Hypertension and Diabetes Prevalence Among U.S. Hispanics by Country of Origin: The National Health Interview Survey 2000-2005

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BACKGROUND: Despite their diverse cultural origins, Hispanics in the US are generally studied as a single ethnic group.

OBJECTIVES: 1) Assess demographic and disease-related differences among U.S. Hispanics by country of origin, and 2) Examine the mediating roles of socioeconomic status and acculturation on disease prevalence in these subgroups.

DESIGN AND PARTICIPANTS: Using data from the 2000-2005 National Health Interview Survey (NHIS), we compared characteristics of Mexican-Americans with Hispanics originally from: Mexico, Puerto Rico, Central/South America, Cuba, and Dominican Republic (n=31,240). We stratified the analysis by foreign versus US-born Hispanic subgroups and modeled hypertension and diabetes prevalence, adjusting for demographic and acculturation differences.

MAIN RESULTS: The six Hispanic subgroups were significantly diverse in all measured variables. Prevalence of hypertension (32%) and diabetes (15%) was highest in foreign-born Puerto Ricans. After adjusting for age, BMI, smoking, socioeconomic status and acculturation in foreign-born Hispanics, Puerto Ricans (OR=1.76 [95% CI: 1.23, 2.50], p=0.002) and Dominicans (OR=1.93 [1.24, 3.00], p=0.004), had higher prevalence of hypertension relative to Mexican-Americans. Adjusted diabetes prevalence among foreign-born Hispanics was half or less in Cubans (OR=0.42 [0.25, 0.68] p<0.001), Dominicans (OR=0.48 [0.26, 0.91], p=0.02) and Central/South Americans (OR=0.51 [0.33, 0.78], p=0.002) relative to Mexican-Americans. Among US-born Hispanic subgroups, Cubans had lower hypertension (OR=0.53, [0.33, 0.83], p=0.006) and Mexicans (OR=0.76 [0.60, 0.98], p=0.03) had lower diabetes prevalence compared to Mexican-Americans in adjusted models.

CONCLUSIONS: The prevalence of hypertension and diabetes varies significantly among Hispanics by country of origin. Health disparities research should include representation from all Hispanic subgroups.

KEY WORDS: diabetes; health status; hypertension; immigrant health; vulnerable populations.

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INTRODUCTION

There are an estimated 45.5 million Hispanics in the United States, comprising 14% of the US population¹. Compared to non-Hispanic whites, this group has been reported to have similar or lower prevalence of hypertension²⁻⁶ and higher prevalence of type 2 diabetes⁷⁻¹⁰. In addition, US Hispanics have poorer control of both hypertension and diabetes and greater associated complications such as amputations, end-stage renal disease, and peripheral vascular disease compared to non-Hispanic-whites^{2,11-15}.

A large number of epidemiologic studies related to Hispanic health disparities in the US have focused on Mexican-Americans from Southwestern United States^{2-8,16,17}. Studies evaluating disease prevalence in other Hispanic subgroups have provided conflicting results, partly due to differences in analytical approach and study design. Also, most studies have focused on the historically prominent groups (Mexican-Americans, Puerto Ricans, Cubans), leaving out those of Caribbean, Central, or South American descent¹⁸⁻²³.

Hispanics, while sharing a common language, are an ethnically and culturally heterogeneous group²⁴. While Mexican-Americans continue to be the largest US sub-group, other nationalities are rapidly growing in size¹. In addition to country-of-origin differences, Hispanic individuals may differ in disease risk if they were born in the U.S. or were foreign-born. Therefore, epidemiologic findings derived exclusively from a single Hispanic subgroup may not be generalizable to the overall Hispanic population.

To address these concerns, we used data from the National Health Interview Survey to stratify US Hispanic adults by country of origin and by US- versus foreign-born nativity. To our knowledge, this is the only large-scale national survey which provides information on country of origin for Hispanics. We compared demographic characteristics and calculated the

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adjusted odds of hypertension and diabetes for each subgroup, to test the hypothesis that data on Mexican-Americans are not representative of other Hispanic subgroups.

