Cigarette Smoking and the Hispanic Paradox in the United States

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Introduction

Nearly three decades of research into the so-called "Hispanic Paradox" has failed to generate a convincing explanation for this pervasive epidemiological phenomenon (Markides & Eschbach, 2005). Despite having lower levels of material wealth and education than non-Hispanic (NH) whites in the United States, Hispanics exhibit lower death rates at most adult ages. While a mortality advantage has been observed among many different Hispanic subgroups (Hummer, Rogers, Amir, Forbes, & Frisbie, 2000; Hummer, Rogers, Nam, & LeClere, 1999), the specific reasons for the advantage remain unclear in the literature. In this paper, I offer a simple explanation: differences in cigarette smoking. I use a large prospective study to examine the contribution of smoking-related mortality to the advantage enjoyed by Hispanics in the United States. I find that low mortality from smoking is the main reason for the adult survival advantage among Mexican-Americans and other Hispanics.

Hypotheses explaining the Hispanic paradox typically fall into two broad categories: *selective migration* and *cultural buffering*. Since the majority of U.S. Hispanics are foreign born, any examination of the Hispanic mortality experience here requires consideration of the characteristics of migrants in comparison to those who do not migrate. Selective migration is a two-dimensional process: (1) those who move from their origin country into the United States are likely to be in generally better health than those who remain in the origin country (healthy migrant effect) (Singh & Siahpush, 2001), and (2) those who return from the United States to their country of origin are likely to be in worse health than those migrants who remain in the United States ("Salmon Bias") (Palloni & Morenoff, 2001). The first process concerns the greater human capital and health resources that may be necessary to undertake an international move, such that we observe a highly select group of individuals from sending countries, which may offset the negative effects of the poor socioeconomic profile (Abraido-Lanza, Dohrenwend, Ng-Mak, & Turner, 1999). The second process refers to the propensity

for foreign-born individuals in the United States to return to their countries of origin when they become ill, both leaving a relatively healthy stock of foreign-born individuals in the United States and leaving many deaths among the foreign born unobserved in American vital registration (Palloni & Arias, 2004). Respectively or in combination, these two processes could produce lower observed death rates among Hispanics than would be observed otherwise (Markides & Eschbach, 2005).

On the other hand, cultural characteristics of U.S. Hispanics may have protective health effects relative to NH whites, and may be responsible for the Hispanic advantage. Research indicates that Hispanics in the United States, particularly immigrant communities, may receive stronger social supports and have more strongly integrated social friend and kin networks. Although Palloni and Arias (2004) find no evidence for a social support effect, a number of studies find that Mexican immigrants benefit from increased concentration of other immigrants in their neighborhood (the so-called "barrio advantage") (Eschbach, Ostir, Patel, Markides, & Goodwin, 2004; LeClere, Rogers, & Peters, 1997). Thus despite increased racial segregation, high-density neighborhoods appear to buffer Mexican-Americans from the negative health consequences of the poverty context, likely as a result of social network ties (Markides & Eschbach, 2005). Hispanic culture may also promote better health behaviors and practices than we observe among non-Hispanic whites. A recent study indicates that first generation Hispanic immigrants in California eat more fruits and vegetables, and drink less soda than native-born whites (Allen et al., 2007). Recent Hispanic immigrants are also less likely than whites to be overweight and obese by virtue of their superior diet and physical activity characteristics (Gordon-Larsen, Harris, Ward, & Popkin, 2003).

The motivation for this paper comes from two related, yet not sufficiently integrated findings in social science research. First, Hispanics in the United States have lower mortality

and longer life expectancy than NH whites. And second, Hispanics exhibit lower prevalence and intensity of smoking than NH whites. While others have suggested the role the cigarette smoking might play in the Hispanic Paradox (Abraido-Lanza, Chao, & Florez, 2005; Hummer et al., 1999; Perez-Stable et al., 2001; Singh & Siahpush, 2002), this will be the first direct examination of the impact of cigarette smoking on mortality differences between non-Hispanic whites and Hispanics in the United States. This paper uses a large, nationally-representative survey to calculate smoking attributable-risk for three population subgroups in the United States[1]: non-Hispanic whites, Mexican-Americans[2], and all other Hispanics[3].

