Is There a Salmon-Bias Effect?
Mortality Differentials by Place of Residence among Primary Social Security Beneficiaries in the United States

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ABSTRACT

Estimates of adult mortality have documented lower mortality for Hispanics than for NH-whites in the United States, despite their lower socioeconomic status. A great deal of research has focused on the factors that may explain this puzzle. In the category of migration selection effects, one hypothesis that has been frequently offered is the salmon-bias effect. However, up to now there has been no direct evidence that return migration is a determinant of the Hispanic mortality advantage. In this paper we use information on residential status and death records for primary Social Security beneficiaries to examine how mortality of elderly Hispanics and NH-whites residing abroad differs from those living in the U.S. Although our results provide evidence of higher mortality rates for foreign-born Hispanics living abroad than for foreign-born Hispanics living in the U.S., the higher mortality among the foreign residents does not explain the lower mortality of Hispanics residing in the U.S. compared to NH-whites.

Estimates of adult mortality have consistently documented lower mortality for Hispanics than for non-Hispanic whites, despite their lower socioeconomic status. According to recent estimates by Elo et al. (2004), Hispanic men and women who survive to age 65 can expect to live, respectively, 1.3 and 0.9 years longer than non-Hispanic white men and women. The mortality advantage is greater for foreign-born Hispanics and has been shown to persist at very old ages (Elo and Preston 1997; Elo et al. 2004; Hummer et al. 2000; Hummer et al. 1999; Turra 2004) A great deal of research has focused on the factors that may explain this puzzle. Possible explanations include health-related behaviors, family networks, social support, and migration selection effects (Franzini, Ribble, and Keddie 2001; Jasso et al. 2005; Markides et al. 1997). Yet, considerable uncertainty remains about the relative importance of each of these factors in determining the Hispanic mortality advantage.

Among migration selection effects, two hypotheses related to return migration have been offered to explain the observed mortality advantage of Hispanics and, in particular, the persistency of this advantage at older ages (Palloni and Arias 2004). The first explanation is related to a data artifact present in prospective mortality follow-up data. Such data sources, typically based on survey data that are subsequently linked to death records in vital registration systems, will miss deaths of individuals who emigrated during the follow-up period prior to death and this omission may bias downward mortality rates for foreign-born populations, including Hispanics. The second hypothesis, often referred as the salmon bias effect, takes the above explanation a step further and posits that Hispanics who return to their countries of origin prior to death are of poorer health status than the average foreign-born Hispanic who remains in the United

States. Such selective migration results in mortality estimates for the U.S. Hispanic population that will be lower than they would be had these individuals remained in the U.S.

Research on the Hispanic mortality paradox has provided mixed evidence for the salmon-bias effect. Comparative analysis of mortality among Hispanic subgroups has demonstrated that Hispanics who are unlikely to emigrate (e.g. people born in Cuba) also enjoy a mortality advantage relative to Non-Hispanic (NH) Whites, suggesting that the salmon-bias effect does not explain the mortality advantage of at least some Hispanic subgroups (Abraido-Lanza et al. 1999). In contrast, comparisons of self-reported health in Mexico and the United States have found health status to be worse among elderly migrants who have returned to Mexico than among Mexican-born elderly living in the United States (Palloni and Arias 2004). To the extent that the data sources are comparable, these results raise the possibility that health-related return migration accounts for at least a part of the Hispanic mortality advantage among the foreign born. These studies, however, fail to offer direct evidence of the effects of selective emigration on mortality estimates among Hispanics living in the United States.

Even if there is a Salmon-bias effect, its ability to impact on mortality depends on the volume of elderly emigration. Previous studies on foreign-born emigration have demonstrated that the probability of return emigration decreases with length of residence in the U.S(Marcelli and Cornelius 2001; Massey et al. 1987; Reyes 1997). Recent estimates based on Social Security records, for example, indicate that only about 20 percent of foreign-born individuals who emigrate do so after spending 10 years in the U.S. and when they leave they do so mostly around retirement age (Duleep 1994).

Although it is unlikely that a large proportion of foreign-born Hispanics residing in the United States emigrate at older ages, it remains unclear whether emigration among middle-aged and elderly Hispanics contributes to the apparent Hispanic mortality advantage at older ages.