METHODS

Data Source and Participants

The National Health Interview Survey (NHIS) is a yearly face-to-face survey conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention. NHIS uses a complex sample design involving stratification, clustering, and multistage sampling to allow extrapolation to the US civilian non-institutionalized population. The total response rate for the adults in 2000 to 2005 ranged from 69 to 74%²⁵. Details of the survey design are reported elsewhere²⁶. In 2000-2005, data were collected for 190,355 adults for the Sample Adult questionnaire, including 32,766 adults (ages 18-85) who answered "yes" to the question "do you consider yourself to be Hispanic or Latino?" NHIS provided the following categories for Hispanic respondents to further self-define ethnicity by their (or their family's) country of origin: Mexican, Mexican-American, Central/South American, Puerto Rican, Cuban/Cuban American, Dominican, Other Spanish, Multiple Hispanic, and Other Latin American type not specified. For the purposes of our analysis, we excluded subjects who reported "Other Spanish" (1,127), "Multiple Hispanic" (356), or "Other Latin American type not specified", leaving 31,240 Hispanic adults for our analysis. The survey instrument did not provide respondents with any specific definitions or instructions when choosing country of origin. Although "Mexican" and "Mexican-American" respondents presumably shared a similar Mexican heritage at some level, we found these two groups to be demographically very different and thus we did not combine them in our analyses. Although not part of our main analysis, in a subsidiary analysis we also compared characteristics of all Hispanics to non-Hispanic whites and non-Hispanic blacks (Online Appendix 1 and 2). Self report of diabetes or hypertension was ascertained by the questions: "Have you ever been told by a doctor or other health professional that you had ... hypertension, also called high blood pressure?" and "Other than during pregnancy, have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes?"

Variables Related to Disease Risk, Socioeconomics, and Acculturation

BMI was derived from self-reported weights and heights. Smoking status (never smoked vs. current/past smoker) and education (high school degree/equivalent or greater vs. less than high school) were analyzed as binary variables. US regions were defined as Northeast, Midwest, South, and West based on US census regions. Health insurance (yes or no), employment status (yes or no), and regular place of medical care (yes or no) pertained to the 12 months preceding the interview. We define acculturation as "the process by which individuals adopt the attitudes, values, customs, beliefs and behaviors of a another culture." This definition has been used elsewhere³⁴. For measures of acculturation, we used the following acculturation proxies: place of birth, years in the US, language of interview, and citizenship status. While place of birth was available for all participants, only

foreigners were asked how many years they had lived in the US. We dichotomized years in the US by 10, based on prior research which found that disease prevalence significantly changes after this time period^{27,28}. Patient's primary language was defined based on whether the interview was conducted in English or Spanish. Other than citizenship (yes or no), no data were collected related to participants' legal immigration status.

Statistical Methods

Because prior literature suggests that there is a significant relationship between nativity and health status among Hispanics²⁹⁻³¹, we stratified our analyses by whether subjects were US- or foreign-born. We analyzed participant characteristics using chi-square for categorical variables and t-tests for normally distributed continuous data. We conducted univariate analysis to determine significant predictors of self-reported hypertension and diabetes for all Hispanics. We then created separate multivariate logistic regression models to evaluate the effect of Hispanic country of origin on the odds of hypertension or diabetes relative to Mexican-Americans. We chose Mexican-Americans as our referent group for each analysis because this is the largest Hispanic subgroup in the United States. Models adjusted for variables related to demographics (age, gender, BMI, smoking status, US region of residence), socioeconomic status (high school degree, employed for the past 12 months, insurance status, if receiving routine care), and acculturation (language of interview, years in the US, US citizenship status).

We used a step-wise modeling approach in which we sequentially added significantly independent variables related to demographics, socioeconomics, and acculturation. We used SAS-callable SUDAAN (9.1) for all our analyses. Data were weighted to create nationally representative estimates using sampling weights provided by NHIS³². The Human Studies Committee at the Massachusetts General Hospital approved this research.

RESULTS

Respondent Characteristics by Nativity and Hispanic Sub-group

We found significant demographic differences across Hispanic subgroups that were particularly evident among foreign-born subjects (Table 1). In US-born participants, the greatest differences were in age and BMI. Mexican-Americans were the oldest and had the highest BMI. Insurance status also varied significantly among US-born, with Cubans having the highest rates (85%). Otherwise, all US-born Hispanics reported high rates of high school attainment (70-87%), employment (69-75%) and routine care (76-87%). Fewer than 22% of people in US-born Hispanic subgroups chose to conduct the interview in Spanish.

Among foreign-born US Hispanics, we found significant differences across all variables measured. Dominicans had the highest proportion of females, Cubans were the oldest, and Puerto Ricans had the highest BMI and smoking rates. Foreign-born Mexicans had the lowest rates of high school attainment (32%), insurance (42%), and routine medical care (55%). While more than 60% of all foreign-born had been in the US for over ten years, US citizenship ranged from 20% among Mexicans to 96% for Puerto Ricans. The rates of interviews

Table 1. Demographic Characteristics of Hispanic Adults by Subgroups, Ages 18-85 and Stratified by US- vs. Foreign-Born: The National Health Interview Survey 2000-2005^a