Evidence for the Hispanic Mortality Advantage

Early findings regarding the health and mortality experience of Hispanics demonstrated that Mexican-Americans in the Southwest exhibited adult death rates similar to non-Hispanic whites, despite substantial socioeconomic disadvantage (Becker, Wiggins, Key, & Samet, 1988; Markides & Coreil, 1986). These studies evaluated the Hispanic population using Spanish surname or other indirect methods of classification, and suffered from a lack of generalizability (Sullivan, Gillespie, Hout, & Rogers, 1984). The first analysis to use a large, population-based sample was by Sorlie et al. (1993) who investigated the survivorship of Hispanic subgroups using the National Longitudinal Mortality Study (NLMS) 1979-1987. They found significantly lower mortality among Mexican-Americans, Puerto Ricans, Cubans, and other Hispanics compared with non-Hispanics, especially at older ages. The advantage was largest for cardiovascular disease and cancers. Since then, evidence of the Hispanic mortality and health advantage has come from a variety of data sources, each valuable for examining different aspects of the phenomenon.

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[1] The current draft considers only Hispanic ethnicity. Future analysis will include nativity status in the analysis since it promises to be important.

[2] The terms Mexican, Mexican-American, or Chicano will hereafter be used interchangeably for those of Mexican origin residing in the United States.

[3] Other Hispanics include all those professing Hispanic origin but not identifying as being of "Mexican" origin. Other Hispanics include individuals of Cuban, Puerto Rican, Caribbean, Central American, South American, and Spanish origin.

The major sources of data on Hispanic mortality are U.S. vital statistics and nationally-representative surveys. Vital statistics use Hispanic ethnicity coded on death certificates and census estimates of the Hispanic population. Differences in the identification of Hispanic ethnicity on death certificates (which is reported by a physician) and the census (which is self-reported) have the potential to underestimate Hispanic mortality; Elo et al. (2004) find that data from the Social Security Administration (NUMIDENT) imply a smaller advantage than that given by vital statistics. Nationally-representative surveys with prospective mortality follow-up partially solve this issue, since ethnicity is self-reported and respondents are matched to records in the National Death Index. The use of large-sample surveys also allows the researcher to examine the Hispanic advantage across a variety of other covariates, including socioeconomic variables and health behaviors (e.g. Rogers, Hummer, Krueger, & Pampel, 2005). While the size of the observed Hispanic advantage varies somewhat depending on the data source used, it has been a remarkably consistent finding for the past two decades in the United States.

Cigarette Smoking Among Hispanics and non-Hispanics

Cigarette smoking has great potential to explain the mortality difference between Hispanics and non-Hispanic because it is (a) responsible for a large number of deaths in the United States and (b) much more prevalent among whites than among Hispanics. Smoking is by far the largest cause of premature mortality in the U.S., causing more than 20% of adult deaths (Peto, Lopez, Boreham, & Thun, 2006; Preston, Glei, & Wilmoth, 2010b). Evidence has also accumulated in recent years that Hispanics are less likely to smoke than non-Hispanic whites, and that Hispanic smokers smoke substantially fewer cigarettes on average (CDC, 2009). Thus while the mortality burden of smoking is very large, it is likely to be much smaller in the Hispanic population.

Current survey data show that Hispanics are less likely to be current smokers and smoke fewer cigarettes on average than whites (Barbeau, Krieger, & Soobader, 2004; Caraballo & Lee, 2004; Sudano & Baker, 2006). According to the 2008 National Health Interview Survey, 20.7 percent of Hispanic men were current smokers compared with 23.5 percent of white men, while 10.7 of Hispanic women and 20.6 percent of white women were smokers (CDC, 2009). Among Mexican-Americans, smoking appears to be extremely light, with a substantial fraction of Mexican smokers smoking fewer than five cigarettes per day (Caraballo, Giovino, Pechacek, & Mowery, 2001; Caraballo et al., 1998; Trinidad et al., 2009). One study found that among Mexican-Americans who identify as current smokers, more than one-quarter had serum cotinine concentrations lower than the amount necessary to be considered smokers (Caraballo et al., 2001).

The mortality burden associated with smoking does not merely reflect current smoking, but also the total accumulated damage from smoking in current cohorts. Since detailed cohort smoking histories are unavailable for most populations, researchers must turn to indirect measures of the impact of smoking within a population. The lung cancer death rate is often considered to be an accurate measure of the damage from smoking in a population, since it primarily reflects the history of smoking (Peto, Lopez, Boreham, Thun, & Heath, 1992; Preston, Glei, & Wilmoth, 2010a). Vital statistics indicate that Hispanics exhibit lower lung cancer mortality than their white counterparts (O'Brien et al., 2003), indicating that Hispanics have also historically smoked less. This paper will use two different methods to calculate the impact of smoking on mortality for each subgroup to provide a clear and concise answer to the question of the importance of smoking for the Hispanic Paradox.

