CHEST

Original Research

COPD

Obstructive Lung Disease in Mexican Americans and Non-Hispanic Whites

An Analysis of Diagnosis and Survival in the National Health and Nutritional Examination Survey III Follow-up Study

Alejandro A. Diaz, MD, MPH; Carolyn E. Come, MD, MPH; David M. Mannino, MD, FCCP; Victor Pinto-Plata, MD, FCCP; Miguel J. Divo, MD; Carol Bigelow, PhD; Bartolome Celli, MD, FCCP; and George R. Washko, MD

Background: **Although obstructive lung disease (OLD), which includes COPD, affects all the populations, Hispanics seem to be protected against COPD development and progression. Whether this advantage translates into a survival benefit for this population is unknown. We aimed to determine the risk for OLD in Mexican Americans, the largest US Hispanic subgroup, compared with non-Hispanic whites and to assess all-cause mortality in subjects with OLD.**
Methods: **We assessed the relationships between Mexican American ethnicity and spirometric OLD and risk of death among 6,456 US adults aged ≥ 40 years who participated in the Third National Health and Nutritional Examination Survey Follow-up Study. We used logistic and Cox regression analyses to estimate the OR for OLD among Mexican Americans and the hazard ratio (HR) for all-cause mortality among Mexican Americans with OLD, respectively.**
Results: **After adjustment for demographic factors, socioeconomic status, and COPD risk factors, Mexican Americans had decreased odds of OLD diagnosis compared with whites (OR, 0.72 [95% CI, 0.54-0.95]). Among the 1,734 participants with OLD, 1,054 (60.8%) died during median follow-up of 12 years. In an adjusted model, Mexican Americans had no advantage in mortality from all causes (HR, 0.88 [95% CI, 0.69-1.13]). After accounting for the fact that some Mexican Americans may have moved back to Mexico and died there (thus, had no US death certificate), there was still no difference in mortality between these groups.**
Conclusions: **Although Mexican Americans appear to have lower risk for OLD, subjects of this ethnicity with OLD do not seem to have a survival advantage.** ***CHEST 2014; 145(2):282–289***

Abbreviations: HR = hazard ratio; LLN = lower limit of normal; NDI = National Death Index; NHANES = National Health and Nutrition Examination Survey; OLD = obstructive lung disease

Obstructive lung disease (OLD) affects about 28.9 million people in the United States.[1] OLD includes asthma and COPD, with the latter being now the third leading cause of death in this country.[2] The prevalence of OLD differs among major US populations, with Hispanics having a lower prevalence than non-Hispanic whites.[1] Since the Hispanic population is the fastest growing and largest minority in the United States, making up about 50 million people,[3,4] an increasing number of Hispanic patients with OLD are expected to seek clinical care. Increased understanding of racial-ethnic differences in OLD will improve disease management and inform the development of health-care policies.

The term "Hispanic paradox" is used to describe the observation that clinical outcomes are comparable or more favorable in Hispanics than whites, despite their lower socioeconomic indexes.[5] Hispanic health advantages include lower general mortality rates[6] and better birth,[7] cancer, and cardiovascular disease outcomes.[8] Among Hispanic subgroups, Mexican Americans—the largest subgroup of Hispanics (approximately two-thirds)[9]—have the lowest general mortality.[6] The Hispanic paradox may also be applicable in OLD.[10-13]

Early and more recent findings demonstrated that relative to non-Hispanic whites, Hispanics had lower prevalence of emphysema and chronic bronchitis,[10,11] OLD,[1] and reduced odds of COPD diagnosis.[12] However, those studies did not account for health-care variables and nonsmoking risk factors for chronic airflow obstruction, such as occupational exposure to respiratory hazards.[1,10-12,14] Whether the potential "protective effect" of Hispanic ethnicity against OLD holds in a nationally representative sample of US Mexican Americans and translates into a survival benefit in subjects with airway obstruction is unknown.