US-Born:	Mexican American	Mexican	Puerto Rican	Cuban	Dominican	Central/South American	Overall χ^2 p value
n	1961	7021	1513	301	126	477	-
Population ^b	8,707,702	29,033,163	6,923,597	1,493,451	609,111	2,516,657	-
Female (%)	1155 (53)	4027 (52)	912 (52)	152 (42)	75 (53)	264 (52)	0.1
Age, mean years (SE)	38.8 (0.3)	37.4 (0.5)	35.1 (0.5)	33.5 (0.9)	28.5 (1.0)	30.3 (0.7)	<0.001
Mean BMI (SE)	28.5 (0.1)	28.0 (0.2)	27.9 (0.2)	26.4 (0.4)	25.7 (0.4)	25.9 (0.3)	<0.001
Ever smoke (%)	672 (32)	2397 (34)	687 (44)	93 (32)	41 (28)	150 (30)	<0.001
Residence							
New England (%)	27 (2)	14 (1)	790 (58)	26 (12)	81 (76)	81 (19)	
Midwest (%)	225 (16)	356 (8)	118 (10)	25 (12)	4 (5)	29 (7)	<0.001
South (%)	516 (31)	2672 (42)	242 (22)	167 (66)	14 (16)	138 (40)	
West (%)	871 (51)	2790 (50)	133 (10)	31 (10)	5 (3)	148 (34)	
>High school (%)	1354 (70)	4889 (73)	1122 (77)	267 (87)	103 (85)	407 (84)	<0.001
Employed (%)	1213 (72)	4144 (69)	941 (74)	204 (75)	80 (70)	327 (75)	0.003
Insured (%)	1468 (74)	5167 (74)	1207 (80)	249 (85)	90 (75)	369 (78)	<0.001
Routine care (%)	1525 (78)	5368 (76)	1261 (82)	263 (87)	100 (79)	373 (80)	<0.001
>10YRSUS (%) ^c	N/A	N/A	N/A	N/A	N/A	N/A	-
Interview in Spanish (%)	297 (15)	889 (13)	136 (8)	70 (22)	25 (22)	51 (12)	<0.001
US citizen (%)	N/A	N/A	N/A	N/A	N/A	N/A	-
Foreign-born:	Mexican American	Mexican	Puerto Rican	Cuban	Dominican	Central/South American	Overall χ^2 p value
n	1219	10217	1689	1576	825	4214	-
Population ^b	5,619,796	47,456,833	7,600,806	6,087,352	3,352,469	20,852,732	-
Female (%)	683 (50)	5191 (45)	1055 (56)	892 (53)	547 (57)	2326 (50)	<0.001
Age, mean years (SE)	40.7 (0.5)	36.9 (0.2)	47.9 (0.6)	53.7 (0.9)	42.0 (0.6)	39.8 (0.3)	<0.001
Mean BMI (SE)	27.3 (0.2)	27.2 (0.06)	27.7 (0.2)	26.9 (0.2)	26.7 (0.2)	26.5 (0.09)	<0.001
Ever smoke (%)	309 (26)	2596 (26)	632 (35)	551 (34)	174 (22)	1094 (26)	<0.001
Residence							
New England (%)	12 (1)	247 (3)	876 (55)	146 (13)	567 (80)	950 (27)	
Midwest (%)	68 (8)	738 (10)	124 (10)	14 (1)	11 (2)	129 (5)	<0.001
South (%)	387 (35)	2458 (29)	355 (29)	1094 (80)	100 (17)	1388 (40)	
West (%)	482 (56)	5001 (58)	76 (6)	67 (6)	5 (1)	1073 (28)	
>High school (%)	593 (50)	3077 (32)	960 (60)	930 (63)	468 (60)	2634 (64)	<0.001
Employed (%)	733 (70)	5827 (67)	760 (51)	714 (52)	460 (70)	2676 (73)	<0.001
Insured (%)	709 (59)	4417 (42)	1408 (82)	1214 (77)	573 (68)	2310 (55)	<0.001
Routine care (%)	843 (69)	5731 (55)	1441 (85)	1273 (81)	663 (79)	2821 (67)	<0.001
>10YRSUS (%) ^c	969 (82)	6037 (60)	1373 (85)	1174 (74)	584 (74)	2543 (62)	<0.001
Interview in Spanish (%)	615 (51)	7572 (74)	599 (33)	1249 (74)	502 (58)	2291 (52)	<0.001
US citizen (%)	646 (53)	2137 (20)	1625 (96)	990 (63)	369 (46)	1428 (35)	<0.001

^aAll 31,240 adults surveyed are included in the variance estimation. Taylor Series (WR) used for variance estimation. ^bData adjusted to the US population using 2000 census data ^cYears in US only asked to foreign born adults

conducted in Spanish varied from 33% among Puerto Ricans, to 74% among Cubans.