Unlike whites, Hispanics have a relatively weak socioeconomic status (SES) gradient in mortality, and this pattern is especially pronounced among Mexican immigrants (Goldman,

Kimbro, Turra, & Pebley, 2006; Turra & Goldman, 2007). As a result, much of the Hispanic advantage is concentrated at lower levels of SES, among those with high school education or less. At the same time, SES gradients in smoking exhibit the same patterns: a strong negative relationship for whites and weak-to-no relationship for Hispanics, particularly Mexicans (Perez-Stable et al., 2001; Rogers et al., 2005). Thus smoking may be the key to explaining the socioeconomic pattern of the Hispanic advantage. This is considered in more detail below.

Methods

Data

Data come from the National Health Interview Survey (NHIS) smoking supplements between 1987 and 2004.[4] Respondents in the NHIS are linked to the National Death Index (NDI) to ascertain mortality status through the multiple cause-of-death (MCD) up to the end of 2006. NHIS samples are obtained through the Integrated Health Interview Series (IHIS, 2008) at the University of Minnesota and mortality follow-up linkage is provided by the National Center for Health Statistics. The relevant sample contains smoking status and mortality follow-up information on 281,567 individuals aged 35 or more at the interview over 16 survey years. 57,467 deaths, including 4,914 from lung cancer, are observed by the end of 2006. Individuals are weighted using supplement-specific annual person weights for survey years 1987 – 1995 and using eligibility-adjusted mortality sample adult weights for 1997 – 2004.[5]

Method

The impact of smoking on mortality at the individual level depends on the intensity of current and past cigarette use and the lifetime duration of smoking. Smoking attributable

[4] Information on individual smoking supplements is available from NCHS http://www.cdc.gov/nchs/nhis/tobacco/tobacco_questions.htm

[5] No supplement providing tobacco use information is available for 1989 or 1996.

risk, the number of deaths that would not occur in the absence of smoking, can be calculated based on the relative mortality risk of smokers relative to non-smokers. To estimate these values, I use loglinear hazard regression models predicting all-cause mortality from smoking behavior

$$\ln\big(m_i(x)\big) = \beta_0 + \beta_X A_i + \beta_H H_i + \beta_S S_i + \varepsilon$$

S_i refers to the smoking status of individual i, H_i is a dummy variable for ethnicity, and A_i are 5-year age groups – 35-39, 40-44,…,80-84, 85+.

Smoking status is ascertained through a series of questions. Respondents are asked if they have smoked more than 100 cigarettes in their entire lives. If they have not, they are classified as "never smokers". All others are considered ever smokers. Respondents are then asked if they smoke cigarettes currently, every day or most days. Ever smokers who no longer smoke are classified as "former smokers". Current smokers also report the number of cigarettes they usually smoke per day.

Smoking status is measured using a six-category variable accounting for current smoking behavior and intensity. The categories are: never smoker, former smoker, current very light smoker (fewer than five cigarettes per day), current light smoker (5-9 per day), current medium smoker (10-19 per day), and current heavy smoker (20+ per day). The very light category is included partly to capture the extremely low cigarette consumption of Mexican-Americans (Caraballo et al., 2001). We include a variable for race/ethnicity based on racial identification and Hispanic/Latino background. The categories are NH white, Mexican or Mexican-American, and other Hispanic.

Estimating Smoking Attributable-Risk

The number of deaths attributable to cigarette smoking in each ethnic group is calculated in two ways. The first is a direct method which uses a conventional attributable-risk approach (Rockhill, Newman, & Weinberg, 1998). This methods predict the number of

deaths that would not have occurred if smokers experienced no excess mortality relative to non-smokers (Ezzati et al., 2003). Based on mortality follow-up, we calculate the number of deaths that would be avoided if there were no mortality burden associated with smoking in Equation (1). Thus the proportion of deaths attributable to smoking (*A*) is given by

$$A = \sum_i p_i \left(\frac{RR_i - 1}{RR_i} \right)$$

where RR_i is the estimated mortality risk of smoking category *i* relative to never smokers and p_i is the proportion of the population in that category. This calculation will be performed by age group, sex, and ethnicity.