Based on prior evidence, we hypothesized that compared with whites, Mexican Americans are less likely to have a spirometric diagnosis of OLD and that Mexican Americans with OLD have decreased all-cause mortality. We also sought to determine whether country of birth and duration of residence in the United States have effects on mortality in Mexican Americans with OLD. We based this hypothesis on data demonstrating that foreign-born compared with US-born Mexican Americans have a lower respiratory disease-related mortality rate[15] and that the longer a Mexican American stays in the United States, the more likely he or she is to adopt negative health-related behaviors and to be exposed to environmental factors, which contribute to the development of chronic diseases.[16] To test these hypotheses we used The National Health and Nutrition Examination Survey (NHANES) III and its Linked Mortality File. Some of the results of this study have been previously reported in the form of an abstract.[17]

Materials and Methods

Study Design

The NHANES III study was conducted from 1988 to 1994 by the National Center for Health Statistics to assess the health and nutrition status of the civilian, noninstitutionalized US population.[18] Follow-up data pertaining to death were available through December 31, 2006, in the Linked Mortality File.[19] Briefly, NHANES III used a multistage stratified probability sampling design to ensure a representative sample of the US population. The total sample was 20,050 adults. Subjects underwent a detailed interview and examination. In this analysis, we chose participants who self-reported as either non-Hispanic white (hereafter whites) or Mexican American, were at least 40 years old,[20] and had examination performed and a reliable spirometric testing based on the American Thoracic Society[21] recommendations (N = 6,456) (Fig 1). The NHANES study was approved by the National Center for Health Statistics Institutional Review Board.

Main Outcomes

The primary outcomes were OLD and all-cause mortality. OLD was defined as a ratio of FEV_1 and $FVC < 0.7$.[1] Mortality was determined through matching NHANES III participants with records from the National Death Index (NDI).[19]

Covariates

Age, sex, country of birth, number of years living in the United States (for immigrant Mexican Americans), education, family income-to-poverty ratio, access to health care, lifetime smoking status, pack-years smoked, exposure to secondhand smoking, comorbidities, work in a high-risk industry, high-risk occupation, and living in urban area were extracted from the Adult Questionnaire at baseline and detailed in e-Appendix 1. We coded the following comorbidities: hypertension, heart attack, chronic heart failure, stroke, diabetes, and cancer. Comorbidities were self-reported or based on physical examination data as detailed in e-Appendix 1. BMI was drawn from the examination file.

Risk factors for chronic airflow obstruction included asthma history, smoking history, exposure to secondhand smoking, high-risk occupation, high-risk industry, and a surrogate for exposure to air pollution. Asthma history was a self-reported physician diagnosis of the disease. A participant was considered to have experienced dyspnea if he/she responded "Yes" to the question regarding the presence of shortness of breath when hurrying or walking up a slight hill.

Statistical Analysis

ORs for OLD were estimated using logistic regression analysis. The main predictor was ethnicity, with white as the reference group. The covariates were chosen a priori based on prior studies[12,14,22] and are listed in e-Appendix 1. Results are also reported as prevalence ratios (also called risk ratios), as the prevalence of OLD was high (26.9%). Race-ethnicity differences in all-cause mortality for OLD cases only were assessed using Cox proportional hazard models. Time to event for all-cause mortality was censored at date of death certificate or at December 31, 2006 (time of last follow-up).[23] The covariates included in the Cox model are based on prior investigations[23-26] and are described in e-Appendix 1. We also performed a survival analysis to examine the effects of country of birth and time living in the United States on mortality in Mexican American subjects with OLD. Finally, we performed a sensitivity analysis to address the potential bias of our hazard ratio (HR) estimates based on the assumption that some non-US-born Mexican Americans may have moved back to and died in Mexico without having a US NDI death certificate.[27] In secondary analyses, we repeated the main analyses using the lower limit of normal (LLN) of the FEV_1/FVC ratio[28] and in the subset of subjects with OLD and low lung function defined as $FEV_1/FVC < 0.7$ and $FEV_1 < 80\%$ of the predicted values.[29] All analyses incorporated

