

# Prevalence of Isolated Systolic Hypertension in Mexican Americans and Other Hispanics

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**Abstract Background:** Isolated systolic hypertension (ISH) is one of hypertension hemodynamic subtypes. Although the prevalence of hypertension has been reported in Hispanics, the prevalence of ISH has not been fully investigated. **Design and Methods:** 7,546 Hispanic adults aged  $\geq 18$  years, representative of the US civilian noninstitutionalized Hispanic population, were selected from the National Health and Nutrition Examination Survey (NHANES) through a stratified multistage probability clustered sampling design. The prevalence estimates of ISH and 95% confidence intervals in Hispanics (including Mexican Americans and other Hispanics) were estimated by conducting weighted frequency and logistic procedures. **Results:** The prevalence of ISH was 11.21% among Hispanics adults in 1999-2010. The prevalence of ISH did not differ significantly between Mexican Americans and other Hispanics. Women were more prevalent in ISH than men (12.98% vs 8.98%) in Hispanics. Adults with a lower education (high school or below) had higher prevalence of ISH than adults with a higher education (college or above) in either of Hispanics (12.10% vs 7.58%) and Mexican Americans (12.14% vs 6.99%). For Hispanics and Mexican Americans, the prevalence of ISH was higher in elderly women than in elderly men, and higher in elderly adults with a lower education than in those with a higher education. Among all Hispanics who received a lower education, women had higher prevalence of ISH than men (14.17% vs 9.80%). In Mexican women, those with a lower education were more prevalent in ISH than those with a higher education (13.48% vs 6.64%). **Conclusion:** ISH is more prevalent in adults with a lower education in Mexican Americans. Considering Mexican Americans accounted for the vast majority of the Hispanic population and 74.09% of them received a high school education or below, more efforts and investments for enhancing the education attainment in Mexican Americans may significantly improve ISH in the Hispanic population.

**Keywords:** hypertension, isolated systolic hypertension, Hispanics, prevalence, blood pressure

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## 1. Introduction

Hispanic population is the fastest-growing segment of the population and has become the largest minority in the United States (US). According to the 2010 Census, 50.5 million people in the US are of Hispanic or Latino origin and account for 16% of the US population [1]. Recent studies show that measures of awareness and treatment of hypertension were lower in Hispanics than in non-Hispanic whites and blacks whereas Hispanics have the prevalence of hypertension similar to non-Hispanic whites and lower than non-Hispanic blacks [2,3]. Uncontrolled hypertension may increase the risks of adverse cardiovascular and renal outcomes. Burden of hypertension in Hispanics is a growing concern with the Hispanic population increasing.

Isolated systolic hypertension (ISH) is one of the three hypertension hemodynamic subtypes [4]. It is defined as levels of systolic blood pressure (SBP) greater than or

equal to 140 mm Hg with levels of diastolic blood pressure (DBP) less than 90 mm Hg. Elevated SBP has been thought to be more important than elevated DBP as a risk factor for adverse cardiovascular and renal outcomes [5]. When combined with other risk factors (e.g. poor diet and lack of exercise), ISH may lead to serious health problems, such as stroke, heart disease, chronic kidney disease and dementia [6,7,8,9]. Although the prevalence of hypertension has been reported among Hispanics in several studies [2,3,10], the prevalence patterns of ISH have never been completely investigated in the US Hispanic population.

In this study, we collected data of Hispanic adults from continuous National Health and Nutrition Examination Survey (NHANES) 1999-2010 [11]. Available data were analyzed to estimate the prevalence of ISH by age, sex and education in Hispanics, following the advisory guidelines from the National High Blood Pressure Education Program with the expressed purpose of further characterizing high SBP. The purpose of this study was to provide the prevalence estimates of ISH by demographic

factors in the US population of Hispanic adults aged 18 years or above and identify differences in the prevalence of ISH between Mexican Americans and other Hispanics in the US.

## 2. Design and Methods

### 2.1. NHANES Design

NHANES 1999-2010 were conducted by the National Center for Health Statistics in the US Centers for Disease Control and Prevention. Beginning in 1999, continuous NHANES included a series of two-year surveys designed to assess the health and nutrition status among children and adults in the US. In each survey, approximately 10,000 volunteers, representative of the civilian non-institutionalized US population, were selected from 30 counties across the US through a stratified multistage probability clustered sampling design. Complete descriptions of the continuous NHANES and sampling designs have been reported in the previous study [12]. All adults provided written informed consent, and the study was approved by the National Center for Health Statistic Institutional/Ethics Review Board [13].

### 2.2. Study Sample

A total of 9,777, 10,897, 9,971, 10,198, 10,001 and 10,425 persons participated in both home interview and clinical examination in NHANES 1999-2000, NHANES 2001-2002, NHANES 2003-2004, NHANES 2005-2006, NHANES 2007-2008 and NHANES 2009-2010, respectively. We pooled data from these six cycles of NHANES surveys to obtain adequate sample sizes and power for unbiased estimation of the prevalence of ISH in Hispanics. Out of 61,269 persons included in NHANES 1999-2010, 33,560 adults aged 18 years or above participated in both interview and examination, of which 9,363 individuals were Hispanics. In these Hispanic adults, 436 individuals with incomplete SBP or DBP measurements and 1,445 individuals who reported antihypertensive medication use were excluded from the final analysis. Finally we had a total of 7,546 Hispanic adults aged 18 years or above available in the continuous NHANES for further study.

### 2.3. BP Measurements and ISH Determination

BP measurements (including SBP and DBP) were recorded by trained physicians using mercury sphygmomanometer in accordance with a standardized procedure [14]. Mid-arm circumference was measured to determine the selection of sphygmomanometer with appropriate cuff size for each participant prior to BP examination. Each participant was taken up to four SBP/DBP readings for accuracy consideration after resting quietly in a sitting position for 5 minutes. The average SBP and DBP were calculated based on the individual readings according to the NHANES specifications. The SBP and DBP values quoted in this study represented averages reported to the examinees. According to the seventh Joint National Commission guidelines [15], a participant was diagnosed to have hypertension if levels of average SBP were  $\geq 140$  mm Hg or levels of average DBP were  $\geq 90$  mm Hg. ISH was one of hypertension subtypes

and defined as average SBP  $\geq 140$  mm Hg and average DBP  $< 90$  mm Hg.

### 2.4. Information for Cross Factors

Race/ethnicity was self-reported in the NHANES demographic survey component. There were five race/ethnicity categories classified in NHANES: Mexican Americans, other Hispanics, non-Hispanic whites, non-Hispanic blacks and other race. Since the objective of this study was to investigate the prevalence of ISH among Hispanic adults, other race/ethnicity categories were excluded from the study sample. Three demographic characteristics (age, sex and education) were selected as demographic factors to see differences in the prevalence of ISH across all factors. Demographic information on age, sex and education were assessed through questionnaire files of NHANES. Hispanic adults were divided into three groups in terms of age: young adults if they were aged  $\geq 18$  years and  $< 40$  years, middle-aged adults if ages were  $\geq 40$  years and  $< 60$  years, and elderly adults if ages  $\geq 60$  years. The participant's level of education was classified as high school or less and college or above, based on the number of years in school.

### 2.5. Statistical Analysis

NHANES report and analysis guidelines were followed in the present study [16]. Survey procedures were performed using SAS statistical software (SAS version 9.2, SAS Institute Inc., Cary, NC, USA) to account for NHANES complex sampling design, estimate mean values and percentages, and provide 95% confidence intervals (CIs) (Taylor series linearization). The sample from each survey was weighted to the US population corresponding to the respective time period during which the survey was performed. The stratified multistage probability sampling design was similar from NHANES 1999-2000 to NHANES 2009-2010. To estimate the prevalence of ISH in NHANES 1999-2010, a 12-year weight was created by assigning one third of the 4-year weight for NHANES 1999-2002 and one sixth of the 2-year weight for NHANES 2003-2004, 2005-2006, 2007-2008 and 2009-2010, respectively.

The prevalence of ISH was age-adjusted by direct standardization to the NHANES 1999-2010 Hispanic population, except for age-specific estimates. In NHANES 1999-2010, 47.42% of Hispanic adults were aged 18-39 years, 26.82% were 40-59 years and 25.76% were 60 years or older with weights of 0.4742, 0.2682 and 0.2576, respectively, which were used to calculate the prevalence of ISH by demographic factors. The prevalence estimates (PEs) and 95% confidence intervals (CIs) of ISH were calculated by using survey frequency procedure. Weighted logistic regression models were conducted to test the differences in ISH prevalence between Mexican Americans and other Hispanics.

## 3. Results

### 3.1. Demographic Characteristics of Participants

A total of 7,546 Hispanic adults aged 18 years or above were included; of which 5,858 persons were Mexican Americans and 1,688 were other Hispanics. Average age

of Hispanic adults in the study sample was 36.92 years. Women account for 48.61%. 67.78% of Hispanics received a high school education or below (74.09% in Mexican Americans). Compared with other Hispanics,

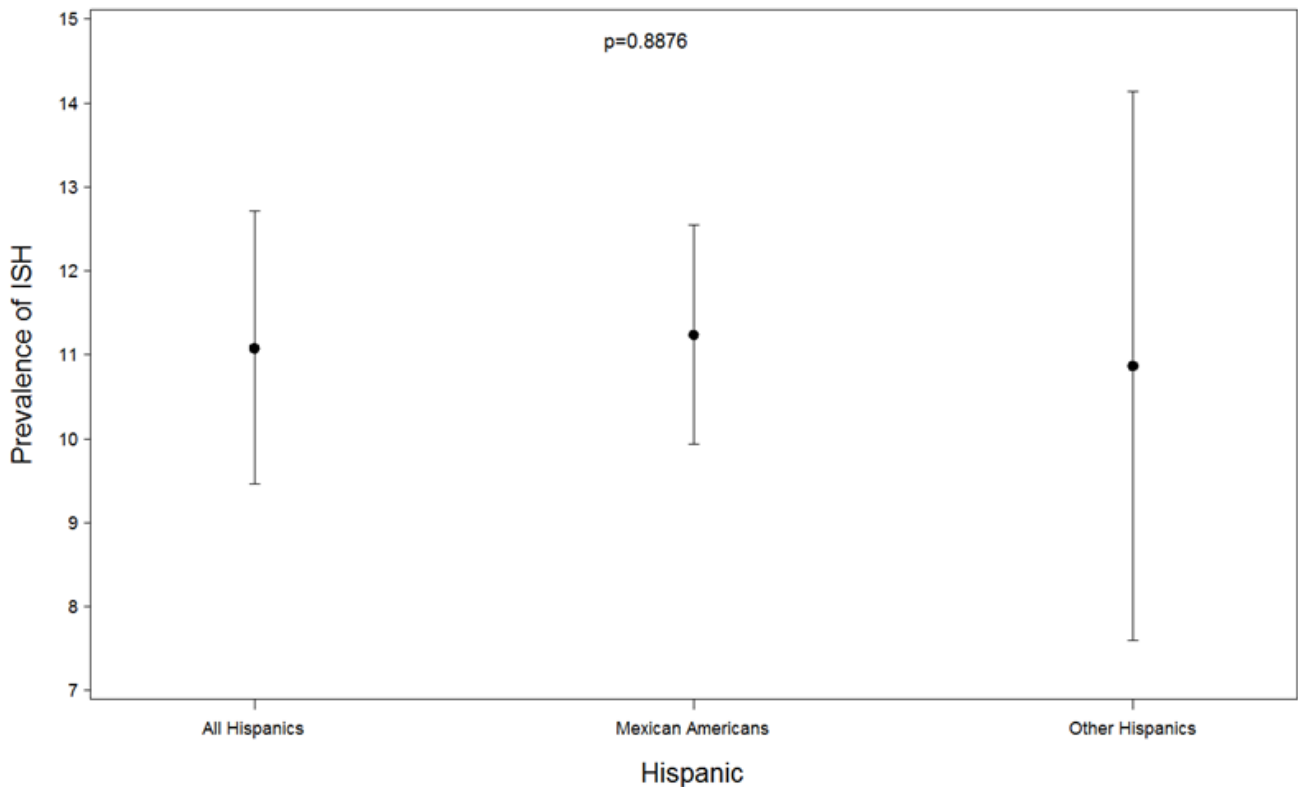
Mexican Americans were older and had higher percentage of women and individuals who received a high school education or below (Table 1).

**Table 1. Characteristics of Mexican Americans and other Hispanics in NHANES 1999-2010, United States**

Characteristics	Mean or percentage (95% CI)			P values <sup>a</sup>
	All Hispanics	Mexican Americans	Other Hispanics	
Age, years	36.92 (36.41, 37.42)	35.95 (35.41, 36.50)	38.50 (37.56, 39.44)	<0.0001
18-39 years, %	63.21 (61.57, 64.84)	65.44 (63.41, 67.47)	59.54 (56.34, 62.74)	0.0012
40-59 years, %	29.45 (28.02, 30.87)	28.16 (26.58, 29.74)	31.55 (28.39, 34.71)	
≥60 years, %	7.35 (6.58, 8.12)	6.39 (5.61, 7.18)	8.91 (7.18, 10.63)	
Sex				
Men, %	51.39 (50.27, 52.51)	53.71 (52.26, 55.17)	47.58 (45.39, 49.77)	<0.0001
Women, %	48.61 (47.49, 49.73)	46.29 (44.83, 47.74)	52.42 (50.23, 54.61)	
Education				
High school or below, %	67.78 (65.90, 69.67)	74.09 (71.90, 76.29)	57.39 (54.13, 60.65)	<0.0001
College or above, %	32.22 (30.33, 34.10)	25.91 (23.71, 28.10)	42.61 (39.35, 45.87)	

Notes: <sup>a</sup> P value indicates the significance for the difference in the mean or percentage of a characteristic between Mexican Americans and other Hispanics; P<0.05 means a significant difference.

NHANES, national health and nutrition examination survey; CI, confidence interval



**Figure 1.** Prevalence and 95% confidence intervals of isolated systolic hypertension in Mexican Americans and Other Hispanics in NHANES 1999-2010, United States (NHANES, national health and nutrition examination survey; ISH, isolated systolic hypertension; p<0.8876 indicates the non-significant difference in the prevalence of ISH between Mexican Americans and Other Hispanics)

### 3.2. Overall Prevalence of ISH

Figure 1 shows the overall prevalence of ISH among all Hispanic adults and the prevalence among Mexican Americans and other Hispanics during 1999-2010. The prevalence of ISH was 11.08% (95% CI=9.46-12.71%) among all Hispanics in 1999-2010. The prevalence of ISH was 11.24% (95% CI=9.94-12.55%) among Mexican Americans and 10.87% (95% CI=7.59-14.14%) among other Hispanics. The difference in the prevalence of ISH was not significant between Mexican Americans and other Hispanics.

### 3.3. Prevalence of ISH by Age, Sex and Education

The prevalence of ISH by age, sex and education among all Hispanics, Mexican Americans and other Hispanics was presented in Table 2. From this table, we can see that there were not significant differences in the prevalence of ISH by the selected factors between Mexican Americans and other Hispanics during 1999-2010 (all P values>0.05). In either of Mexican Americans and other Hispanics (as well as all Hispanics), the prevalence of ISH increased with age, and was the highest

in elderly adults and the lowest in young adults. Women were more prevalent in ISH (PE=12.98%, 95% CI=10.92-15.04%) than men (PE=8.98%, 95% CI=7.39-10.57%) in all Hispanics. Adults who received a high school education or below had higher prevalence of ISH than adults with at least a college education in either of

Hispanics (PE=12.10%, 95% CI=10.50-13.71% vs PE=7.58%, 95% CI=4.95-10.20%) and Mexican Americans (PE=12.14%, 95% CI=10.63-13.65%) vs PE=6.99%, 95% CI=4.64-9.33%), but not in other Hispanics.

**Table 2. Prevalence of isolated systolic hypertension by age, gender and education among Mexican Americans and other Hispanics in NHANES 1999-2010, United States**

Characteristics	Prevalence (95% CI)			P values <sup>a</sup>
	All Hispanics, %	Mexican Americans, %	Other Hispanics, %	
Age, years				
18-39 years, %	1.58 ( 1.05, 2.11)	1.81 (1.15, 2.46)	1.17 (0.30, 2.04)	0.2958
40-59 years, %	6.07 (4.74, 7.40)	5.56 (4.41, 6.72)	6.82 (4.09, 9.54)	0.3647
≥60 years, %	33.79 (28.09, 39.50)	34.53 (30.20, 38.85)	32.93 (21.26, 44.60)	0.8033
Sex				
Men, %	8.98 (7.39, 10.57)	10.02 (8.64, 11.40)	7.57 (4.43, 10.71)	0.1794
Women, %	12.98 (10.92, 15.04)	12.34 (10.67, 14.01)	13.72 (9.64, 17.80)	0.5422
Education				
High school or below, %	12.10 (10.50, 13.71)	12.14 (10.63, 13.65)	12.03 (8.44, 15.62)	0.9722
College or above, %	7.58 (4.95, 10.20)	6.99 (4.64, 9.33)	7.99 (4.02, 11.96)	0.6008

Note: The prevalence of ISH was age-adjusted by direct standardization to the NHANES 1999-2010 Hispanic population, except for age-specific estimates.

<sup>a</sup> P values is to test the significance for a difference in the prevalence of ISH by factors between Mexican Americans and other Hispanics; P<0.05 indicates a significant difference.

NHANES, national health and nutrition examination survey; CI, confidence interval; ISH, isolated systolic hypertension.

**Table 3. Prevalence and changes of isolated systolic hypertension stratified by characteristics among Mexican Americans and other Hispanics in NHANES 1999-2010, United States**

Characteristics	Stratified prevalence (95% CI)			P values <sup>a</sup>
	All Hispanics, %	Mexican Americans, %	Other Hispanics, %	
Age 18-39 years				
Men	2.50 (1.69, 3.32)	2.81 (1.79, 3.83)	1.89 (0.61, 3.16)	0.2994
Women	0.57 (0.19, 0.95)	0.62 (0.17, 1.06)	0.49 (0.00, 1.25)	0.8027
Age 40-59 years				
Men	5.28 (3.95, 6.61)	5.28 (3.76, 6.80)	5.28 (2.60, 7.97)	0.9988
Women	6.87 (4.51, 9.23)	5.89 (4.09, 7.69)	8.11 (3.42, 12.81)	0.3225
Age ≥60 years				
Men	24.75 (19.46, 30.03)	28.24 (24.15, 32.32)	20.41 (9.81, 31.00)	0.2041
Women	42.19 (35.15, 49.22)	40.64 (34.62, 46.66)	43.92 (30.12, 57.71)	0.6756
Age 18-39 years				
High school or below	1.94 (1.22, 2.66)	2.00 (1.18, 2.83)	1.79 (0.33, 3.25)	0.8114
College or above	0.84 (0.22, 1.46)	1.27 (0.38, 2.16)	0.37 (0.00, 1.12)	0.2458
Age 40-59 years				
High school or below	6.39 (4.99, 7.80)	6.29 (4.81, 7.78)	6.59 (3.67, 9.51)	0.8559
College or above	5.46 (2.69, 8.23)	3.59 (1.90, 5.29)	7.14 (2.25, 12.03)	0.0988
Age ≥60 years				
High school or below	36.75 (31.28, 42.23)	36.90 (32.02, 41.78)	36.54 (23.98, 49.10)	0.9599
College or above	22.18 (13.24, 31.12)	21.04 (12.71, 29.37)	22.89 (9.51, 36.27)	0.8108
Men				
High school or below	9.80 (8.45, 11.14)	10.61 (9.12, 12.11)	8.63 (6.04, 11.23)	0.1920
College or above	6.35 (3.23, 9.47)	7.50 (4.82, 10.18)	5.27 (0.13, 10.41)	0.5176
Women				
High school or below	14.17 (11.63, 16.70)	13.48 (11.57, 15.39)	15.17 (9.51, 20.82)	0.5850
College or above	8.69 (4.95, 12.44)	6.64 (3.38, 9.91)	10.08 (4.50, 15.65)	0.2818

Notes: The prevalence of isolated systolic hypertension is age-adjusted by direct standardization to the NHANES 1999-2010 Hispanic population, except for age-specific estimates.

<sup>a</sup> P value is to test the significance for a difference in the prevalence of ISH stratified by combined factors between Mexican Americans and other Hispanics; P<0.05 indicates a significant difference.

NHANES, national health and nutrition examination survey; CI, confidence interval.

### 3.4. Prevalence of ISH Stratified by Age-Sex, Age-Education and Sex-Education

The prevalence of ISH stratified by age-sex, age-education and sex-education among all Hispanics, Mexican Americans and other Hispanics were presented in Table 3. Stratification analyses show that the prevalence of ISH stratified by the combinations of the three selected factors did not differ significantly between

Mexican Americans and other Hispanics (all P values>0.05). In Hispanics and Mexican Americans, the prevalence of ISH was higher in elderly women (PE=42.19%, 95% CI=35.15-49.22% in Hispanics and PE=40.64%, 95% CI=34.62-46.66% in Mexican Americans) than in elderly men (PE=24.75%, 95% CI=19.46-30.03% in Hispanics and PE=28.24%, 95% CI=24.15-32.32% in Mexican Americans) whereas it was lower in young women (PE=0.57%, 95% CI=0.19-0.95% in Hispanics and PE=0.62%, 95% CI=0.17-1.06% in

Mexican Americans) than in young men (PE=2.50%, 95% CI=1.69-3.32% in Hispanics and PE=2.81%, 95% CI=1.79-3.83% in Mexican Americans). Elderly Hispanics with a high school education or below had higher prevalence (PE=36.75%, 95% CI=31.28-42.23%) than elderly Hispanics who received a college education or above (PE=22.18%, 95% CI=13.24-31.12%), and elderly Mexican Americans had the same situation (PE=36.90%, 95% CI=32.02-41.78% vs PE=21.04%, 95% CI=12.71-29.37%). Among all Hispanics who received a high school education or below, women had higher prevalence of ISH than men (PE=14.17%, 95% CI=11.63-16.70% vs PE=9.80%, 95% CI=8.45-11.14%). In Mexican women, those with a high school education or below were more prevalent in ISH than those with at least a college education (PE=13.48%, 95% CI=11.57-15.39% vs PE=6.64%, 95% CI=3.38-9.91%).

#### 4. Discussion

The NHANES includes a series of national probability surveys valuable for comparative estimates of the prevalence and trends in health status by sociodemographic and other factors. It has been used to provide a comprehensive description of the prevalence of hypertension [2,3,17] and examine racial disparity in cardiovascular risk factors [18]. We used data from the continuous NHANES to examine the prevalence of ISH in Hispanic adults, including Mexican Americans and other Hispanics in the US. The prevalence of ISH was not significantly different between Mexican Americans and other Hispanics. Women were more prevalent in ISH than men in all Hispanics. Adults who received a high school education or below had higher prevalence of ISH than adults with at least a college education in either of Hispanics and Mexican Americans.

The overall prevalence of ISH has been reported to be similar in Hispanics and non-Hispanic whites. In this study, the prevalence estimate of ISH among Hispanic adults during 1999-2010 was 11.08% which is consistent with the prevalence estimate from a previous study about ISH among adults [19], considering differences between studies in the exclusion criteria and the US population on which the age-adjustment for the prevalence estimate was based. Non-significant difference in the prevalence of ISH between Mexican Americans and other Hispanics may be mostly contributed to their Spanish genetic admixture and experiences of similar culture in the US. A previous study has shown that the prevalence of hypertension does not differ in men and women in Hispanics [10]. This may not be the case for ISH. Our results indicated that Hispanic women had higher prevalence of ISH than Hispanic men (although not significant, similar trend was found in either of Mexican Americans and other Hispanics). Moreover, education attainment has been demonstrated to be inversely associated with the prevalence of hypertension in Mexican Americans or Spanish population [10,20]. However, Hispanics or Mexican Americans with a high school education or below was more likely to have ISH compared with those who received at least a college education.

SBP has been shown to be a stronger risk factor of myocardial infarction for women compared with men [21]. Among women aged 65-84 years, the hazard of death

significantly increased with increase in SBP [22]. The higher prevalence of ISH in women than in men, particularly in elderly women may increase the risk of myocardial infarction and cardiovascular related mortality among Hispanic women in the future. SBP is associated with mortality from both coronary heart disease and stroke in people between the ages of 40 and 89 years [23]. Our study showed that lower education attainment (high school or below) was associated with higher prevalence of ISH. This may reveal the increased risks of coronary heart disease and stroke, and shorten overall life expectancy and life expectancy free of cardiovascular disease in the US Hispanics who received a high school education or below. In this regard, more efforts and investments would be recommended to improve the education attainment in the US Hispanics, particularly in Mexican Americans.

In the present study, one interesting finding was that young men had higher prevalence of ISH than young women while elderly men had lower prevalence than elderly women. Although ISH is less common in young adults, ISH in young men should be a public concern as young adults account for the vast majority of the Hispanic population. The prevalence of ISH was 17.44% higher in elderly women than in elderly men whereas it was 1.93% lower in young women than in young men in overall Hispanics. This may explain why the prevalence of ISH was higher in women than in men as elderly women dominated the prevalence in women. Individuals with a high school education or below had higher prevalence than those who received a college education or above in either of elderly Hispanics and elderly Mexican Americans; the education attainment was not associated with the prevalence of ISH in young and middle-aged adults. Thus the association of low education with the high prevalence of ISH in Hispanics and Mexican Americans in this study may be contributed by the group of elderly adults because of the higher prevalence in elderly adults with a high school education or below compared with those with at least a college education. The mechanisms by which high school education or below were associated with the higher prevalence of ISH are still open to discussion. Lower education itself probably does not act on ISH. The primary mechanisms may involve conventional risk factors for ISH, including obesity, smoking, alcohol use and antihypertensive medication use [24]. Low educational attainment has been demonstrated to predispose individuals to high strain positions, characterized by higher levels of demand and low levels of control, which has been associated with elevated SBP [25]. Higher social status seems to be a buffer against many sources of stress which affects blood pressure, and people with low education levels may not be able to resist stress better because of low socioeconomic positions, which may be additional mechanisms contributing to educational disparities in SBP [26].

ISH is a predominant type of hypertension in elderly people. Similarly to hypertension, ISH was increasingly prevalent with age and is the most common in participants with at least 60 years of age among Mexican Americans and other Hispanics as well as combined Hispanics in the present study. ISH in older adults results from an increase in artery stiffness and a decrease in artery compliance [27-230]. Structural components of the arterial wall have been thought to be major determinants of vessel stiffness while

the functional regulations by smooth muscle tone influenced by circulating and endothelium-derived vasoactive mediators, including nitric oxide and endothelin-1 may also be responsible for artery stiffness [27, 28]. The deterioration in arterial compliance was determined through both structural and functional changes in large arteries [29, 30]. Structural changes result in a decrease of the lumen-to-wall ratio, the overall lumen cross-sectional area and an increase of arterial stiffness which involve the aorta and other elastic arteries. Functional changes result in the baroreceptor dysfunction or lower sensitivity of beta-receptors and increased sympathetic activity. All these changes may raise the level of SBP and cause the higher prevalence of ISH in the elderly Hispanic population (including Mexican Americans and other Hispanics).

NHANES is a series of national surveys representative of the US non-institutionalized civilian population. A complex stratified multistage probability sampling design is used to select participants. Sampling weights and strata were incorporated into data analyses to account for the NHANES design. Our prevalence estimates of ISH are representative at the national level and can be generalized to the entire non-institutionalized population of US Hispanics (Mexican Americans and other Hispanics). In this study, the group of other Hispanics was relatively small compared with Mexican Americans. The small sample size might limit analysis power and bias the estimates of the prevalence and sampling errors in this group. Hypertensive individuals who took prescribed medications for treatment were not included in the study because we could not determine what types of hypertension they had (isolated systolic hypertension, isolated diastolic hypertension or systolic and diastolic hypertension) due to antihypertensive drug therapy. Exclusion of these hypertensive persons under drug treatment may underestimate the prevalence of ISH in the US Hispanics. A few Hispanic individuals who were diagnosed to have hypertension used non-pharmacological techniques to control hypertension. The information for hypertension subtypes among these persons with SBP successfully controlled by physical activity, weight control and other non-pharmacological techniques was not available. Our definition of ISH treated them as normotensive persons, and this might also underestimate the prevalence of ISH in the study.

## 5. Perspectives

Our study indicates that there were no significant differences in the prevalence of ISH in Mexican Americans and other Hispanics. However, women were more prevalent in ISH than men and adults with a high school education or below had higher prevalence of ISH than adults with a higher education in Hispanics. These findings suggest that more changes in public health measures or clinical practice are needed to improve the ISH in Hispanic women, particularly in those with a lower education. ISH was more prevalent in adults with a lower education in Mexican Americans. Considering Mexican Americans accounted for the vast majority of the Hispanic population and 74.09% of them received a high school education or below, more efforts and investments for

enhancing the education attainment in Mexican Americans may significantly improve ISH in the Hispanic population.

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## Disclosures

The authors declare no conflicts of interest in this study.

## List of Abbreviations

BP	blood pressure;
CI	confidence interval;
DBP	diastolic blood pressure;
ISH	isolated systolic blood pressure;
NHANES	National Health and Nutrition Examination Survey;
PE	prevalence estimate;
SBP	systolic blood pressure;
US	United States.

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