The second attributable risk calculation applies the method developed by Preston, Glei, and Wilmoth (2010a) using ethnicity-specific estimates of age-specific lung cancer death rates. Based on the statistical relationship between lung cancer mortality and mortality from all other causes of death across countries between 1950 and 2003, the Preston et al. method calculates smoking attributable risk using several formulas. The first is the proportion of lung cancer deaths attributable to smoking

$$A_L = \frac{M_L - M_L^*}{M_L}$$

where M_L is the observed lung cancer death rate in the population and M_L^* is the lung cancer death rate among lifelong never smokers, available from the American Cancer Society's Cancer Prevention Study-II (Thun et al., 1997). Attributable risk for other causes of death relies on the estimated coefficients from Preston et al.

$$A_O = \frac{e^{\beta_L'(M_L)} - e^{\beta_L'(M_L^*)}}{e^{\beta_L'(M_L)}}$$

where β_L' denotes the coefficient used to predict the expected death rate from causes of death other than lung cancer based on the lung cancer death rate in a population. The overall

attributable fraction *A* is simply an average of A_L and A_O weighted by the number of deaths from each respective cause (*D*): $A = (A_L D_L + A_O D_O)/D$.

Contribution of Smoking to the Hispanic Advantage

Smoking attributable-risk, as calculated by each method, can be used to estimate death rates that we would observe in the absence of smoking-related mortality (${}_nM_x^*$). These death rates reflect the contribution of smoking to the mortality experience of each population. They are calculated by subtracting smoking-attributable deaths in each age-group ${}_nM_x^* = {}_nM_x\ (1 - A)$. ${}_nM_x$ is the estimated age-specific death rate from the hazard regression. ${}_nM_x^*$ can be used to estimate the contribution of smoking to differences between each Hispanic subgroup and non-Hispanic whites in adult life expectancy (*e*)

$$\Delta_s = \frac{\left({}_He - {}_We\right) - \left({}_He^* - {}_We^*\right)}{\left({}_He - {}_We\right)}$$

The subscript *H* refers to the measure for the Hispanic subgroup while the *W* refers to NH whites. The * superscript refers to life expectancy in the absence of smoking. Δ_s can be interpreted as proportional decrease in the Hispanic advantage with the removal of the effect of cigarette smoking. In order to examine the role of socioeconomic status, I assess the size of the Hispanic advantage at various educational levels. The contribution of smoking will be computed for all education groups together as well as separately by education.

Results

Table 1 presents age-specific death rates by Hispanic group for men and women estimated from hazard regression.[6] Although Mexican-Americans and Other Hispanics exhibit higher death rates than NH whites in some of the age groups under 50, they tend to experience lower death rates at older ages, a finding that is consistent with previous analyses

[6] Models are estimated separately by sex and Hispanic subgroup to allow group-specific variation in the age-pattern of mortality.

using large-sample datasets (Palloni & Arias, 2004). These mortality rates translate into a 1.5-year advantage in life expectancy at age 35 for Mexican-American women, and a 1.4-year advantage for Mexican-American men. Other Hispanics likewise show advantages of 1.96 years for women and 1.81 years for men. These differences are slightly smaller than those found using vital statistics (Markides & Eschbach, 2005), and may partially reflect differences in the coding of Hispanic ethnicity in vital records versus the census. Still, these rate differences are non-trivial and reflect a substantial survival advantage of Hispanic individuals at adult ages (10-25% in most age groups).

The large sample of the pooled National Health Interview Survey allows us to consider more detailed population subgroups. Characteristics of the NHIS sample are presented in Table 2. NH whites have considerably higher levels of educational attainment than Hispanics. 51% and 44% of white men and women, respectively, have a college education compared with 24% and 21% of Mexican men and women, and 39% and 34% of other Hispanic men and women. On the other hand, more than 50% of Mexican-Americans and more than 30% of other Hispanics have less than a high school education, compared with only 15% of NH whites. Thus Tables 1 and 2 provide evidence for the Hispanic Paradox: lower observed death rates combined with a risky socioeconomic profile.