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Affiliations: From the Division of Pulmonary and Critical Care Medicine (Drs Diaz, Come, Pinto-Plata, Divo, Celli, and Washko), Brigham and Women's Hospital, Harvard Medical School, Boston, MA; the Division of Pulmonary, Sleep, and Critical Care Medicine (Dr Mannino), University of Kentucky College of Medicine, Lexington, KY; the University of Kentucky College of Public Health (Dr Mannino), Lexington, KY; and the Division of Biostatistics and Epidemiology (Dr Bigelow), University of Massachusetts, Amherst, MA.
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Correspondence to: Alejandro A. Diaz, MD, MPH, Department of Medicine, Division of Pulmonary and Critical Care Medicine, Brigham and Women's Hospital, 75 Francis St, Boston MA, 02115; e-mail: ADiaz6@partners.org

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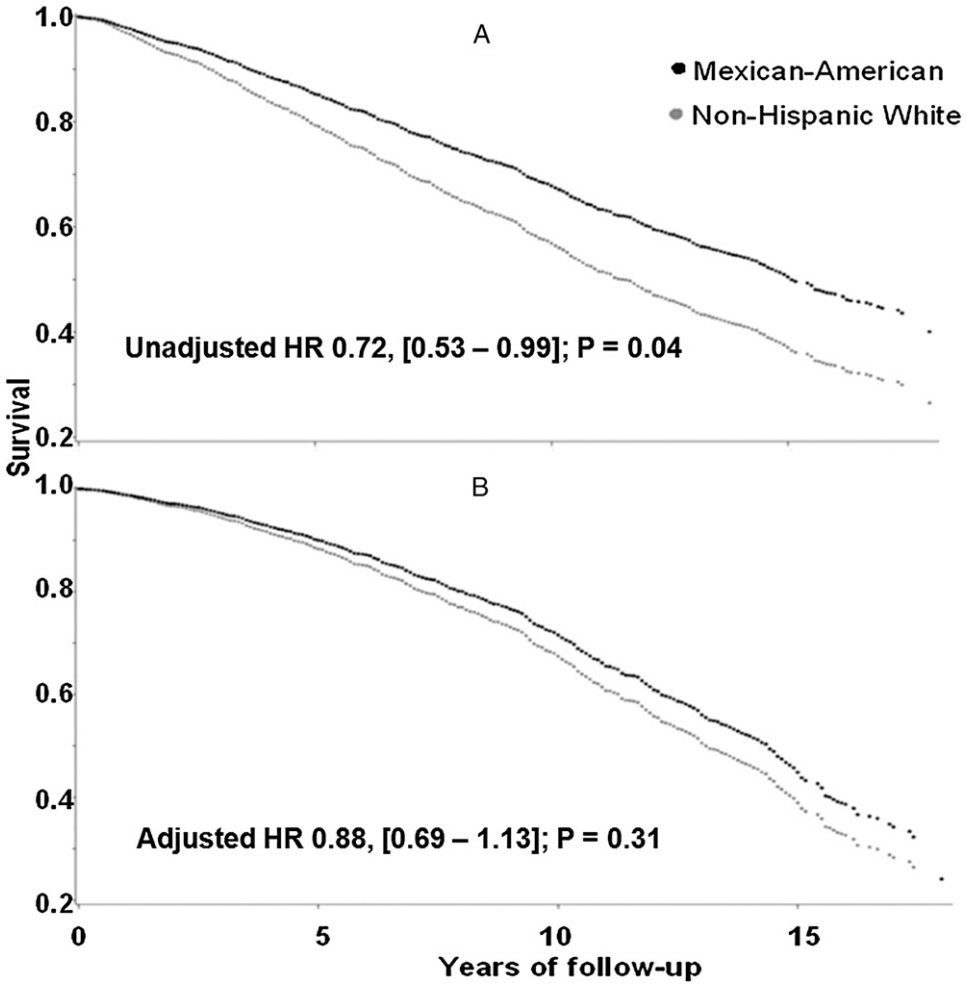