In this paper, we examine mortality in 1996-2000 among Hispanic and NH-white primary social security beneficiaries residing in the United States and abroad. Although we estimate mortality only for individuals at ages 65 and above, we include in our analyses all primary beneficiaries who emigrated prior to age 65 if they received social security benefits in December 1995. By combining mortality data for beneficiaries residing abroad and in the United States, we can examine the effect of selective migration on mortality estimates among Hispanics and NH-whites at ages 65 and above.

MATERIALS AND METHODS

Master Beneficiary Record-NUMIDENT Data

Data for this analysis come from Social Security Administration (SSA) records. We summarize the data briefly herein; more information about data quality and the methodology can be found elsewhere (Elo et al. 2004; Kestenbaum 1992, 1997; Kestenbaum and Ferguson 2002; Lauderdale and Kestenbaum 2002).

We combine data from two sources: the Master Beneficiary Record (MBR) and the NUMIDENT file. From the MBR we select data items that are useful for estimating mortality and migration: sex, date of birth, date of death, and current or last place of residence. The NUMIDENT file provides us with data items useful for Hispanic identification: race/ethnicity, given name, surname, country of birth and father's name (for married women). When information on race/ethnicity is available, we use the

Hispanic-origin item collected in the social security application forms to identify Hispanics. Because information on Hispanic origin is lacking for individuals who last applied for a social security card before 1981, we employ two additional strategies to infer Hispanic origin. First, individuals born in Spain and Spanish-speaking countries in Latin America are considered to be Hispanic. Second, we calculate a "Spanishness" score based on individual's surname, given name (or maiden name for women when available), and the percentage of residents who are Hispanic in the county of U.S. residence. Individuals are assumed to be Hispanic when the score exceeds a certain threshold value that simultaneously (1) leads to the classification of the same number of individuals as Hispanic in the Medicare records as in the U.S. population in 1990, and (2) correctly identifies as Hispanic the vast majority of Medicare enrollees known to be Hispanic. Early evaluations of our "Spanishness" score suggest that the method correctly classifies most of the cases with missing ethnicity and performs better than census surname lists (Elo et al. 2004).

Our mortality estimates pertain to the period 1996-2000 and are based on the experience of primary social security beneficiaries who were ages 65 and older in December 1995 and who were living in the United States or abroad. Primary beneficiaries have achieved insured status based on their own work history and thus, with only a few exceptions, they have lived in the U.S. during their working ages. Generally, the number of quarters needed to become fully insured is 40 or the number of years between 1950 and the year of attainment of age 61 (Duleep 1994). Therefore, individuals could achieve insured status after working for a decade or even less in the U.S. Individuals could then emigrate at middle age and start receiving social security benefits

when they retire whether or not they were living in the United States at that time. Approximately 75-80% of persons ages 65 and older in the December 1995 MBR data file were primary beneficiaries.

We exclude secondary beneficiaries – individuals whose entitlement to social security benefits is based on someone else's work record - because many secondary beneficiaries living abroad have never resided in the U.S. (Kestenbaum 1988). This exclusion would bias our estimates only if mortality of secondary and primary beneficiaries differed substantially. Comparisons that we performed of mortality estimates of primary beneficiaries with those of all Medicare Part B recipients, which include primary and secondary beneficiaries, living in the United States in 1980 to 1999 (Elo et al. 2004) show no significant differences between the two estimates (results not shown). In addition, we exclude beneficiaries who were living in Puerto Rico on December 1995 because Puerto Rican residents are entitled to social security benefits based on covered employment on the island and many Puerto Ricans have never lived in the United States. However, we include Puerto Rican born individuals as long as they were residing in the United States on December 1995. Thus our data are restricted to primary social security beneficiaries who lived in the United States, 50 states and the District of Columbia, or in foreign countries in December 1995.