Table 2 also shows the distribution of baseline smoking status by ethnic subgroup and sex for those aged 35 or more at the interview. Mexican-Americans and Other Hispanics are more likely than whites to be lifelong non-smokers. Among women, 73% of Mexican-Americans and 68% of other Hispanics report never smoking more than 100 cigarettes, compared with only 50% of NH white women. For men, the difference is not quite as pronounced, with 46% of Mexicans and other Hispanics identifying as never smokers compared with 36% of whites. But while whites are more likely to have smoked, they also smoke considerably more heavily than Hispanics. The proportion of current smokers among

NH white and Hispanic men is similar, but intensity is higher among whites. 70% of white men smokers and 56% of white women smokers report smoking more than one pack per day. Corresponding proportions are 25% and 18% for Mexican men and women, respectively. Moreover, more than one-third of Mexican smokers report smoking fewer than 5 cigarettes per day, while only 8% of whites report so few. On average, white men smoke an average of 23 cigarettes per day, while Mexican men smoke 11, and other Hispanic men 14. White women average nearly twice as many cigarettes per day as their Hispanic counterparts (18 vs. 9).

Such large ethnic differences in smoking behavior suggest that the estimated mortality burden of smoking should be substantially higher among whites compared with Mexicans and other Hispanics. Figure 1 shows the contribution of smoking-related mortality to differences in life expectancy at age 35 between NH whites and each Hispanic subgroup using the *direct method* for calculating attributable-risk. Among Mexican-Americans, both men and women exhibit around 1.5 years high life expectancy at age 35 than their NH white counterparts. In the absence of smoking, these differences would be substantially smaller. For women, smoking accounts for 1 year difference, two-thirds of the total. For men, more than 108.5% of the difference; the Mexican advantage would be completely eliminated in the absence of smoking. The life expectancy advantage of other Hispanics relative to NH whites is slightly larger than that of Mexicans, 1.96 years for women and 1.8 years for men. The method predicts that 39% of the difference for women and 59% for men are due to differences in smoking-related mortality.

Figure 2 uses the *indirect method* from Preston et al. (2010b) for calculating smoking attributable-risk to assess the contribution of smoking to the differences in life expectancy at age 50. Similar to the results from the direct method above, the indirect method suggests that much of the life expectancy advantage of Mexican-Americans and other Hispanics results

from differences in mortality related to smoking. Smoking explains 104% of the advantage for Mexican-American women and 90% of the advantage for men. The corresponding figures are 77% and 74% for other Hispanic men and women, respectively. Although the Preston et al. method typically attributes a slightly higher proportion of the difference to smoking, both methods identify smoking as the main reason for the life expectancy advantage of Hispanic subgroups.

Since previous studies indicate that the magnitude of the Hispanic advantage is concentrated at lower levels of education (Goldman et al., 2006), it is essential to consider how the importance of smoking varies by education. I compute attributable-proportions separately for three educational groups: 1) less than high school, 2) high school diploma, and 3) college or more[7]. Results are shown in Figure 3. As expected, the size of the Hispanic life expectancy advantage is largest for those with less than a high school education, smaller for those with a high school diploma, and smallest for those with college education or more. Accordingly, the number of years explained by smoking is largest at lower educational levels. Among those with less than high school, Mexican-American men enjoy 5.7 years longer life expectancy at age 35 than NH whites, and smoking accounts for 3.2 years (56%) of this difference. Women exhibit a 4.6 year advantage, with 2.2 years attributable to smoking. Among the high school educated, Mexican men and women live 1.8 and 2.5 years longer respectively than their white counterparts and more than half of each difference is due to smoking. At the highest levels of education, the size of the life expectancy advantage among Hispanic subgroups is substantially smaller. Mexican women live 1.35 years longer, and 0.9 (66%) years are attributable to smoking. However, college-educated Mexican men actually exhibit lower life expectancy than NH whites, though smoking remains an important factor in life expectancy for both groups.

[7] The analyses were done using the direct attributable-risk method only since too few lung cancer deaths were observed in each education group to compute Preston et al. estimates.

Significance

The consistent observation of lower mortality among Hispanics in the United States, particularly the foreign-born, has continued to perplex demographers up to the present day (Palloni & Arias, 2004). The "Hispanic Paradox" remains a powerful example of a situation in which low socioeconomic status (SES) does not translate into higher mortality, and as such, it represents an especially valuable empirical regularity. In understanding the reasons why Hispanics do not suffer higher mortality than whites as a function of their lower SES, we gain a fuller picture of the factors that mediate the SES-mortality relationship.

Previous explanations most commonly offered to explain Hispanics' advantage in adult mortality have not produced convincing evidence. While each has the potential to contribute to the phenomenon, none seems large enough to explain the majority of the disparity. This paper finds that the majority of the mortality advantages for two major Hispanic subgroups, Mexican-Americans and all other Hispanics, can be explained by a low mortality burden from cigarette smoking compared with non-Hispanic whites. This finding confirms the suspicions of many researchers who have found evidence that Hispanics are generally less likely to smoke than whites, and smoke less heavily when they do (Caraballo & Lee, 2004; Denney, Rogers, Hummer, & Pampel, ; Hummer et al., 2000; Singh & Siahpush, 2002). Yet this paper contributes further to the literature on Hispanic health and mortality because it is the first to directly quantify smoking's contribution to the 'Paradox'.

This finding is not necessarily inconsistent other explanations, as long as the mortality advantage is a real phenomenon. Cigarette smoking may simply be a manifestation of migrant selectivity or cultural buffering effects: those who do not smoke may be more likely to migrate from their origin country to the United States, or smoking may less culturally-acceptable among Hispanic populations, both in origin countries and in the United States. Although no studies have formally examined this question, there is evidence that smoking

behavior among immigrants converges to that of the native-born with time spent in the U.S. (Abraido-Lanza et al., 2005; Bethel & Schenker, 2005). Thus smoking appears to have some cultural significance, since even Hispanic individuals born in the United States do not exhibit rates of smoking as high as native-born whites.

There are a number of methodological considerations associated with estimating mortality attributable to cigarette smoking. In this paper, smoking attributable-risk is calculated using two disparate methods. The first relies on the observed association between reported smoking behavior and all-cause mortality using prospective follow-up (direct method). The second uses the empirical connection between lung cancer and cigarette smoking to produce an estimate of attributable-risk from lung cancer death rates (indirect method). While these methods tell the same substantive story about the importance of smoking for the Hispanic Paradox, the indirect method ultimately attributes more importance to cigarette smoking. This is somewhat unsurprising, since direct methods are more likely to suffer from measurement error in smoking status, which can bias attributable-risk estimates downward (Rogers et al., 2005; Thun et al., 1997). Indirect methods also suggest a larger role for smoking in social inequality in mortality than direct methods (Jha et al., 2006). It is encouraging, then that both methods imply the same general result: smoking-related mortality is the main reason for longer adult life expectancy among Hispanic populations.

An important related phenomenon to the Hispanic Paradox is socioeconomic differences in mortality. The educational gradient in mortality is particularly pronounced among whites, while it is fairly weak for Hispanics, particularly Mexicans (Goldman et al., 2006; Turra & Goldman, 2007). For these groups, low relative socioeconomic status does not translate into high mortality risk as it does for whites. As such, the size of the Hispanic advantage grows at lower levels of education, and is rather small among the well-educated; so, too, does the importance of smoking. While differences in smoking account for about 1

year difference in life expectancy among those with college education, they are responsible for 2-3 years difference for those with no high school diploma. This general pattern holds for each Hispanic subgroup, suggesting that the educational gradient in the magnitude of the Hispanic advantage is strongly impacted by smoking patterns.

The difference between Hispanics and whites in the strength of the SES gradient in mortality serves to concentrate the Hispanic mortality advantage at lower levels of education. But socioeconomic differences in smoking behavior may be an important reason why the SES gradient among Hispanics is so weak and so strong among whites. Health behaviors like cigarette smoking have been shown to explain a substantial portion of social class differences in mortality across many contexts, because lower-class individuals are far more likely to smoke (Jha et al., 2006). Yet among Hispanics, especially immigrants, there appears to be no major increase in smoking among individuals with less education (Singh & Siahpush, 2002).

The impact of cigarette smoking at the population level has recently gained support among demographers. It is a major factor determining differences in mortality by sex (Pampel, 2002; Preston & Wang, 2006), social class (Jha et al., 2006), across countries (Preston et al., 2010a), and over time (Wang & Preston, 2009). This paper adds another comparison to this list: Hispanics and non-Hispanic whites. This contribution is particularly important since a cogent explanation of this disparity has been elusive in the literature.

