BMJ Open

# Disparities in Multiple Sleep Characteristics among US-born and Foreign-born Non-Hispanic Whites and Hispanic/Latino Heritage Groups in the United States: Modification by Birthplace and Language Preference



| | |
|---|---|
| Journal: | *BMJ Open* |
| Manuscript ID | bmjopen-2020-047834 |
| Article Type: | Original research |
| Date Submitted by the Author: | 09-Dec-2020 |
| Complete List of Authors: | Gaston, Symielle; National Institute of Environmental Health Sciences,<br>Martinez-Miller, Erline<br>McGrath, John<br>Jackson II, W. Braxton<br>Napoles, Anna<br>Pérez-Stable, Eliseo<br>Jackson, Chandra |
| Keywords: | SLEEP MEDICINE, EPIDEMIOLOGY, PUBLIC HEALTH, SOCIAL MEDICINE |
| | |

*I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.*

*The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.*

*Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.*

**Reviewer Information Page**

| | |
|---|---|
| Article Type: | Original research |
| Abstract Word Count: | 249/250 |
| Word Count of Manuscript | 3,016 |
| Number of Figures & Tables: | 5/5 |
| References | 40/40 |
| Number of Supplemental Figures & Tables: | 11 |

# Disparities in Multiple Sleep Characteristics among US-born and Foreign-born Non-Hispanic Whites and Hispanic/Latino Heritage Groups in the United States: Modification by Birthplace and Language Preference

Symielle A. Gaston, PhD, MPH [1]

Erline E. Martinez-Miller, PhD, MPH [2,3]

John McGrath, MA [2]

W. Braxton Jackson, II, MPH [2]

Anna Nápoles, PhD, MPH [4]

Eliseo J. Pérez-Stable, MD [5]

Chandra L. Jackson, PhD, MS [1,6]

[1] Epidemiology Branch, National Institute of Environmental Health Sciences, National Institutes of Health, Department of Health and Human Services, Research Triangle Park, NC, USA

[2] Social & Scientific Systems, a DLH Holding Company, Durham, NC, USA

[3]Department of Population and Data Sciences, University of Texas Southwestern Medical Center, Dallas, TX

[4]Office of the Scientific Director, National Institute on Minority Health and Health Disparities, National Institutes of Health, Department of Health and Human Services, Bethesda, MD, USA

[5]Office of the Director, National Institute on Minority Health and Health Disparities and the Division of Intramural Research, National Heart, Lung and Blood Institute, National Institutes of Health, Department of Health and Human Services, Bethesda, MD, USA

[6]Divison of Intramural Research, National Institute on Minority Health and Health Disparities, National Institutes of Health, Department of Health and Human Services, Bethesda, MD, USA

Please direct correspondence to Dr. Chandra L. Jackson at 111 TW Alexander Drive, Research Triangle Park, N.C. 27709; telephone: 984-287-3701; fax: 301-480-3290; email: Chandra.Jackson@nih.gov.

**ACKNOWLEDGEMENTS:**

The authors would like to thank the National Center for Health Statistics for designing, conducting, and disseminating the survey and data files. We would like to thank all respondents who participated in the survey. This research was presented, in part, at the SLEEP 2020 Virtual Meeting, August 27-30, 2020.

**FUNDING:**

This work was funded by the Intramural Program at the National Institutes of Health (NIH), National Institute of Environmental Health Sciences (NIEHS, Z1AES103325) and the Division of Intramural Research, National Institute on Minority Health and Health Disparities.

**CONFLICT OF INTEREST:**

The authors declare they have no conflict of interest.

**DATA SHARING STATEMENT:**

The data are publicly available. No additional data are available.