FIGURE 1. Survival plots for all-cause mortality in subjects aged 40 y or older with obstructive lung disease by race/ethnicity group. A, An unadjusted Cox proportional hazard model shows an advantage in mortality for Mexican Americans (black line) compared with non-Hispanic whites. B, This advantage is no longer apparent in the adjusted model. Adjustment for age, sex, BMI, lifetime smoking status, pack-y of smoking, education level, asthma history, age at asthma diagnosis, dyspnea, and FEV_1 % predicted was performed. HR = hazard ratio.

appropriate sampling weights and were performed with the SAS 9.3 callable SUDAAN 10.1 (RTI International) statistical software.

RESULTS

Compared with whites, Mexican Americans were more likely to be younger, poorer, and have less education and less access to health care. Mexican Americans were more likely to be never smokers and smoke fewer pack-years than whites. Mexican Americans were also more likely to report chronic heart failure and diabetes and less likely to report asthma, hypertension, heart attack, stroke, and cancer. Participants of this ethnicity were more likely to live in urban areas and to work in high-risk occupations or industries (Table 1). Compared with those with complete data (e-Appendix 1), participants with missing data (n = 904) (e-Fig 1) were more likely to be older and Mexican American. These participants were also more likely to have ≤ 12 years of school and higher prevalence of self-reported physician diagnoses of both chronic bronchitis and emphysema. There was no difference in sex proportion and lifetime smoking status between these groups.

The prevalence of OLD was lower among Mexican Americans than whites (No., [weighted % ± SE], 302 [12.7% ± 0.7%] vs 1,432 [24.7% ± 0.7%]). Differences in OLD prevalence between these populations were slightly greater when using alternate definitions (e-Table 1). In univariate analysis, Mexican Americans had lower odds of OLD than whites (e-Table 2). In the full model, the odds of having OLD for Mexican Americans was attenuated but remained significant (OR, 0.72 [95% CI, 0.54-0.95]) (Table 2). Prevalence ratios of OLD for Mexican Americans were comparable to ORs (e-Table 3). Other results when we added

Table 1—*Characteristics of Selected Participants by Race/Ethnicity Group (N = 6,456)*