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Table 1: Age-Specific Death Rates for Non-Hispanic Whites, Mexican-Americans, and Other Hispanics, based on NHIS 1987 - 2004 (per 100,000)

	Non-Hispanic White	Mexican-American		Other Hispanic	
Men					
35-39 years	172.8	189.0	(1.09)	183.5	(1.06)
40-44	235.2	255.8	(1.09)	241.7	(1.03)
45-49	387.2	496.9	(1.28)	425.2	(1.10)
50-54	619.2	677.6	(1.09)	556.2	(0.90)
55-59	932.8	924.4	(0.99)	749.8	(0.80)
60-64	1,547.2	1,119.0	(0.72)	1,252.2	(0.81)
65-69	2,448.0	2,126.7	(0.87)	2,162.2	(0.88)
70-74	3,776.0	3,690.5	(0.98)	3,414.3	(0.90)
75-79	5,600.0	4,969.3	(0.89)	4,346.2	(0.78)
80-84	8,640.0	6,950.0	(0.80)	7,280.0	(0.84)
85+	16,000.0	11,905.4	(0.74)	12,914.7	(0.81)
Life Expectancy age 35	41.7	43.0		43.6	
Women					
35-39 years	86.7	90.7	(1.05)	107.1	(1.24)
40-44	145.9	141.6	(0.97)	160.7	(1.10)
45-49	215.6	310.6	(1.44)	186.4	(0.86)
50-54	373.9	376.8	(1.01)	309.0	(0.83)
55-59	591.9	604.8	(1.02)	560.3	(0.95)
60-64	949.3	897.6	(0.95)	843.6	(0.89)
65-69	1,500.2	1,219.2	(0.81)	1,174.2	(0.78)
70-74	2,279.5	1,785.6	(0.78)	2,029.1	(0.89)
75-79	3,721.1	3,278.4	(0.88)	2,616.2	(0.70)
80-84	5,860.0	4,800.0	(0.82)	5,448.7	(0.93)
85+	12,112.6	10,507.2	(0.87)	10,300.0	(0.85)
Life Expectancy age 35	46.9	48.5		49.0	

Note: Mortality ratio relative to non-Hispanic whites in parentheses

Table 2: Characteristics of Pooled NHIS Smoking Supplement Sample ages 35+: 1987 - 2004, N=281,567

	Men			Women			
	Non-Hispanic White	Mexican-American	Other Hispanic	Non-Hispanic White	Mexican-American	Other Hispanic	Total
Mean Age	54.6	49.5	51.1	57.4	50.7	52.1	55.44
Education (percent)							
Less than High School	14.7	50.5	31.1	16.6	52.7	36.4	20.2
High School Diploma	33.9	25.7	29.9	39.3	26.7	29.5	35.7
College or more	51.4	23.9	39.0	44.2	20.6	34.1	44.1
Smoking Status (percent)							
Never Smoker	35.1	46.7	45.7	54.1	73.1	68.0	49.3
Former Smoker	39.4	28.8	29.2	24.7	14.1	15.9	25.5
Current <5 Per Day	1.8	8.4	5.3	1.9	4.8	3.9	2.6
Current 5-9 Per Day	1.3	4.0	3.2	1.8	2.7	2.9	2.3
Current 10-19 Per Day	4.6	5.8	7.0	5.7	3.0	4.4	6.3
Current 20+ Per Day	17.8	6.2	9.6	11.8	2.4	4.8	14.0
Avg Cigs/Per Day, Current Smokers	22.5	10.6	14.4	18.1	9.1	9.8	18.5
Observations	106,991	7,790	6,121	142,170	9,538	8,957	281,567
Number of Deaths	23,715	825	770	30,445	800	912	57,467

Figure 1: Proportion of the Hispanic advantage in life expectancy at age 35 attributable to smoking using direct attributable-risk method