## ABSTRACT

**Background:** Prior studies suggest that sleep health may vary by birthplace and Hispanic/Latino heritage.

**Methods:** Using pooled 2004-2017 National Health Interview Survey data, we investigated whether sleep disparities varied by birthplace among adult non-Hispanic Whites (NHWs) and Hispanic/Latinos in the United States (US). Adjusting for sociodemographic and behavioral/clinical characteristics, survey-weighted Poisson regressions with robust variance estimated prevalence ratios (PRs) and 95% confidence intervals (CIs) of self-reported sleep characteristics (e.g., sleep duration, trouble and staying asleep) among (1) foreign-born NHWs and Hispanic/Latino heritage groups vs. US-born NHWs and (2) Hispanic/Latino heritage groups vs. foreign-born NHWs.

**Results:** Among 254,699 participants with a mean age±standard error 47±0.9 years, 81% self-identified as NHW, 12% Mexican, 2% Puerto Rican, 1% Cuban, 1% Dominican, and 3% Central/South American. Compared to US-born NHWs, foreign-born NHWs were more likely to report poor sleep quality (e.g., $PR_{\text{trouble staying asleep}}$=1.27 [95% CI:1.17-1.37]), and US-born Mexicans were no more likely to report non-recommended sleep duration while foreign-born Mexicans were less likely (e.g., $PR_{\leq 5\text{-hours}}$=0.52 [0.47-0.57]). Overall, Mexicans had lower prevalence of poor sleep quality vs. US-born NHWs, and PRs were lowest for foreign-born Mexicans. US-born Mexicans were more likely than foreign-born NHWs to report shorter sleep duration. Regardless of birthplace, Puerto Ricans were more likely to report shorter sleep durations vs. NHWs. Generally, sleep duration and quality were better among Cubans and Dominicans vs. US-born NHWs but were similar vs. foreign-born NHWs.

**Conclusion:** Sleep disparities varied by birthplace and Hispanic/Latino heritage, and each characteristic should be considered in sleep disparities research.

**Keywords:** Sleep; Emigrants and Immigrants; Hispanic Americans; European Continental Ancestry Group; Health Status Disparities; Acculturation

## Article summary

- Although prior evidence suggests that sleep health differs by birthplace or immigration status and by Hispanic/Latino heritage/descent (e.g., Mexican, Puerto Rican), prior studies of sleep health disparities often include both United States (US)-born and foreign-born non-Hispanic Whites (NHWs) in the reference group and, despite diversity in heritage/descent, combine Latinos into one comparison group.
- Using recent, nationally representative data, we simultaneously considered how both birthplace and Hispanic/Latino heritage may modify differences in sleep between Latinos and NHWs.
- There was a higher prevalence of poor sleep quality characteristics among foreign-born NHWs compared to US-born NHWs.
- Disparities in sleep between Latino heritage groups and NHWs varied by birthplace, and English language interview was associated with worse sleep duration and quality among Mexicans and Puerto Ricans.
- Our results highlight the importance of considering birthplace, heritage, and language preference/acculturation as potential modifiers in future studies of sleep health disparities, which can also support data driven approaches towards targeted interventions.

## Strengths and limitations of this study

Although limited by the cross-sectional study design, use of self-reported data, use of a unidimensional proxy measure of language acculturation, and potential for residual confounding, study strengths include: the use of recent nationally representative data consisting of a large sample size that allowed for robust stratification, assessment of several important sleep dimensions, and adjustment for multiple relevant confounders.

## INTRODUCTION

Poor sleep, which is prevalent among United States (US) adults [1, 2] and disproportionately affects certain racial/ethnic minority groups [3], may partially explain racial/ethnic disparities in poor health indicators like obesity [4-6]. Studies of racial/ethnic disparities in sleep to date may be limited by imprecise measurement of characteristics related to the social construct of race/ethnicity. For instance, evidence suggests that certain Hispanic/Latino heritage groups (e.g., Puerto Ricans) but not others (e.g., Mexicans) are more likely to report worse sleep compared to non-Hispanic Whites (NHWs) [7]. However, heterogenous heritage groups within the Hispanic/Latino community are often combined into one category [7-10]. Further, the reference group of NHWs is also heterogenous and usually comprises both US-born and foreign-born NHWs despite evidence of sleep disparities between the two [9, 11]. As illustrated by the socioecological framework, both an individual's characteristics and social context should be considered to better understand health behaviors and outcomes [12]. Therefore, in addition to individual characteristics like birthplace, ethnicity, and cultural background, consideration of the social environment related to culture (e.g., language spoken with friends) in studies of racial/ethnic disparities is important. For instance, language acculturation is a strong indicator of overall acculturation that is hypothesized to influence disparities in health behaviors [13, 14].

Recent studies using nationally representative data have not yet simultaneously considered immigration status/birthplace, heterogeneity in heritage, and language preference as modifying factors of racial/ethnic disparities in multiple sleep health characteristics among Hispanics/Latinos compared to NHWs [7, 9, 11, 15-17]. Although a recent study used National Health Interview Survey (NHIS) data and reported variation in Hispanic/Latino-NHW differences in sleep duration by Hispanic/Latino heritage [18], the study lacked information regarding other important sleep quality characteristics and did not compare the sleep of foreign-born and US-born NHWs [17]. To address important research gaps, we used the most recent data from a

large, nationally representative sample of the US adult population of Hispanics/Latinos and NHWs to disentangle immigration status (birthplace) and heritage as contributors to sleep disparities. We sought to determine whether multiple sleep characteristics differed between (1) foreign-born and US-born NHWs and (2) both foreign-born and US-born Hispanic/Latino heritage groups compared to NHWs. In a secondary aim, we investigated language preference as a modifier.

## METHODS

### NHIS

The NHIS is the largest annually administered cross-sectional, in-person household survey in the US. NHIS survey protocols are described in detail elsewhere [19]. Briefly, NHIS uses a multistage probability sampling design to obtain a nationally representative sample of the non-institutionalized civilian population of children and adults in the US. After recruitment, trained interviewers used computer-assisted personal interviewing to obtain health-related data from participants. All provided informed consent. NHIS recruitment and data collection protocols were approved by the National Center for Health Statistics Review Board.

### Study Population

We pooled self-reported NHIS data collected from survey years 2004 to 2017, which were merged by the Integrated Health Interview Series [20]. The overall response rate was 80% for adults (range: 74.2% in 2008 - 83.8% in 2004). Eligible participants were aged ≥18 years and self-identified as either NHW alone or Hispanic/Latino of any race. In this analysis, we focused on NHW and Hispanic/Latino of any race participants because they represent the majority and largest ethnic minority populations in the US. Of 329,279 participants, ineligible participants were excluded, sequentially, if data were missing or implausible for sleep duration

(≤2 or ≥23 hours; 2.2%) or birthplace (0.1%) or were currently pregnant (0.9%) (Supplemental Figure S1). Hispanic/Latino participants who reported "other" or multiple ethnicities (1.4%) were excluded because study objectives were to distinguish between Hispanic/Latino heritage groups. After excluding participants with missing data on potential confounders (18.1%), the final analytic sample comprised 254,699 participants.

## Patient and Public Involvement

Patients and the public were not involved in the development and design of this study.

## Measures

### *Race/ethnicity*

Participants were asked, 'What race do you consider yourself to be?' with response options that met the Office of Management Budget Race and Ethnic Standards for Federal Statistics and Administrative Reporting [21]. Participants provided a 'yes' or 'no' response to 'Do you consider yourself to be Hispanic or Latino?'. Participants who self-identified as White race alone and non-Hispanic were categorized as NHW. Only region of birth (e.g., Europe) was available among NHW participants (Supplemental Table S1), which prevented measurement of national heritage among NHWs. Participants of any race who self-identified as Hispanic/Latino were asked to provide Hispanic origin, ancestry, or heritage with response options of Puerto Rican, Cuban, Dominican, Mexican, and Central/South American.

### *Multiple Sleep Characteristics*

Participants responded to the following question: 'On average, how many hours of sleep do you get in a 24-hour period?". Reported values ≥30 minutes were rounded up to the nearest hour and values of <30 minutes were rounded down to the nearest hour; NHIS provided average sleep duration in whole numbers [19]. Using evidence-based recommendations [22],

we defined two non-mutually exclusive levels of short sleep duration: very short (≤5-hours) and short (<7-hours). Long sleep duration may be associated with worse health or be an artifact of poor health; therefore, we defined long sleep as >9-hours and recommended sleep as 7-9-hours [23].

During survey years 2013 to 2017, participants reported the number of times/week they had trouble falling asleep, trouble staying asleep, nonrestorative sleep (awoke not feeling rested), and sleep medication during the week prior to the interview. We defined frequent trouble falling asleep, trouble staying asleep, nonrestorative sleep, and sleep medication use as reports of ≥3 nights (or days) per week versus <3 nights (or days) per week.

*Birthplace*

Participants were asked "Where were you born?". Birthplace included dichotomous categories of US-born (born in a US state or the District of Colombia [D.C.]) or foreign-born (not born in a US state or D.C., born in a US territory [including Puerto Rico], or born outside of the US and US territories).

*Language of Interview*

Language is an important dimension of acculturation associated with health behaviors (e.g., smoking) among Hispanics/Latinos [13]. Language of interview was the assumed language preference, and we derived a proxy three-level language acculturation variable: English (high acculturation), English and Spanish (medium acculturation), or Spanish (low acculturation).

*Potential Confounders*

Parameterizations of each potential confounder are listed in Table 1. Sociodemographic characteristics included age category, sex/gender, annual household income, educational attainment, unemployed/not in the labor force, 2000 Standard Occupational Classification categories for longest held occupation, marital/cohabitating status, time in the US, and Census region of residence. Health behaviors included smoking status, physical activity based on the Guidelines for Americans [24], and alcohol consumption. Clinical characteristics included body mass index (BMI) category calculated from self-reported height and weight [25], serious psychological distress [26], and self-report of physician-diagnosed dyslipidemia (available for survey years 2011-2017), hypertension, prediabetes or diabetes, and cancer. Certain behavioral and clinical characteristics were not considered individually but were used to define "ideal" cardiovascular health (yes vs. no), a dichotomized version of the American Heart Association's metric that includes meeting all of the following criteria: never smoker/quit smoking in the prior 12 months, normal BMI, and no report of physician diagnosis of dyslipidemia, hypertension, or prediabetes/diabetes [27].

**Statistical Analysis**

All analyses accounted for the NHIS complex survey design using survey weights to account for non-response and oversampling of certain groups (e.g., racial/ethnic minorities, older adults). We applied direct age standardization using the 2010 Census as the reference population to estimate descriptive statistics. Poisson regressions with robust variance estimated prevalence ratios (PRs) and 95% confidence intervals (CIs) for each sleep characteristic among foreign-born NHWs and both US-born and foreign-born Hispanic/Latino heritage groups, separately, compared to US-born NHWs (Table 2). With the same approach, we estimated PRs and 95% CIs for each sleep characteristic among each US-born and foreign-born Hispanic/Latino heritage group, separately, compared to foreign-born NHWs (Table 3).

Models were adjusted for *a priori* potential confounders: age category, sex/gender, annual household income, educational attainment, employment status, occupational class, marital status, region of residence, alcohol consumption, serious psychological distress, "ideal" cardiovascular health, and cancer. Lastly, in a secondary analysis, we further stratified by language of interview (English, English and Spanish, and Spanish) as a proxy measure of language acculturation and compared sleep characteristics for each Hispanic/Latino heritage group to US-born NHWs (Figure 1). Four separate sensitivity analyses are described in Table 4. We performed all analyses using Stata/SE 15. A two-sided p-value of 0.05 was used to determine statistical significance.

## RESULTS

### Study Population Characteristics

Among 254,669 participants, mean age ± standard error was 47±0.9 years (Table 1). Most participants self-identified as NHW (81%) and the remainder as Hispanic/Latino of the following heritage: Mexican (12%), Puerto Rican (2%), Cuban (1%), Dominican (1%), Central/South American (3%). Most (96%) NHW and approximately half of Mexican (47%) and Puerto Rican (50%) participants were US-born. Most Cubans (78%), Dominicans (84%), and Central/South Americans (86%) were foreign-born. We present but do not interpret results for Central/South Americans because of within-group heritage heterogeneity.

### Foreign-born NHWs Compared to US-born NHWs

Compared to US-born NHWs, foreign-born NHWs were not more likely to report non-recommended sleep duration (Table 2), but were more likely to report trouble staying asleep (PR=1.27 [1.17-1.37]), nonrestorative sleep (PR=1.06 [1.00-1.12]), and sleep medication use (PR=1.34 [1.16-1.55]).

**US-born and foreign-born Hispanic/Latino Heritage Groups Compared to US-born NHWs**

Compared to US-born NHWs, US-born Mexicans were as likely to report non-recommended sleep duration; however, foreign-born Mexicans were less likely to report non-recommended sleep duration ($PR_{very\ short}$=0.52 [0.47-0.57], $PR_{short}$=0.70 [0.67-0.73], $PR_{long}$=0.75 [0.66-0.85]). Overall, Mexicans were less likely to report trouble falling, trouble staying asleep, nonrestorative sleep, and sleep medication use compared to US-born NHWs; however, racial/ethnic differences were larger across comparisons between foreign-born Mexicans and US-born NHWs.

Overall, both US-born and foreign-born/island-born Puerto Ricans were more likely than US-born NHWs to report very short sleep (PR 1.39 [1.26-1.53]) and short sleep (PR= 1.20 [1.14-1.25]) with little variation by nativity/birthplace. Similarly, there was negligible variation by birthplace for sleep quality characteristics among US-born and foreign-born/island-born Puerto Ricans who were marginally less likely to report trouble staying asleep (PR=0.91 [0.83-1.00]) and no more likely to report other poor sleep quality characteristics compared to US-born NHWs.

Small sample sizes resulted in wide confidence intervals for US-born and foreign-born Cubans and Dominicans. Overall, adults of Cuban heritage were less likely to report non-recommended sleep duration and poor sleep quality characteristics compared to US-born NHWs. However, only non-US born Cubans had lower prevalence of short sleep and poor sleep quality characteristics. Generally, Dominicans were less likely to report trouble falling asleep and no more likely to report non-restorative sleep or sleep medication use compared to US-born NHWs. However, only foreign-born Dominicans were less likely to report short sleep and trouble staying asleep.

**US-born and foreign-born Hispanic/Latino Heritage Groups Compared to foreign-born NHWs**

Compared to foreign-born NHWs, US-born Mexicans were more likely to report short sleep duration (PR=1.19 [1.12-1.26]) but foreign-born Mexicans were no more likely. US-born Mexicans were no more likely to report trouble staying asleep compared to foreign-born NHWs (PR=0.97 [0.86-1.10]); however, foreign-born Mexicans were less likely to report trouble staying asleep (PR= 0.72 [0.62-0.84]; Table 3). Overall, Puerto Rican adults were more likely to report very short and short sleep duration, trouble falling asleep, trouble staying asleep, and sleep medication use compared to foreign-born NHWs with little evidence of variation by birthplace. Small sample sizes of US-born Cubans and Dominicans resulted in wide, often overlapping confidence intervals limiting the ability to examine differences by birthplace.

**Hispanic/Latino-Heritage Groups Compared to US-born NHWs: Modification by Language of Interview**

Prevalence of non-recommended sleep duration among foreign-born Mexicans compared to US-born NHWs were lowest among subpopulations of foreign-born Mexicans with English/Spanish and Spanish versus English interviews (Figure 1). Additionally, among Mexicans, overall, those with Spanish interviews had the lowest prevalence of poor sleep quality compared to US-born NHWs. Among Puerto Ricans, overall, those with Spanish interviews had similar prevalence of shorter sleep durations and suggestively better sleep quality characteristics compared to US-born NHWs. Among Cubans and Dominicans, albeit imprecise, patterns of variation by language of interview were similar to those among Mexicans. Results of sensitivity analyses are provided in Table 4.

## DISCUSSION

In a nationally representative sample of NHW and Hispanic/Latino adults, we found sleep disparities between foreign-born and US-born NHWs, and differences in sleep characteristics varied by Hispanic/Latino heritage, birthplace/nativity, and language of interview among Hispanics/Latinos compared to NHWs. Compared to US-born NHWs, foreign-born NHWs had a higher prevalence of poor sleep quality indicators. Although habitual sleep duration was similar between US-born Mexicans and their NHW counterparts, foreign-born Mexican adults reported better sleep duration than US-born NHWs. Better sleep quality among foreign-born Mexican adults compared to US-born NHWs was of greater magnitude than the better sleep quality reported by US-born Mexicans compared to US-born NHWs. Puerto Rican adults generally reported worse sleep duration compared to NHWs. Acknowledging small sample sizes, foreign-born Cubans and Dominicans may generally have even better sleep duration and quality compared to US-born NHWs than US-born Cubans and Dominicans. Overall, Spanish language preference may be associated with increasingly better sleep among Hispanic/Latino heritage groups.

Our results are consistent with prior studies that suggest differences in sleep by birthplace and language preference. Most studies report better subjective sleep among foreign-born compared to US-born adults [10, 11, 15, 16], and our results were generally in agreement across each Hispanic/Latino heritage group except Puerto Ricans. Further, our results suggesting that birthplace is a modifier of sleep duration are congruent with findings of both an earlier study of NHIS data and the multisite Study of Women's Health Across the Nation (SWAN) where short sleep duration and sleep complaints were more often reported by US-born adults versus their foreign-born counterparts [10, 15]. Results of SWAN also suggested that language acculturation may mediate differences in sleep complaints, and similarly, completion of interviews in English versus Spanish were positively associated with probably clinically significant insomnia in a separate study of pregnant Latina women in San Diego [10, 28]. Like

our study, a different nationally-representative sample found no differences in short sleep duration among US-born Mexicans compared to US-born NHWs but lower odds of short sleep duration among foreign-born Mexicans compared to NHWs [7]. Prior studies either comprised solely individuals of Mexican heritage or used a heterogenous Hispanic/Latino category [7, 10, 15, 16, 28]. Importantly, our study extended this literature by illustrating heterogeneity across Hispanic/Latino heritage groups [29].

Differences in study populations, the grouping of Hispanics/Latinos, and sleep assessments likely contribute differences between results of our and some prior studies. Among Mexican women aged 21-40 years in Northern California, birthplace and language preference were not associated with sleep disturbances [30]. In a prior study using 2012 NHIS data, short sleep was more prevalent among US-born Hispanics/Latinos compared to US-born NHWs, and there were no differences in sleep duration between foreign-born Hispanics/Latinos and NHWs [9]. However, all individuals of Hispanic/Latino heritage were combined. In a recent study using 2004-2017 NHIS data, investigators reported higher odds of short sleep among all Hispanic/Latino heritage groups except US-born Cubans compared to NHWs [17]. Our conflicting results are likely due to differences in categorization of sleep duration (e.g., ≤6 hours and ≥9 hours versus 7-8 hours), adjustment sets, and modeling approaches [17, 23, 31]. Unlike our study, a multidimensional language acculturation measure was not associated with self-reported sleep problems among middle-aged Puerto Rican, Cuban, and Dominican women in New Jersey [29].

Several environmental and cultural factors that influence sleep behaviors and sleep health likely explain our findings. Lower social status, lower socioeconomic position, and stress related to immigration status among foreign-born NHWs likely drive the disparity with US-born NHWs. Variation in sleep by birthplace and Hispanic/Latino heritage is likely due to differentially experienced environments and unique cultural backgrounds that influence health and coping behaviors. Housing environments, color-related stigma and discrimination, social (including

acculturation) stressors, structural barriers, and health behaviors like smoking vary by Hispanic/Latino heritage groups with individuals of Puerto Rican descent usually more negatively affected compared to other heritage groups, which may manifest as differences in sleep health [13, 32-38].

There are several study limitations. First, the cross-sectional study design precluded our ability to make causal assumptions about birthplace as a predictor of sleep health. Secondly, all data were self-reported; however, misclassification of individuals into categories of race/ethnicity, sleep duration and quality, birthplace/nativity, language preference/acculturation, and covariates is likely non-differential [39]. Third, our unidimensional, proxy measure of language acculturation did not capture the full breadth of acculturation [40], and data was not available for NHWs; however, psychometric analyses have shown language explains most of the variance in acculturation scales [13]. Nonetheless, future studies would benefit from using multidimensional measures of acculturation. Fourth, the observational nature of the study fosters potential for residual confounding. Fifth, small sample sizes upon stratification (e.g., Dominicans) and within group heterogeneity (e.g., birthplace for NHWs and Central/South Americans) limited interpretability of results for certain heritage groups. Lastly, we tested for many associations and did not adjust for multiple comparisons due to the novelty of our study and our interest in identifying potential associations that may warrant further investigation.

Study strengths included the use of the most recently available data collected from a nationally representative and large sample that allowed for robust stratification by birthplace, race/ethnicity, Hispanic/Latino heritage, and language preference/acculturation as well as adjustment for multiple confounders. Further, we used evidence-based categories of sleep duration, assessed multiple important sleep dimensions, and directly estimated prevalence ratios [18, 23, 31]. Our study extended prior literature as one of the few using national data to compare sleep health between US-born and foreign-born NHWs as well as between foreign-born Hispanic/Latinos and their NHW counterparts [9, 11].

In conclusion, consideration of variation in birthplace/nativity, heritage, language, and other cultural factors in future studies of racial/ethnic disparities in sleep health is important. Sleep disparities studies in the US often consider NHWs as the reference group despite heterogeneity in birthplace, which may lead to inaccurate conclusions about racial/ethnic disparities in sleep health. Studies also often combine Hispanic/Latino heritage groups despite cultural heterogeneity. Future studies should disentangle cultural contributors in the social environment that influence sleep health and sleep health behaviors. Findings from such studies have the potential to inform culturally tailored public health interventions designed to improve sleep health among racial/ethnic subpopulations.

## AUTHOR CONTRIBUTIONS

**Authors: Symielle A. Gaston, Erline E. Martinez-Miller, John McGrath, W. Braxton Jackson II, Anna Nápoles, Eliseo J. Pérez-Stable, Chandra L. Jackson**

*Study concept and design:* CL. Jackson, SA. Gaston.

*Acquisition of data:* CL. Jackson.

*Statistical Analysis:* J. McGrath, WB. Jackson II.

*Interpretation of data:* SA. Gaston, EE. Martinez-Miller, J. McGrath, WB. Jackson II, A. Nápoles, EJ. Pérez-Stable, CL. Jackson.

*Drafting of the manuscript:* SA. Gaston, EE. Martinez-Miller.

*Critical revision of the manuscript for important intellectual content:* SA. Gaston, EE. Martinez-Miller, J. McGrath, WB. