Published in final edited form as:

J Immigr Minor Health. 2015 August ; 17(4): 1130–1137. doi:10.1007/s10903-014-0043-6.

Widening Life Expectancy Advantage of Hispanics in the United States: 1990–2010

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Abstract

We examine trends in the Hispanic longevity advantage between 1990 and 2010, focusing on the contribution of cigarette smoking. We calculate life expectancy at age 50 for Hispanics and non-Hispanic whites between 1990 and 2010. We use an indirect method to calculate the contribution of smoking to changes over time in life expectancy. Among women, the Hispanic advantage in life expectancy grows from 2.14 years in 1990 (95 % CI 1.99–2.30 years) to 3.53 years in 2010 (3.42–3.64 years). More than 40 % of this increase reflects widening differences in smoking-attributable mortality. The advantage for Hispanic men increases from 2.27 years (2.14–2.41 years) to 2.91 years (2.81–3.01 years), although smoking makes only a small contribution. Despite persistent disadvantage, US Hispanics have increased their longevity advantage over non-Hispanic whites since 1990, much of which reflects the continuing importance of cigarette smoking to the Hispanic advantage.

Keywords

Life expectancy; Hispanic; Smoking; Mortality; United States

Introduction

Several decades of health research finds lower adult mortality and longer life expectancy among people of Hispanic origin in the United States than among non-Hispanic whites [1–7]. This finding has been called the “Hispanic Paradox,” as the longevity advantage exists despite Hispanics’ relative socioeconomic disadvantages, including lower average income and educational attainment [8]. As the size of the Hispanic population grows in the US, it becomes increasingly important to understand the mortality experience of Hispanics relative to more socioeconomically advantaged groups. In particular, although studies of the

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IRB statement: the study received no IRB review since the research does not constitute human subjects research.

Hispanic Paradox have existed since at least the 1980s, [9] surprisingly little is known about how the Hispanic longevity advantage has evolved over time.

This research gap reflects, in part, a historical lack of comparable mortality data. Information on Hispanic ethnicity was not widely collected by state death certificates until the mid-1980s, [10] and the US census contained no question about Hispanic origin until 1970 [11]. Only in the past few years have there been significant attempts to standardize Hispanic mortality data for racial/ethnic comparisons [7, 12]. As more reliable mortality data become available, it is possible to produce comparable estimates of Hispanic and non-Hispanic white mortality over time. Tracking ethnic disparities in mortality over time can, in turn, improve our understanding of the mechanisms that produce them.

Several recent studies indicate that a large portion of the Hispanic longevity advantage may reflect low smoking prevalence among US Hispanics in the past, particularly among Mexican Americans and foreign-born Hispanics, [13, 14] compared to the non-Hispanic white majority [15, 16]. The contribution of smoking to the Hispanic advantage has been shown using both indirect estimation methods as well as survey-based prevalence methods, with similar results [16, 17].

This study examines trends in the Hispanic longevity advantage between 1990 and 2010, with particular attention to the contribution of cigarette smoking. We use US national censuses and vital statistics data to calculate life expectancy at age 50 for Hispanics and non-Hispanic whites. We then trace the contribution of cigarette smoking to ethnic differences in life expectancy during this period. Because US women, overall, have had slower declines in smoking prevalence than have US men (although starting from a lower level) [18, 19], we hypothesize that smoking-attributable mortality may increase or remain constant over the period 1990–2010 among non-Hispanic white women. As a result, we hypothesize that smoking may be increasingly important over time to the Hispanic longevity advantage among women.

Methods

We examine changes in the life-expectancy advantage of US Hispanics over US non-Hispanic whites during the two-decade period from 1990 to 2010. We first tabulate age-specific death rates for Hispanics and non-Hispanic whites aged 50 and above, separately by sex, in 1990, 2000, and 2010. We then use standard life-table methods to calculate life expectancy at age 50 for each population (by sex and ethnicity) in each of the 3 years: 1990, 2000, and 2010. We limit analyses to decennial census years to avoid inaccuracies in population estimation in intercensal years. We focus on ages 50 and above since most individuals survive to age 50 and because previous research indicates that much of the observed Hispanic advantage is concentrated at older adult ages [1].

Calculation of Age-Specific Death Rates

All-cause death rates are calculated by five-year age group (e.g., 50–54, 55–59, ..., 85+). We use mortality data (for rate numerators) from US vital statistics and data on population size (for rate denominators) from decennial censuses. The National Center for Health

Statistics collects and maintains a database of all deaths in the US through the National Death Index. Mortality microdata are released as part of the Multiple Cause of Death (MCD) files, containing demographic information on all deaths. Census population counts come from 1 % Public Use Microdata Samples (PUMS), which are weighted to represent the US resident population in each census year. We use standard census and death certificate definitions of Hispanic origin. In the census, Hispanics are those that identify as being of Hispanic origin and may be of any race. Non-Hispanic whites are individuals whose race is classified as white and do not identify as being of Hispanic origin. Where ethnicity is “unclassifiable,” as it is on about 5 % of the death records from the year 1990, we assume that unclassifiable deaths have the same ethnic distribution as the classifiable deaths. We explore the impact of this assumption on our estimates of the Hispanic longevity advantage in the Appendix.

Estimating Smoking-Attributable Death Rates

We examine the contribution of smoking using an indirect estimation method [20], which treats the lung cancer death rate as an indicator of accumulated damage from smoking within a population. This approach is supported by both individual-level data demonstrating a strong link between cigarette smoking and the development of lung cancer [21] as well as comparative research indicating that smoking is the overwhelming source of population variation in lung cancer mortality [22]. The method we use, originated by Preston and colleagues [20], extrapolates smoking-related deaths from the statistical relationship between lung cancer mortality and mortality from other causes across 20 high-income countries.

We calculate age-specific lung cancer death rates by five-year age group, above age 50 (with ages 85+ combined), and separately by sex, for Hispanics and for non-Hispanic whites, using the same vital statistics and census data described above. Lung cancer deaths are identified using cause-of-death codes from the International Classification of Disease (ICD). 1990 data refer to the 9th revision (ICD9: code 162) and 2000 and 2010 to the 10th revision (ICD10: code C33-C34). Finally, we then calculate life expectancy in the absence of smoking by removing deaths attributable to smoking, and assuming independent causes of death. The difference between this smoking-deleted life expectancy and the observed life expectancy reflects the number of years lost to smoking at age 50. We calculate the contribution of smoking to the Hispanic advantage by comparing the size of the advantage in the smoking-present and smoking-absent scenarios. The larger the decrease in the advantage after the removal of smoking-related mortality, the greater the contribution of smoking.

Results

Trends in life expectancy at age 50 for Hispanics and non-Hispanic whites are shown in Fig. 1. Although Hispanics and non-Hispanic whites both experience substantial life expectancy gains over the period from 1990 to 2010, Hispanics exhibit larger gains. Among women, there is a steady increase in the Hispanic/non-Hispanic-white life expectancy gap, from 2.14 years (95 % CI 1.99–2.30 years) in 1990 to 3.53 years (3.42–3.64) in 2010. Hispanic men

increase their advantage over non-Hispanic white men by 0.64 years, from 2.27 years (2.14–2.41) in 1990 to 2.91 (2.81–3.01) years in 2010. As noted above, estimates for 1990 may be sensitive to the assumptions made about “unclassifiable” ethnicity reported on death certificates. The Appendix explores the possible impact on results, and shows that even if all unclassifiable deaths occurred among non-Hispanics, the estimated Hispanic advantage in 1990 would still be lower than that observed in 2000. Thus, although inaccurate ascertainment of Hispanic ethnicity may lead to bias in the estimated size of the Hispanic advantage in 1990, it is very unlikely to affect our conclusion that the life expectancy advantage of Hispanics, and of Hispanic women in particular, has increased over the past 20 years.

Some of the widening gap between Hispanics and non-Hispanic whites appears to reflect differences in smoking behavior. Figure 2 presents the contribution of smoking to the Hispanic life expectancy advantage in each decennial year. The life expectancy gap is divided into the portion explained by differences in smoking and the portion explained by other factors. Smoking is the primary factor explaining the Hispanic life expectancy advantage, according to our analysis, and is responsible for the majority of the gap in each year considered, except for among men in 2010. The contribution of smoking to the advantage of Hispanic women grows, as we hypothesized, increasing from 1.26 (95 % CI 1.20–1.31) years in 1990 to 1.83 (1.79–1.87) years in 2010. Among men, the contribution of smoking remains relatively constant, increasing from 1.30 (1.21–1.40) years in 1990 to 1.36 (1.30–1.43) in 2000, and then falling slightly to 1.33 (1.28–1.37) in 2010. The proportionate contribution of smoking to the Hispanic advantage declines slightly from 60 to 52 % among women and from 58 to 46 % among men.

Table 1 describes in greater detail the contribution of smoking to the change in the Hispanic longevity advantage between 1990 and 2000 and between 2000 and 2010. The first column denotes the change in the Hispanic advantage, essentially the number of additional years gained by Hispanics compared to non-Hispanic whites, in each 10-year period. The second column denotes the portion of the change that is attributable to smoking-related causes of death, estimated using the Preston et al. [20] method. The third column shows the contribution of factors other than smoking. Smoking is an important contributor to the increase in the Hispanic advantage among women. Between 1990 and 2000 it explains 62 % of the 0.9-year increase. Between 2000 and 2010, other factors dominate. Overall, from 1990 to 2010, 45 % of the 1.38-year increase in the Hispanic longevity advantage among women is due to cigarette smoking. For men, smoking contributes just 16 % to the overall increase in the life expectancy advantage. For both men and women, factors other than smoking contribute 0.53–0.76 years to the widening gap between 1990 and 2010.

Discussion

The Hispanic longevity advantage in the United States represents an unusual phenomenon in which the expected relationships between socioeconomic position and health do not operate as expected. Our study adds an additional layer to this “Hispanic Paradox.” We identify an increase in the magnitude of the Hispanic life expectancy advantage vis-à-vis non-Hispanic whites between 1990 and 2010. During the past 20 years, Hispanic women's life expectancy

at age 50 has increased steadily, adding 1.38 years more than did whites. Hispanic men have gained 0.64 years more than white men. In other words, despite persistent socioeconomic disadvantage among Hispanics in the United States [23], their mortality experience remains markedly more favorable than that of whites.

We also demonstrate that smoking is a substantial contributor to the Hispanic life expectancy advantage in each year, consistent with existing research demonstrating that smoking may be the single largest factor driving the paradox [15, 16]. We find that smoking is responsible for around 50 % of the Hispanic advantage in each year. The absolute contribution of smoking to the advantage remains relatively constant for men (1.30–1.36 years), but increases for women (from 1.20 to 1.83 years).

Our result that smoking contributes for women, but not for men, to a widening Hispanic advantage is consistent with recent trends in smoking behavior. Historical data on US cigarette consumption suggest that American women were among the heaviest smokers in the developed world in the 1960s and 1970s [18]. As a result, the health burden of smoking among American women, especially white women, has continued to rise into the twenty-first century [24]. Our study confirms that smoking-attributable mortality rose considerably among non-Hispanic white women between 1990 and 2000, as members of the heavy-smoking cohorts of the mid-twentieth century reached old age. Meanwhile, smoking-attributable mortality remained relatively constant among Hispanic women during this period, so that between 1990 and 2010 about 45 % of the widening of the Hispanic advantage among women can be attributed to smoking. This same pattern is not seen among men, however. Although US men, overall, smoked more than women until at least the last quarter of the twentieth century [18], American men have experienced sustained declines in smoking since the 1960s, and smoking-attributable mortality has fallen since the 1980s [24]. We find, as a result, that the fraction of deaths attributable to smoking among non-Hispanic white men declined rapidly between 1990 and 2010, reflecting lower lifetime cigarette consumption among the cohorts reaching old age [19, 25].

Although smoking remains the single most important contributor to the Hispanic advantage, the role of other factors has grown between 1990 and 2010 among both men and women. Further research into the Hispanic advantage should attempt to identify these additional contributors. One possibility for the increase in the Hispanic advantage over time is the changing composition of the Hispanic population. It is well known that health and mortality experience varies considerably among Hispanic subgroups [2, 16]. Thus, it may be that the relative improvement in the Hispanic mortality experience reflects the changing representation of specific groups within the broad category, “Hispanic,” rather than exceptional improvement within subgroups. We show the composition of the Hispanic population in each census year, as reported on census forms, in Table 2. There is a marked increase in the fraction of adult Hispanics who are foreign-born from 48 % in 1990 to more than 57 % in 2010. There were also increases in select origin subgroups, specifically those from Mexico, Central America, and South America. Previous studies find that these subgroups may indeed be the primary drivers of the Hispanic longevity advantage [1, 3, 16]. In combination, these populations grew from 29 % of Hispanics in 1990 to more than 45 % in 2010.

Another possible explanation for the widening Hispanic longevity advantage is a growing importance of lifestyle factors other than cigarette smoking, such as diet, exercise, and drinking behavior [26]. However, it is important to note that Hispanics exhibit a higher prevalence of obesity than non-Hispanic whites, particularly among women. This difference appears to be relatively stable [27]. In fact, diabetes remains among the only major causes of death on which Hispanics exhibit a mortality disadvantage relative to non-Hispanic whites [28, 29].

Alternatively, it may be that Hispanics experienced improved economic circumstances during the period from 1990 to 2010. Although Hispanics remain socioeconomically disadvantaged vis-à-vis whites, it is possible that employment and income prospects among Hispanics progressed during this period, with implications for their comparative health and mortality experience. Evidence of relative economic improvements of Hispanics over this period is somewhat weak [30], and many educational gains among US-born Hispanics may be offset by the rising proportion of foreign-born among Hispanics with lower average educational attainment. Future research should examine the contribution of improving economic outlook for both US-born and foreign-born Hispanics.

Our analysis has two major limitations. First, we estimate the impact of smoking using an indirect method that treats lung cancer as a reliable marker of a population's smoking behavior. Although studies using indirect methods have typically found a greater contribution of smoking to all-cause mortality than those using survey-based methods [17], this difference may reflect imprecise measurement of lifetime cigarette consumption in most surveys [31]. Lung cancer rates are generally considered to represent a more accurate and more comprehensive measure of the population impact of smoking than are survey self-reports of smoking status [20].

Second, we are unable to fully account for inconsistencies in the ascertainment of Hispanic ethnicity on death certificates compared with in the census, which may create discrepancies between the “Hispanic” populations included in death rate denominators vs. those included in rate numerators. Although the magnitude of this bias has been shown to be small in recent years [7], inconsistencies may be larger in 1990 during the initial years of census and vital-statistics data collection on Hispanic ethnicity [5, 12]. This limitation also prevents us from considering the mortality experience of individual Hispanic subgroups (e.g., those of Mexican origin, or Cuban origin), since finer categories lead to greater probability, and greater impact, of mismatch. Our sensitivity analyses (see “Appendix”) seek to present a reasonable range for the size of the Hispanic advantage in 1990. These analyses suggest that our 1990 estimates are indeed quite sensitive to assumptions about ethnicity reporting on death certificates. However, they further show that, despite this, it is almost certain that the Hispanic advantage has grown between 1990 and 2010, just as we conclude from our primary analysis.

Our study provides the first analysis of trends in the Hispanic longevity advantage. We identify a striking increase in the life expectancy advantage of Hispanics between 1990 and 2010. A large portion of the increase among women reflects a growing difference in the burden of smoking between Hispanics and non-Hispanic whites. Future research should

examine the contribution of other factors to this trend and examine the experience of specific Hispanic subgroups. Overall, however, given the remarkable persistence of the Hispanic advantage during this period of rapid growth in the Hispanic population in the United States, and given persistently lower prevalence of smoking among Hispanics, we expect the advantage to persist well into the future.

Appendix

Our primary methodological concern is the accurate assessment of Hispanic origin in vital statistics and the US census. That is, research on the Hispanic paradox indicates that one of the early challenges of producing estimates of life expectancy among US Hispanics was obtaining consistent measurements of Hispanic ethnicity between the data sources used for death rate numerators and death rate denominators [5]. Any mismatch in Hispanic ethnicity coding may lead to biased estimates of Hispanic mortality, and thus of the magnitude of the Hispanic longevity advantage [12].

This bias has been shown to be small in recent years [7]. However, it may not have been small in 1990, the first year of analysis in this study. US vital statistics data from 1990 contain a large number of death certificates on which Hispanic origin is recorded as “unclassifiable.” Roughly 90,000 individuals aged 50 and above have no available information on Hispanic origin that year, representing nearly 5 % of deaths in this age group. Therefore, to examine the sensitivity of our results to assumptions about unclassifiable individuals, we present a series of counter-factual scenarios in which various proportions of the unclassifiable group are assumed to be Hispanic, non-Hispanic white, or non-Hispanic other.

Figure 3 presents the results of our sensitivity analysis. It shows the magnitude of the Hispanic longevity advantage in four scenarios:

1. the baseline scenario—that used for the primary analysis in the paper—assumes that unclassifiable deaths have the same racial/ethnic distribution as classifiable deaths;
2. the High scenario assumes 90 % of unclassified deaths are non-Hispanic white, 9 % are other, and 1 % are Hispanic;
3. the Medium scenario assumes that 75 % are non-Hispanic white, 20 % are other, and 5 % are Hispanic; and
4. the Low scenario assumes that 75 % are non-Hispanic white, 15 % are other, and 10 % are Hispanic.

The proportions attributed to each group are ultimately arbitrary. However, we consider it unlikely for more than 10 % of the 1990 unclassifiable deaths to be among Hispanics, or for more than 90 % to be among non-Hispanic whites. In almost all age groups 50 and above, 2–5 % of classifiable decedents are Hispanic, and 75–90 % are non-Hispanic white. Furthermore, the total number of the unclassifiable deaths is large enough—much larger than the total number of deaths classified as Hispanic—that attributing a proportion substantially greater than 10 % to Hispanics would result in implausibly low life expectancy

among this group [7]. Attributing more than 90 % to non-Hispanic whites is inconsistent with reported race among those with unclassifiable Hispanic ethnicity; that is, nearly 20 % of those with unclassifiable Hispanic ethnicity are reported as non-white.

Figure 3 shows that our assumption regarding the racial/ ethnic distribution of “unclassifiable” deaths has a considerable influence on our estimate of the magnitude of the Hispanic longevity advantage. This is consistent with previous research [8]. However, despite uncertainty over the precise magnitude of the Hispanic advantage in 1990, it is almost certain that the advantage has grown over the period 1990–2010. In each sensitivity analysis scenario, the estimated Hispanic advantage for women is markedly lower than that observed in the year 2000 (3.03 years); for men, the estimated advantage is lower than in 2000 (2.47 years) in each scenario except the High, where it is 2.62 years. This High scenario, it is worth noting, assumes that almost no deaths with unclassifiable ethnicity occurred among Hispanics (just 1 %). Moreover, the greater the proportion of unclassifiable deaths assumed to occur among Hispanics, the more striking the improvement in Hispanic advantage appears. Thus, although there is a great deal of uncertainty in our estimation of the 1990 Hispanic advantage, the sensitivity analysis supports our conclusion that the increase in the advantage over time represents a real trend.

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Fig. 1.

Trends in expected years of life at age 50 for Hispanics and non-Hispanic whites 1990–2010 **a** women, **b** men. Estimates refer to remaining years of life expected at age 50. Estimates use standard life table methods. Hispanic life expectancy advantage shown in years. 95 % CIs for life expectancy estimates reflected in *lighter lines*. CIs for the Hispanic advantage in each year are shown in *parentheses*

Fig. 2.

Contribution of smoking and other factors to the Hispanic advantage in life expectancy at age 50, 1990–2010 **a** women, **b** men. Contribution of smoking refers to the expected decline in the Hispanic life expectancy advantage if smoking-related mortality were removed. The contribution of “other factors” reflects the expected magnitude of the advantage in the absence of smoking. Although the role of other factors grows over the period 1990–2010, smoking continues to explain at least half of the Hispanic advantage in each year. *Black vertical lines with cap* represent 95 % CIs on the magnitude of the Hispanic advantage. *White vertical lines with cap* represent 95 % CIs for the contribution of smoking

Fig. 3.

Sensitivity and robustness: Hispanic life expectancy advantage at age 50 in 1990, calculated under four different assumptions regarding the Hispanic ethnicity of “unclassifiable” deaths in the 1990 multiple cause of death files. “Hispanic advantage” is defined as the difference, in years, between life expectancy at age 50 among Hispanics and life expectancy at age 50 among non-Hispanic whites. Baseline scenario assumes unclassified deaths have the same racial/ ethnic distribution as classified deaths; High scenario assumes 90 % of unclassified deaths are non-Hispanic white, 9 % are other, and 1 % are Hispanic; medium scenario assumes that 75 % are non-Hispanic white, 20 % are other, and 5 % are Hispanic; low scenario assumes That 75 % are non-Hispanic white, 15 % are other, and 10 % are Hispanic

Table 1
Contribution of smoking to increased advantage of hispanics in life expectancy at age 50

	Change in Hispanic advantage (years)	Due to smoking (years)	Due to other factors (years)
Women			
1990–2000	0.89 (0.70–1.09)	0.55 (0.48–0.62) (62 %)	0.34 (38 %)
2000–2010	0.50 (0.33–0.66)	0.08 (0.02–0.15) (16 %)	0.42 (84 %)
1990–2010	1.44 (1.20–1.57)	0.63 (0.56–0.70) (45 %)	0.76 (55 %)
Men			
1990–2000	0.20 (0.02–0.37)	0.14 (0.06–0.21) (71 %)	0.06 (29 %)
2000–2010	0.44 (0.28–0.59)	-0.04 (-0.10 to 0.03) (-9 %)	0.47 (109 %)
1990–2010	0.64 (0.46–0.81)	0.10 (0.04–0.16) (16 %)	0.53 (84 %)

“Change in Hispanic advantage” refers to the increase in the life expectancy advantage (at age 50) of Hispanics over non-Hispanic whites. 95 % CIs in parentheses. Contribution of smoking refers to the portion of change in the Hispanic life expectancy advantage estimated to be caused by ethnic differences in smoking-related mortality. The contribution of “other factors” is expected change in the advantage in the absence of smoking

Table 2
Composition of Hispanics aged 50 and above by nativity and country of origin 1990–2010

Subgroup	Percentage of all Hispanics by year					
	1990			2000		
	US-born (%)	Foreign-born (%)	Foreign-born (%)	US-born (%)	Foreign-born (%)	Foreign-born (%)
Mexican	31	20	24	25	26	30
Puerto Rican	1	10	2	10	3	8
Cuban	<1	12	<1	9	<1	7
Central American	<1	4	<1	4	<1	7
South American	<1	5	<1	5	<1	8
Spanish	2	1	<1	<1	2	<1
Dominican	<1	2	<1	2	<1	3
Other/unspecified	6	2	10	6	3	1
Total	42	58	37	63	35	65

Foreign-born Puerto Ricans refer to those born in Puerto Rico. For all other origins, individuals born in US territories are considered US-born. *Source:* 1990 and 2000 data come from US Census 5 % Public Use Microdata Sample (PUMS). 2010 data come from the 5 % sample of the American Community Survey