Variable	No.	Non-Hispanic White (n = 4,554)	Mexican American (n = 1,902)	*P* Value
Age, y				< .0001
Mean	6,456	57.4 (0.5)	52.6 (0.3)	
≤ 55	2,317	49.3 (1.8)	65.7 (1.2)	
56-70	2,110	32.0 (1.2)	27.5 (1.1)	
> 70	2,029	18.7 (1.1)	6.8 (0.6)	
Male sex	3,126	46.9 (0.8)	48.7 (1.1)	.24
Country of birth				< .0001
United States or another country	5,636	99.9 (0.1)	55.8 (3.0)	
Mexico	810	[a]	44.2 (3.0)	
BMI, kg/m^2				< .0001
≤ 18.5	101	1.7 (0.2)	4 (0.1)	
18.6-25	2,150	37.0 (1.2)	24.1 (1.3)	
25.1-30	2,533	36.9 (1.0)	39.5 (1.2)	
> 30	1,662	24.4 (1.1)	36.0 (1.4)	
Education, y				< .0001
< 12	2,873	24.5 (1.5)	64.8 (2.7)	
≥ 12	3,546	75.5 (1.5)	35.2 (2.7)	
Family income-to-poverty ratio				< .0001
< 1.00	921	6.0 (0.6)	29.3 (1.6)	
≥ 1.00	4,900	94.0 (0.6)	77 (1.6)	
Access to health care	5,517	86.5 (1.0)	75.7 (1.6)	< .0001
Language at interview				< .0001
English	5,464	99.9 (0.1)	53.7 (3.0)	
Spanish	979	[a]	46.3 (3.0)	
Self-reported asthma	431	7.7 (0.5)	6.0 (0.7)	.04
Smoking status				< .0001
Never smoker	2,890	40.2 (1.0)	49.2 (1.0)	
Former smoker	2,355	37.8 (1.0)	38 (1.0)	
Current smoker	1,211	22.1 (1.0)	20 (1.1)	
Pack-y of smoking				< .0001
Mean	3,282	30.4 (0.7)	18.4 (1.5)	
< 1	2,923	42.4 (0.9)	52.3 (1.1)	
1-19	1,538	25.9 (0.7)	32.1 (0.9)	
≥ 20	1,711	31.7 (0.9)	15.7 (1.2)	
Secondhand smoking	2,253	41.2 (1.6)	36.9 (1.8)	.06
Comorbidities				
Hypertension	3,031	39.4 (1.1)	34.0 (1.4)	.0006
Heart attack	510	6.2 (0.5)	3.7 (0.5)	.0003
Chronic heart failure	346	3.1 (0.2)	4.8 (0.4)	< .0001
Stroke	283	3.3 (0.3)	1.8 (0.2)	.0002
Diabetes	749	7.3 (0.5)	14.2 (0.8)	< .0001
Cancer	420	6.3 (0.4)	2.3 (0.5)	< .0001
Living in urban area	2,678	43.7 (4.8)	56.0 (5.9)	.04
High-risk industry	2,614	36.6 (1.5)	44.2 (1.4)	.0003
High-risk occupation	1,817	22.0 (1.0)	35.2 (1.4)	< .0001
Shortness of breath	1,898	29.6 (1.3)	28.0 (1.5)	.38
FEV_1, mL	6,456	2,805 (27)	2,832 (18)	.36
FEV_1 % predicted	6,456	93 (0.5)	97 (0.4)	< .0001
FEV_1/FVC	6,456	0.74 (0.002)	78 (0.002)	< .0001

Data are presented as weighted % (SE) for categorical variables and as weighted mean (SE) for continuous variables. Percents do not sum up 100% for some variables because of rounding. Missing data: country of birth, 10; BMI, 10; education, 37; family income-to-poverty ratio, 635; access to health care, 1; language spoken at interview, 13; lifetime asthma status, 1; pack-y smoked, 284; secondhand smoke exposure, 4; heart attack, 80, diabetes, 7, shortness of breath, 34. Data from NHANES III, Third National Health and Nutrition Examination Survey (1988-1994), National Center for Health Statistics.[18]

[a]This estimate does not meet the standard statistical reliability and precision (relative SE ≥ 30%).

smoking duration and age at start of smoking or country of birth to this model and when the model was performed only among smokers are shown in the Results section of e-Appendix 1. The ORs were comparable with those of the main analysis.

Among the 1,734 participants with OLD, 1,054 (60.8%) died (Mexican American, 154), and two had missing vital status during a median follow-up of 12.0 years (interquartile range, 6.3-14.6). In an unadjusted Cox model, Mexican Americans had a lower

Table 2—*Multivariate Logistic Analysis Predicting OLD*

Variable	OR	95% CI Lower Limit	95% CI Upper Limit	*P* Value
Race/ethnicity				.02
Non-Hispanic white	1.00	…	…	
Mexican American	0.72	0.54	0.95	
Sex				.0001
Female	1.00	…	…	
Male	1.63	1.28	2.08	
Age, y				< .0001
40-55	1.00	…	…	
56-70	3.44	2.76	4.27	
> 70	6.77	5.39	8.50	
BMI, kg/m²				
≤ 18.5	2.17	1.22	3.85	.007
18.6-24.9	1.00	…	…	…
25-29	0.76	0.62	0.92	.005
≥ 30	0.54	0.41	0.70	< .0001
Self-reported asthma history				< .0001
No	1.00	…	…	
Yes	3.77	2.84	5.01	
Smoking status				
Never smoker	1.00	…	…	…
Former smoker	1.45	1.09	1.93	.009
Current smoker	3.87	2.67	5.59	< .0001
Pack-y smoked	1.01	1.01	1.02	< .0001

OLD is defined as $FEV_1/FVC < 0.7$. The main predictor is the race/ethnic group, where non-Hispanic white was the reference group. All logistic models incorporated sampling weights. The covariates were those showed in the table and education level, family income-to-poverty ratio, access to health care, secondhand smoke exposure, high-risk industry, high-risk occupation, and living in urban area. Data from NHANES III, Third National Health and Nutrition Examination Survey (1988-1994), National Center for Health Statistics.[18] OLD = obstructive lung disease.