Hypertension Prevalence

Table 2 demonstrates the wide variation in weighted unadjusted prevalence of hypertension across subgroups, with overall rates ranging from 12% for Central/South Americans to 25% for Cubans. Among US-born Hispanics, the unadjusted hypertension rate was highest for Mexican-Americans (20%) and lowest for Dominicans (6%). After adjusting for demographic, socioeconomic and acculturation differences, hypertension rates were similar for all groups except Cubans (OR=0.53, CI: 0.33, 0.83 vs. Mexican-Americans). Among foreign-born Hispanics, a fully adjusted model showed significantly higher odds of reporting hypertension for Puerto Ricans (OR=1.76: CI: 1.23, 2.50) and Dominicans (OR: 1.93, CI: 1.24, 3.00).

Diabetes Prevalence

There was also wide variation in the prevalence of diabetes by Hispanic subgroup and nativity (Table 3). Overall prevalence of

diabetes ranged from 4% for Central/South Americans to 11% for Puerto Ricans. For US-born subgroups, diabetes prevalence was lower for Mexicans (OR=0.76, CI: 0.60, 0.98). In contrast, among foreign-born Hispanics, diabetes prevalence remained significantly lower in fully adjusted models for Cubans (OR=0.42, CI: 0.25, 0.68), Dominicans (OR=0.48, CI: 0.26, 0.91) and Central/South Americans (OR=0.51, CI: 0.33, 0.78, referent group=foreign-born Mexican-Americans).

DISCUSSION

We found significant variability in demographic characteristics and disease prevalence by country of origin among US Hispanics. This country of origin effect on hypertension and diabetes prevalence was significant among both US and foreign-born Hispanic immigrants. US born Cubans had lower hypertension and US born Mexicans had lower rates of diabetes compared to US born Mexican-Americans. Among foreign-born Hispanics, Puerto Ricans and Dominicans had higher hypertension prevalence compared to Mexican-Americans, whereas Cubans, Dominicans and Central/South Americans had lower diabetes prevalence. These results indicate that Hispanics cannot be

[illegible]

American lifestyle habits. Prior research has shown that years in the US is a significant predictor of increasing BMI and poor health outcomes^{39,40}. Conversely, as a positive part of acculturation, they also gain more access to healthcare. The balance between positive and negative aspects of acculturation and how they play out across subgroups has yet to be explored. Although a standard for measuring acculturation has not been reached^{34,41}, our findings indicate that country of origin may be an important proxy for social determinants related to migration and acculturation and must be considered when exploring these processes.

In contrast, the relatively uniform prevalence of hypertension and diabetes among US-born Hispanic subgroups indicates that the determinants of disease expression in these participants are similar across different Hispanic sub-groups. While US-born Hispanics may share common cultural values, our study also indicates that they have high rates of high school education, insurance, and routine care. These factors have been shown to be important determinants of health^{18,24}. We also show that US-born Hispanics lack the language disparity of their foreign-born counterparts.

A strength of this study is the large sample size. Also, this study included Dominicans, and Central/South Americans, which have been excluded in prior Hispanic subgroups analysis. However, our findings must be interpreted in light of certain limitations. First this is a cross-sectional analysis and therefore we cannot attribute causality. Nonetheless it presents a valuable starting point for a future longitudinal analysis of the acculturation process and how it manifests itself in each Hispanic subgroup. Second, the data are self-reported and thus could be biased by under- or over-reporting disease prevalence. However, self-reported hypertension has been shown to be similar to physician-diagnosed hypertension among patients who receive routine care^{42,43}. Another limitation is the issue of misclassification. For instance, although all Puerto Ricans are US-born, because the interviews were conducted only in mainland US, we found that not all Puerto Ricans born outside mainland US considered themselves as US-born. Furthermore, the self-identified Mexican versus Mexican-American categories did not closely correlate with US nativity or years in US. That is, some respondents describing themselves as Mexican were US born whereas other respondents who identified as Mexican-American were born in Mexico. These discrepancies indicate that birthplace alone does not necessarily determine ethnic identity among Mexican and Mexican-American Hispanics. Lastly, although we would have preferred to analyze Central and South Americans as two separate groups, these respondents were grouped into a single category in the NHIS survey.

We conclude that Hispanics are a heterogeneous group and cannot be represented by one subset of this population. This heterogeneity is particularly evident among foreign-born Hispanics. Further, traditional variables of demographics, socioeconomic status, or acculturation do not fully account for differences in disease prevalence across foreign-born Hispanic subgroups. We hypothesize that nationality might be a proxy for risk factors that accompany various migration experiences and the process of acculturation. This concept would be worth exploring in future studies. We need to cease assuming that Mexican Americans or any other Hispanic subgroup are representative of all Hispanics and to take into account the cultural diversity within this population. Future studies should explore how a

migrant's incorporation into the American healthcare system is influenced by the country of origin.

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