We follow these individuals, 21.6 million persons of whom 0.9 million were Hispanics and 20.7 million were NH-whites, from December 1995 through December 2000. Among NH-whites we distinguish three population subgroups: US-born NH-whites (79%), foreign-born NH-whites (6%), and NH-whites with unknown place of birth (16%). Among Hispanics, we distinguish four population subgroups: US-born Hispanics

(38%), foreign-born Hispanics (42%), persons born in Puerto Rico (9%) and Hispanics with unknown place of birth (11%). At the end of each 12-month period we record the survival and residential status (U.S. residence and foreign residence) of each individual. Because date of death does not change we obtained it from a current (June 2004) snapshot of the MBR. Residential status (U.S. residence and foreign residence) of each individual, on the other hand, is obtained for each December from annual snapshots of the MBR. For deceased persons we obtain the last residence. We determine person-years of exposure, number of deaths, and number of changes in residential status in each year for population subgroups defined in terms of place of residence, 5-year age groups, and sex.

Given the seriousness with which SSA carries out its stewardship responsibilities, the ascertainment of death for primary beneficiaries is close to 100 percent of deaths in the United States and it is likely to be almost as good for deaths of primary beneficiaries outside the United States. For example, foreign enforcement questionnaires are sent once a year to obtain updated information about beneficiaries; failure to complete these questionnaires results in the suspension of benefits. Also, occasional validation and integrity investigations are carried out to evaluate the accuracy of this information.

Statistical Analysis

To test the salmon-bias hypothesis, whether mortality is higher among foreign-born Hispanics living abroad than among foreign-born Hispanics living in the United States, we use Poisson regression to estimate mortality levels by sex, ethnicity, and place of residence. Similar models were used in previous studies of mortality (e.g. Hu and Goldman 1990) and are appropriate when grouped data are used in the estimation.

Because of confidentiality of social security records all estimates must be performed on grouped data. We estimate separate models for foreign and native-born Hispanic and NH-white men and women and for Hispanic and NH-white men and women with unknown place of birth. Among the foreign-born Hispanics, we further distinguish those who were born in Puerto Rico. Each model controls age, in 5-year age groups, and place of current residence, U.S. versus foreign residence. These models also allow us to examine whether mortality varies between U.S. and foreign residents for NH-whites, US-born Hispanics, and individuals with unknown place of birth, a question that has received little attention in the literature. Residential status in theses analyses is based on place of residence at the end of each year during 1996-2000, or on the last place of residence for the deceased. We assume that individuals who changed their residential status during any year of 1996-2000 were at risk of dying in each place of residence by half the year, on the average.

In the second set of estimates, we extend the above analysis to examine mortality following a migratory move among emigrants and returning in-migrants to the United States in 1996-2000 and we compare these estimates to the mortality of U.S. residents. What chiefly distinguishes this analysis from the previous one is the exclusion of the mortality experience of those who were already living abroad on December 1995. To the extent that emigration is selective of individuals of poorer health status and the effects of selection are more pronounced in the first years after emigration, we expect to see higher mortality among recent emigrants than among all persons residing abroad relative to US residents. With regard to retuning in-migrants, it is also possible that individuals who return to the United States do so for health reasons because Medicare does not cover health care services abroad, and thus mortality among return migrants may also be high

relative to U.S. residents. We limit the mortality estimates for migrants to all Hispanics and all NH-whites due to sample size considerations

The Salmon-bias effect is a function of both the magnitude of mortality differentials by place of residence and the proportion of the population who return to their countries of origin. Therefore we also provide estimates of the percentage of NH-white and Hispanic social security beneficiaries who were living abroad in 1996-2000 by 5-year age group and sex. Because these percentages do not take into account migratory moves during the period of observation, we also estimate sex- and age-specific emigration and return migration rates for the period 1996-2000. These estimates provide additional insights on the level of migration at older ages. Because migration is a repeatable event and a change in residential status in one year may affect the probability of a subsequent move, we fit a negative binomial regression model to our data(Cameron and Trivedi 1998; Long 1997). For each sex, we estimate a model that controls for age, in 5-year age groups, type of residential change, to the United States versus abroad, and interaction terms for age and type of residential move. We then predict age-specific migration rates based on the parameter estimates obtained from the model and test for significant differences between the two rates. Comparing emigration and immigration rates is important in the context of the Salmon-bias effect because such a comparison can reveal whether emigration at older ages is likely to play a role in mortality estimates for Hispanics.