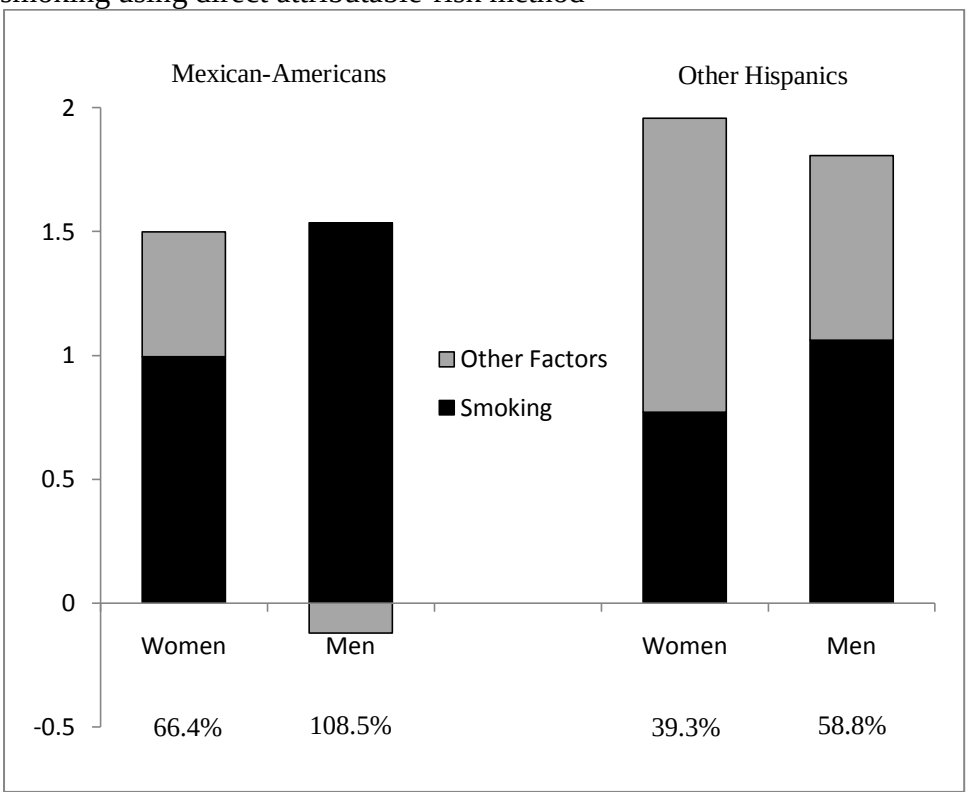

Figure 2: Proportion of the Hispanic advantage in life expectancy at age 50 attributable to smoking using the attributable-risk method from Preston et al. (2010b)

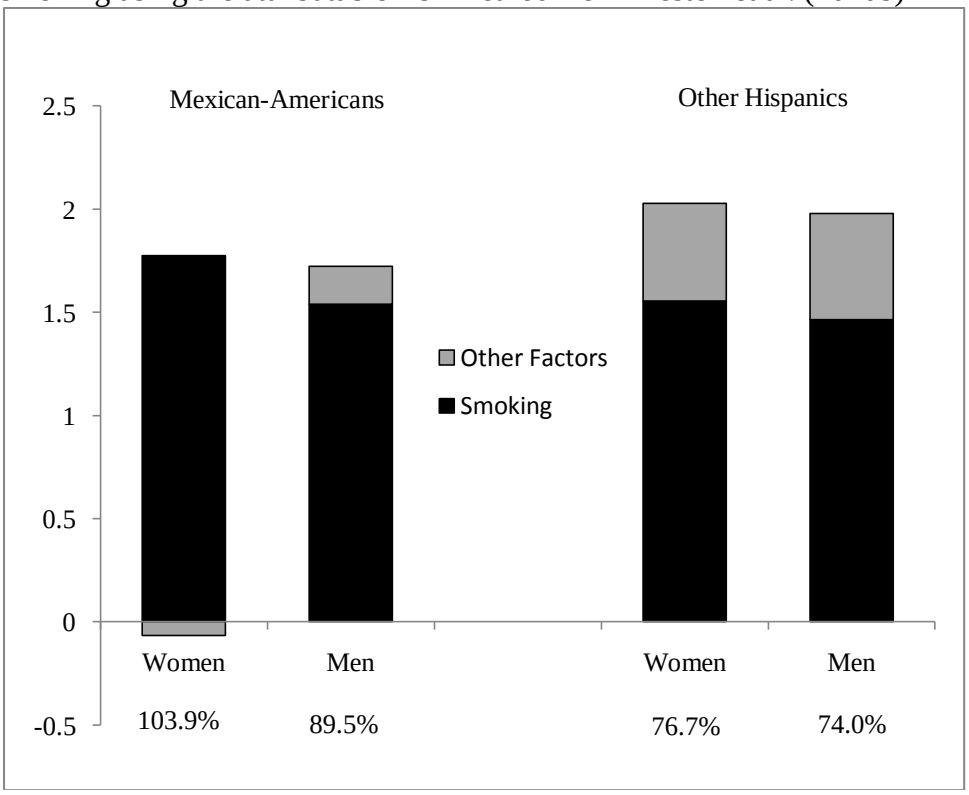

Figure 3: Contribution of smoking to the Hispanic advantage by education