Table 3—*Adjusted Cox Proportional Hazard Model for All-Cause Mortality in OLD Subjects*

Variable	HR	95% CI Lower Limit	95% CI Upper Limit	*P* Value
Race/ethnicity				.31
Non-Hispanic white	1.00	…	…	
Mexican American	0.88	0.69	1.13	
Sex				< .0001
Female	1.00			
Male	1.50	1.25	1.79	
Age, y	1.11	1.10	1.13	< .0001
BMI, kg/m²				
≤ 18.5	1.83	1.03	3.26	.04
18.6-24.9	1.00	…	…	…
25-29.9	0.87	0.70	1.08	.19
≥ 30	0.81	0.58	1.13	.20
Smoking status				
Never smoker	1.00	…	…	…
Former smoker	1.07	0.81	1.40	.64
Current smoker	1.70	1.23	2.35	.002
Pack-years smoked	1.002	1.000	1.004	.02
FEV_1 % predicted	0.98	0.98	0.99	< .0001

The main predictor for all the models is the race/ethnic group, where non-Hispanic white was the reference group. The survival model incorporated sampling weights. The HR calculation was made with ascertainment of death based on US death certificates. See e-Table 7 for HR estimates assuming that some non-US-born Mexican Americans may have moved back to and died in Mexico (thus, with no US death certificate). The covariates included were those showed in the table and education level, asthma, age of asthma diagnosis (< 18 years old = 1), and dyspnea. Data from NHANES III, Third National Health and Nutrition Examination Survey (1988-1994), National Center for Health Statistics[18] and its Linked Mortality File, National Center for Health Statistics.[19] HR = hazard ratio. See Table 2 legend for expansion of other abbreviation.

risk of death from all causes than whites (HR, 0.72 [95% CI, 0.53-0.99]) (e-Table 4). In the full Cox model, survival benefit for Mexican Americans was no longer apparent (HR, 0.88 [95% CI, 0.69-1.13]) (Fig 1, Table 3). When we added comorbidities (ie, cardiovascular disease, diabetes, cancer) to the survival model, the result was similar (HR, 0.89 [95% CI, 0.70-1.14]; $P = .35$) to that of the smaller model. Similarly, when we included all the participants with missing data who had assumed OLD in the analysis, the result was also comparable (HR 0.85 [95% CI, 0.64-1.13]; $P = .25$).

Among 302 Mexican Americans with OLD, 68 out of 142 (47.9%) Mexican-born died compared with 85 out of 159 (53.5%) US-born Mexican Americans. One participant of this ethnicity did not report the country of birth. The survival analysis showed no difference in all-cause mortality between Mexican-born and US-born Mexican Americans (HR, 0.87 [95% CI, 0.54-1.40]). There was no relationship between time living in the United States and mortality among non-US-born Mexican Americans in adjusted models (e-Appendix 1).

In secondary analyses, using the LLN for the FEV_1/FVC ratio to define OLD (n = 1,047), Mexican Americans had lower odds of OLD than whites (OR, 0.61 [95% CI, 0.45-0.84]) (e-Table 5). Similarly in the multivariable Cox model, there was no survival benefit for Mexican Americans (HR, 0.92 [95% CI, 0.67-1.26]). Results were also consistent in the subset of subjects with OLD and low lung function (n = 811); Mexican Americans again had lower odds of OLD and low lung function than their white counterparts (OR, 0.66 [95% CI, 0.46-0.95]) (e-Table 6). Finally, Mexican American and white subjects with OLD and low lung function had no differences in mortality (HR, 0.83 [95% CI, 0.58-1.19])

Finally, the results of the sensitivity analysis are shown in e-Table 7. When we assumed increasing return migration rates for non-US-born Mexican Americans, there was a nonsignificant trend to increase all-cause mortality of participants of this ethnicity with

OLD compared with whites (HR from 0.98 to 1.23; *P* value from .87 to .10).