In the final analysis, we provide estimates of age-specific mortality rates by sex for (1) all Hispanics and all NH-whites residing in the United States only and (2) for all Hispanic and NH-whites residing in the United States and abroad. We obtain these rates

by fitting a Poisson regression model by sex controlling for age, in 5-year age groups, race/ethnicity, and an interaction between each age group and race/ethnicity. We use the exponentiated parameter estimates of the age-race/ethnicity interaction terms to examine the ratio of Hispanic to NH-white death rates by age. If selective emigration plays a role in the Hispanic mortality advantage, we would expect to find the ratios of Hispanic to NH-white mortality to be significantly closer to one when estimated on U.S. and foreign residents combined than when the analyses are based on U.S. residents only.

RESULTS

Table 1 presents the number of residential moves, deaths, and person-years of exposure for each population subgroup in 1996-2000. Starting with the two right most columns of the table, we see that a much larger proportion of foreign-born Hispanics were living abroad compared to native-born Hispanics in the late 1990s. A similar pattern is documented for NH-whites. We also find that residential moves – both emigrations and immigrations – are more frequent among foreign-born Hispanics and NH-whites and among persons born in Puerto Rico than among the native-born Hispanics and NH-whites. A finding that surprised us, however, was that the volume of moves in (3,400) and out (3,500) of the United States was nearly identical among foreign-born Hispanics. In contrast, among foreign-born NH-whites and Puerto Ricans the net flow was more consistently out of the United States.

The results presented in Table 2 address the Salmon-bias hypothesis by examining whether mortality is higher among foreign-born Hispanics living abroad than those living in the United States. The relative mortality ratios and their 95% confidence intervals were calculated by exponentiating the coefficient for foreign versus U.S.

residence obtained from the Poisson regression. Consistent with the Salmon-bias hypothesis, foreign-born Hispanics living abroad have significantly higher mortality than foreign-born Hispanics living in the U.S. The same result holds for persons born in Puerto Rico. This excess mortality ranges from 13-19% depending on sex and population subgroup. In contrast, mortality among native-born Hispanics and those with unknown place of birth does not vary by place of residence. As seen in Table 2, we also find higher mortality among foreign-born NH-whites living abroad than in the United States. The rates among foreign residents are 8% higher for women and 10% higher for men than among U.S. residents.

If individuals return to their countries of origin because of declining health status, then we would also expect to find that mortality shortly after emigration is particularly high. To examine this possibility, we present the relative mortality ratios for recent emigrants and return migrants to that of U.S. residents in Table 2. Recent emigrants and return migrants are those who migrated during the study period – 1996-2000. The results confirm the higher expected mortality among recent emigrants compared to U.S. residents. This pattern is true for both Hispanics and NH-whites, although the relative ratios are higher for Hispanic men (1.48) and Hispanic women (1.84) than for NH-white men (1.39) and NH-white women (1.24). Surprisingly, however, we find similar and significant relative ratios among Hispanic men (1.53) and NH-white men (1.38) and women (1.39) returning to the United States. Therefore, at least among recent migrants ages 65 and older, selection of Hispanics of poorer health status appears to work in both directions. The same pattern is true for non-Hispanic whites.

As noted previously, for the Salmon-bias effect documented above to explain the lower mortality of foreign-born Hispanics living in the United States, then a substantial number of foreign born individuals must have moved from the United States to a foreign country. In Table 3, we show the percentages of the total population by subgroups who are residing abroad. These numbers are consistent with those reported in Table 1. Among NH-whites only a very small fraction of the population (less then 1%) was living abroad in 1996-2000. Among U.S.-born Hispanics, the percentage living abroad is also less than 1% among women and less than 2% among men at most ages above age 65. The percentage living abroad among foreign-born Hispanics is somewhat higher, but these percentages are mostly below 10%. Also the age variation in these percentages is small. Results in Table 3 also demonstrate that migration rates are low at older ages (never higher than 7 per thousand), although there is statistically significant excess of emigration over return migration.

Despite the higher mortality rates for foreign-born Hispanics living abroad than for foreign-born Hispanics living in the United States, the higher mortality among the foreign residents does not explain the lower mortality of Hispanics residing in the United States compared to non-Hispanic whites. In Table 4, we present mortality estimates for Hispanics and NH-whites residing in the United States and for U.S. and foreign residents combined. As the rate ratios in Table 4 illustrate, there is virtually no variation in the Hispanic mortality advantage when the two sets of estimates are compared.

DISCUSSION

To our knowledge this is the first study that examines direct evidence of the effect of selective emigration on Hispanic and NH-white mortality in the United States. We base

these analyses on data for primary social security beneficiaries residing in the United States and abroad in 1996-2000. We estimate death rates at ages 65 and above for U.S. and foreign residents and for recent emigrants and return migrants to investigate (1) whether mortality varies by residential status and (2) whether the observed differences in mortality can account for the lower mortality among Hispanics than NH-whites in the United States. Our study is a significant improvement over earlier investigations that have relied primarily on indirect evidence to assess the role of selective emigration.

We find moderate excess mortality among foreign-born Hispanics and Puerto-Rican born individuals living overseas and among recent Hispanic emigrants compared to foreign-born Hispanics and Puerto Ricans living in the United States. This finding is consistent with the hypothesis that foreign-born Hispanics who return to their countries of origin prior to death are of poorer health status than the average foreign-born Hispanic who remains in the U.S. (Pablos-Mendez 1994; Palloni and Arias 2004). We also find a similar pattern for foreign-born NH-whites. These results suggest that the Salmon-bias hypothesis may have more general applicability than previously recognized. We must, however, be somewhat cautious in our interpretation. We have no direct evidence for the fact that excess mortality among the foreign-born is due to health-selective migration rather than some other factors, such as differences in the quality of health care available for the elderly in the United States compared to other countries. It has been suggested, for example, that the lower mortality among the oldest old in the United States than in Europe or Japan is at least in part due to differences in the availability of medical care for the elderly that is thought to be more generous in the U.S. than in other low mortality

countries (Manton and Vaupel 1995). The availability and quality of health care for the elderly is also likely to be more constrained in Latin America than in the United States.

Whether or not the higher mortality among Hispanic emigrants is due to health-related migration or some other factors, their higher mortality does not account for the lower Hispanic than NH-white mortality in the United States. In this context, several of our findings are relevant. First relates to our results concerning mortality among return migrants to the United States, an issue that has received no prior attention in the literature. We find that both emigrants and return migrants have higher mortality than U.S. residents and thus migration effects on Hispanic mortality work in both directions. The higher mortality of return migrants elevates mortality among US residents while the higher mortality among emigrants lowers death rates in the U.S. These two effects are quite similar in magnitude and tend to cancel each other out among Hispanics, especially males, and also among NH-whites. We speculate that the return of the sick to the U.S. seeking medical care explains at least a part of the higher mortality among return migrants if only because Medicare does not cover medical services abroad.

Second, only a small fraction of foreign-born Hispanics ages 65 and older were living abroad in 1996-2000 and thus mortality rates for all Hispanics in the U.S. remained virtually unchanged when data for foreign-residents and US-residents were combined. This result is related to the finding that there were no significant differences in mortality by place of residence for the vast majority of Hispanics, those born in the United States and those with unknown place of birth.

Our study has two important limitations. First, our data exclude individuals who emigrated prior to qualifying for social security benefits. In other words, if the lower

mortality among elderly Hispanics is due to selective emigration at young ages our data cannot capture this effect. However, based on simulations done in earlier research (e.g. Palloni and Morenoff 2001) we believe that it is unlikely that health-related emigration at young ages, to the extent that it is present, explains the persistency of the Hispanic mortality advantage among the very old in the United States.

The second limitation is the exclusion of elderly Hispanics who were not enrolled in the social security program at the end of 1995. According to a recent study, about one-quarter of Hispanics ages 65 and older did not receive social security benefits in 1996(SSA 1998). Because we further limit our analyses to primary social security beneficiaries, we estimate that our data cover about 60% of the Hispanic population ages 65 and older. We do not believe that our conclusions are substantively affected by this limitation, however. In sensitivity analyses (not shown), we estimated that even in an extreme and unlikely scenario where all Hispanics excluded from our analysis were foreign-born and half were living abroad and subject to death rates that were 20% higher than among the U.S. residents, the average ratio of Hispanic to NH-white mortality would increase by only 3.5% (from 0.88 to 0.91). Thus, we believe that our study provides strong evidence that despite the higher mortality among emigrants the Salmon-bias hypothesis cannot account for the lower mortality of elderly Hispanics compared to elderly NH-whites in the United States.

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Table 1: Number of Events and Person-Years Lived by Sex and Population Subgroup, Master Beneficiary Record-NUMIDENT Data, 1995-2000 [a]

Population Subgroup	Number of Changes in Residential Status (1,000)		Number of Deaths (1,000)		Number of Person-Years (1,000)	
	From Abroad to the U.S. [b]	From the U.S. [b] to Abroad	US[b] Residence	Foreign Residence	US[b] Residence	Foreign Residence
Men						
Hispanics						
US-born	0.7	0.4	44.8	1.0	915.9	18.7
Foreign-born	3.4	3.5	39.7	5.0	964.6	99.6
Born in Puerto Rico	0.9	3.5	9.6	0.7	203.4	11.7
Unknown Place of Birth	0.3	0.6	27.5	2.3	203.4	16.5
NH Whites						
US-born	2.4	2.0	2,071.4	3.2	38,600.0	68.9
Foreign-born	2.2	4.1	97.5	11.7	1,940.0	239.1
Unknown Place of Birth	0.4	0.6	840.8	5.7	5,056.0	37.9
Women						
Hispanics						
US-born	0.3	0.1	22.2	0.2	741.1	5.9
Foreign-born	1.3	1.9	18.6	1.2	743.0	27.5
Born in Puerto Rico	0.6	2.3	5.2	0.2	171.4	6.6
Unknown Place of Birth	0.1	0.4	20.5	0.9	181.3	7.6
NH Whites						
US-born	1.1	0.9	1,287.0	1.1	35,000.0	34.9
Foreign-born	1.7	3.2	68.0	4.8	1,961.0	145.6
Unknown Place of Birth	0.3	0.7	925.5	6.4	6,839.7	45.9

[a] The data refer to individuals who on December 31, 1995 were primary beneficiaries of Social Security aged 65 and older.
[b] 50 states and DC

Table 2: Relative Mortality Ratios [a] - Foreign Residents Relative to US-Residents - by Population Subgroup and Sex, Master Beneficiary Record--NUMIDENT Data, 1996-2000

	Men		Women	
	Ratio	95% CI	Ratio	95% CI
Hispanics				
US-born	1.05	0.98 , 1.12	0.91	0.78 , 1.06
Foreign-born	1.15	1.12 , 1.19	1.19	1.13 , 1.27
Born in Puerto Rico	1.13	1.04 , 1.21	1.13	1.10 , 1.42
Unknown Place of Birth	0.96	0.92 , 0.99	0.96	0.89 , 1.02
All Hispanics (1996-2000 emigrants) [b]	1.48	1.32 , 1.66	1.84	1.57 , 2.16
All Hispanics (1996-2000 return immigrants) [c]	1.53	1.34 , 1.76	1.19	0.89 , 1.60
NH whites				
US-born	0.91	0.88 , 0.94	0.86	0.81 , 0.92
Foreign-born	1.10	1.08 , 1.12	1.08	1.05 , 1.11
Unknown Place of Birth	0.92	0.90 , 0.94	0.99	0.96 , 1.01
All NH whites (1996-2000 emigrants) [b]	1.39	1.24 , 1.56	1.24	1.05 , 1.45
All NH whites (1996-2000 return immigrants) [c]	1.38	1.20 , 1.59	1.39	1.14 , 1.71

[a] For each population subgroup by sex, the poisson model includes age (5 year age groups) and place of residence (foreign residence vs. US-residence). Tests of model fitting indicate that the percentage reduction of the deviance of the null model exceeds 98% for all models. In addition, there is no significant evidence of overdispersion in any of the models (.05 level).

[b] Relative mortality ratios for recent foreign-residents - persons who emigrated during the 1996-2000 observation period - to mortality among US-residents.

