while setting a variable of interest to a particular value. Thus, a foreign-born Latino had a 19.3 percent probability of being an attritor and 15.5 percent probability of being dead, while for a non-Latino white the corresponding probabilities were 15.9 and 20.4 percent. Across all groups of elderly, foreign birth was associated with greater probability of attrition than death. Lack of health insurance was associated with about 25 percent probability of death for whites and blacks, while for Mexican Americans and Latinos these probabilities were smaller. However, a Mexican American without health insurance had a 19 percent probability of becoming an attritor; for similar non-Latino whites this probability was only 11.6 percent. Medicaid status was associated with lower probability of attrition for all groups of elderly. Having two health conditions led to significantly greater probability of death relative to probability of attrition for non-Latino whites. For Latinos and Mexican Americans these probabilities statistically were the same.

Table 3: Predicted Probabilities for Selected Variables Based on Race/Ethnic-Specific Multinomial Logit Models

Race/Ethnicity	Always in (%)	Died (%)	Ever Out (%)	Attritors (%)
Born outside the U.S.				
White non-Latino	52.4	20.4	11.3	15.9***
African Americans	43.1	15.6	18.8	22.5***
Mexican Americans	52.1	13.6	17.0	17.3***
Latinos, all	48.6	15.5	16.6	19.3***
No insurance				
White non-Latino	52.2	25.7	10.5	11.6***
African Americans	44.0	25.4	18.1	12.5*
Mexican Americans	48.3	17.9	14.9	19.0
Latinos, all	49.7	18.9	14.8	16.6
Medicaid				
White non-Latino	53.9	22.8	10.6	12.7
African Americans	47.4	27.0	15.1	10.5***
Mexican Americans	61.0	19.3	7.6	12.2
Latinos, all	58.4	22.8	10.0	8.8**
Having two health conditions				
White non-Latino	52.6	24.6	8.3	14.6***
African Americans	47.6	24.0	13.8	14.5
Mexican Americans	48.3	20.8	15.0	15.9
Latinos, all	47.9	22.5	14.6	15.0
Poor/fair self-reported health				
White non-Latino	48.2	28.0	8.9	14.9***
African Americans	48.0	26.0	12.7	13.3***
Mexican Americans	49.6	22.4	17.0	10.9***
Latinos, all	49.2	23.9	15.8	11.2***

Notes. Statistical significance indicates whether particular variable is a significant predictor of being an attritor compared to being dead and is based on Table 2. To obtain predicted probabilities, estimates from race/ethnic specific multinomial logit models were sequentially applied to the entire sample of 28,523 individuals while the variable of interest was set to one (for born outside the U.S., no insurance, Medicaid, and poor/fair health) or two (no. of health conditions).
***statistically significant at 0.01 level;
**statistically significant at 0.05 level;
*statistically significant at 0.1 level.
ADL, activities of daily living.

DISCUSSION

This study compares models of attrition across different racial/ethnic groups to demonstrate some implications of growing diversity of the U.S. population for health-related research and assist in planning of future studies of health disparities in aging populations. Variables describing immigration status, insurance, and health status differed in their prediction of attrition across minority

groups of elderly that may lead to biased estimates of the relationships under investigation. Our findings suggest that work examining racial/ethnic disparities in mortality, health decline, and disability onset using the HRS was likely to underestimate health disparities due to higher relative attrition of Latinos in poor health measured by the number of health conditions and ADLs (Sudano and Baker 2006; Dunlop et al. 2007). Sudano and Baker (2006) found that lack of health insurance was responsible for small fraction of disparities in health outcomes that could be explained by the lack of attrition adjustment in their work. Similarly, our findings suggest that work debating about the relationship between lack of health insurance and mortality is likely to be sensitive to attrition process by health insurance status, particularly for Mexican Americans (McWilliams et al. 2004; Kronick 2009). McWilliams et al. (2004) found that while the lack of health insurance was associated with significantly higher mortality rate among whites, there was no mortality differential for Hispanics referring to Hispanic paradox as an explanation. Ethnic differences in the attrition processes by health status and health insurance could explain their finding as well. Due to growing ethnic diversity of the U.S. population, researchers would be advised to pay a closer attention to potential ethnic/ racial attrition differentials in health-related research.

This study has several limitations. The sample of Latinos in the HRS was still small, forcing us to combine several cohorts to conduct analysis. Due to the small sample of Latinos, we were unable to test interactions of covariates and ethnic/racial binary variables to test statistical significance of differences in the effects of covariates across races/ethnicities. The small sample size problem may also have been responsible for some of the nonsignificant results for Latinos. As a share of minority population becomes more prevalent, findings of our study can be validated in the future. Larger representation of the minority population in surveys will allow additional testing of our model.

To summarize, there are important differences in the attrition process across different groups of aging minorities. Our study indentified respondent characteristics that may improve attrition adjustment in health-related research and guide future effort to retain minority population in panel surveys.

ACKNOWLEDGMENTS

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix SA1: Author Matrix.

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