Discussion

In this study of a nationally representative sample of US adults with long-term mortality follow-up, we found that Mexican Americans had a lower likelihood of OLD diagnosis compared with whites. Despite having a lower odds of OLD diagnosis, Mexican Americans with OLD had no difference in mortality compared with whites.

Our study shows that Mexican Americans have lower odds of OLD than their white counterparts. This finding confirms prior findings of Hispanics in New Mexico and extends them in several ways.[10,12] First, unlike previous studies, we used a nationally representative sample of Mexican Americans, including foreign-born and US-born subjects as well as both English and Spanish speakers. This allowed us to obtain estimates generalizable to the largest subgroup of US Hispanics. We also used two definitions of OLD and performed the analysis in the subset of subjects with OLD and low lung function only and obtained similar results, which substantiates our main findings. We accounted for several factors that might confound or modify the association between the Mexican American group and OLD, including relevant demographic information (country of birth), socioeconomic status (access to health care), and chronic airflow obstruction risk factors (history of asthma, secondhand smoke exposure, occupational exposures). Although the odds of OLD in Mexican Americans were attenuated after these factors were accounted for, this Hispanic subgroup was still 28% less likely to have OLD than whites. A recent multiethnic study using prebronchodilator data,[30] however, did not find differences in the effect of Hispanic ethnicity (vs whites) on the relationship between smoking and FEV_1 or OLD defined as the LLN. One of the differences between that and our study is that they included multiple subgroups of Hispanics, which may have obscured a potential advantage for Mexican Americans against OLD.

Prior studies support a biologic plausibility for the protective effect of Hispanic ethnicity against chronic airflow obstruction. Lung function is heritable, and Coultas et al[31] have shown that the lung function of Hispanic offspring correlates with that of their parents. Sood et al[32] and Vollmer et al[33] have demonstrated that both Hispanic female and male smokers have higher FEV_1 measurements than their respective white counterparts. Additionally, Bruse et al[12] suggested that Hispanic subjects may be less susceptible to COPD (a component of OLD), because of protective alleles that may be more frequent in their genetic background (or their Native American ancestry). Moreover, participants from Ciudad de México had the lowest prevalence of COPD among five major Latin American cities included in the PLATINO (Proyecto Latinoamericano de Investigación en Obstrucción Pulmonar) study.[34] In our study, the potential protective effect of Mexican American ethnicity against OLD was observed despite differences in demographic, socioeconomic, and chronic airflow obstruction risk factors (including asthma history, lifetime smoking status, pack-years smoked, and occupational exposure) compared with whites. Thus, our findings support prior observations in Hispanics and extend them by showing that the lower susceptibility to the deleterious effects of smoking and environmental factors on lung function and having OLD is observed in the largest subgroup of Hispanics, Mexican Americans. Thus, further research efforts toward understanding the factors associated with protection against OLD in Hispanics are needed.