[c] Relative mortality ratios for recent return migrants - persons who returned to the U.S. during the 1996-2000 observation period - to mortality among US-residents.

Table 3: Percent Foreign Residents and Change in Residential Status (rates per 1,000) by Race/Ethnicity and Place of Birth, Master Beneficiary Record-NUMIDENT Data, 1996-2000

	Percent Foreign Residents				Change in Residential Status (rate per 1,000) [a]		
		Hispanics			Hispanics		
Sex & Age Group	NH Whites	Born in Puerto Rico and Unknown Place of Birth	US-born	Foreign-Born	From Abroad to the U.S.	From the U.S. to Abroad	p-value for the difference[b]
Men							
65-70	0.80	5.20	1.83	7.67	2.45	4.07	<0.01
70-75	0.81	5.67	1.95	9.01	2.26	3.32	<0.01
75-80	0.70	5.95	2.28	10.66	2.56	3.44	0.01
80-85	0.64	7.18	2.09	11.34	2.85	4.16	<0.01
85-90	0.74	7.76	1.82	10.13	2.74	4.04	<0.01
90+	0.82	9.04	1.54	9.02	2.89	5.92	<0.01
Women							
65-70	0.49	3.42	0.59	3.84	1.68	3.73	<0.01
70-75	0.52	3.78	0.80	4.63	1.41	2.68	<0.01
75-80	0.48	3.71	0.90	5.36	1.50	2.85	<0.01
80-85	0.48	3.75	0.96	5.97	1.78	3.82	<0.01
85-90	0.60	4.28	0.86	5.52	1.37	3.47	<0.01
90+	0.72	4.35	0.84	4.26	1.82	6.91	<0.01

[a] For each sex, the negative binomial model includes age (5 year age groups), type of residential change (to the U.S. vs. to abroad), and an interaction term for age and type of residential change. The rates were predicted based on the estimates from the models.

[b] Tests of the difference in the estimates between the two groups (residential change to the U.S. vs. residential change to abroad).

Table 4: Sex-and-Age-Specific Mortality Rates (Deaths per 1,000) for Hispanics and NH Whites and Relative Mortality Ratios [a], by Place of Residence: Master Beneficiary Record-NUMIDENT Data, 1996-2000

	U.S. Residence				U.S. Residence & Foreign Residence Combined			
Sex & Age Groups	Hispanics	NH Whites	Ratio	95% CI	Hispanics	NH Whites	Ratio	95% CI
Men								
65-70	25.08	29.01	0.86	0.85, 0.88	25.16	28.97	0.87	0.85, 0.88
70-75	35.67	40.68	0.88	0.87, 0.89	35.80	40.64	0.88	0.87, 0.89
75-80	54.82	62.64	0.88	0.86, 0.89	54.98	62.61	0.88	0.87, 0.89
80-85	90.95	101.80	0.89	0.88, 0.91	91.07	101.79	0.89	0.88, 0.91
85-90	144.15	164.13	0.88	0.86, 0.89	144.22	164.08	0.88	0.87, 0.89
90+	242.52	279.36	0.87	0.85, 0.88	241.96	279.30	0.87	0.85, 0.88
Women								
65-70	13.18	16.08	0.82	0.80, 0.84	13.19	16.07	0.82	0.80, 0.84
70-75	19.34	23.66	0.82	0.80, 0.83	19.39	23.63	0.82	0.81, 0.84
75-80	32.32	38.57	0.84	0.82, 0.85	32.52	38.54	0.84	0.83, 0.86
80-85	57.12	66.40	0.86	0.85, 0.88	57.08	66.40	0.86	0.85, 0.87
85-90	101.86	115.50	0.88	0.87, 0.90	101.99	115.52	0.88	0.87, 0.90
90+	198.78	223.97	0.89	0.87, 0.90	198.39	223.99	0.89	0.87, 0.90

[a] For each subgroup, the poisson model includes age (5 year age groups), race/ethnicity (Hispanic vs. NH whites) and a significant interaction term ($p<0.05$) for age and race/ethnicity. Tests of model fitting indicate that the percentage reduction of the deviance of the null model exceeds 98% for all models. In addition, there is no significant evidence of overdispersion in any of the models (.05 level).