An important finding in our study was that among Mexican Americans with OLD, no benefit in survival was observed when compared with whites with OLD. This finding suggests that the Hispanic paradox may only apply to having OLD. Prior studies by Samet et al[11] and Keppel et al[35] reported lower mortality rates of chronic lower respiratory diseases in Hispanics than whites from 1958 to 1982 and from 1990 to 2006, respectively. Unlike these studies, our study provides an all-cause mortality HR estimated from a cohort of participants with OLD with long-term mortality follow-up. Our analysis included clinically relevant covariates, including comorbidities associated with increased risk for mortality from OLD in NHANES participants. A potential explanation for the lack of difference in mortality in our study is that once the obstructive impairment of lung function is acquired, both OLD populations are subject to the effects of a variety of conditions that balance their risk of death in long-term follow-up. In a review of the Hispanic paradox, Markides and Eschbach[6] stated that among Hispanic subgroups the survival benefit is greatest for immigrants, which may be due to a "healthy immigrant effect."[36] However, as immigrants stay in the United States longer, their protective health behaviors deteriorate, a process termed "negative acculturation."[37] It is unclear whether country of birth and duration of time living in the United States affect long-term mortality in Mexican Americans with OLD. Our current analysis revealed no difference in all-cause mortality between US- and Mexican-born Mexican Americans with OLD. Further, the apparent survival benefit for those living in the United States < 15 years disappeared after adjustment for age. Thus, the healthy immigrant effect and negative acculturation do not seem to have an impact on all-cause mortality in Mexican Americans with OLD.

Limitations

Caution should be exercised when interpreting these results. First, since NHANES III is a survey, misclassification is possible. However, we used an objective definition of OLD and self-reported race/ethnicity, both accepted means of assessing these variables.[30,38,39] As NHANES III had only prebronchodilator spirometric values, we may have overestimated the OLD prevalence; however, doing so would not likely have affected the difference we observed between the two populations. Although OLD includes various conditions like asthma and COPD, these obstructive airway diseases share similar genetic and epidemiologic risk factors.[40] The association between Mexican American ethnicity and OLD may be biased due to residual confounding by exposure to risk factors for chronic airflow obstruction, including characteristics of smoking (cigarette type, depth of inhalation). Although we accounted for nonsmoking risk factors in our models, their assessments were based on self-reported or possibly imprecise indicators (eg, the surrogate for air pollution), which may not completely capture the exposure to nonsmoking environmental risk factors for chronic airflow obstruction. Further, a number of Mexican Americans may have moved back to and died in Mexico without having an NDI death certificate. They would have been censored and assumed to be alive, which would bias our HR estimates toward a survival advantage for Mexican Americans. Our analysis assuming increasing percentages of non-US-born Mexican Americans emigrated to Mexico and subsequently died there also revealed no survival benefit for Mexican American ethnicity. Additionally, since the survival analysis was performed in subjects with OLD only, the restriction in sample size may have obscured a potential advantage in mortality among Mexican Americans. Similarly, this limitation may have masked differences in mortality between non-US- and US-born Mexican Americans and between immigrants living a short vs long time in the United States. Further research with larger Hispanic cohorts and closer follow-up may provide more definitive conclusions. Finally, because of a relatively small number of deaths due to chronic respiratory conditions, we could not estimate respiratory-specific mortality.

Conclusions

In summary, our study suggests that although Mexican Americans seem to be protected from having OLD, those with OLD do not appear to have a survival benefit. More studies are needed to elucidate the Hispanic paradox in OLD, particularly the mechanisms mediating the lower risk for airway obstruction in Hispanics.

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Dr Diaz: contributed to conception and design of the study; acquisition of data; analysis and interpretation; drafting the manuscript for important intellectual content; and creation, revision, and final approval of this manuscript.

Dr Come: contributed to conception and design of the study; drafting the manuscript for important intellectual content; and creation, revision, and final approval of this manuscript.

Dr Mannino: contributed to conception and design of the study; analysis and interpretation; drafting the manuscript for important intellectual content; and creation, revision, and final approval of this manuscript.

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Dr Bigelow: contributed to conception and design of the study; analysis and interpretation; drafting the manuscript for important intellectual content; and creation, revision, and final approval of this manuscript.

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Dr Washko: contributed to conception and design of the study; analysis and interpretation; drafting the manuscript for important intellectual content; and creation, revision, and final approval of this manuscript.

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Additional information: The e-Appendix, e-Figure, and e-Tables can be found in the "Supplemental Materials" area of the online article.

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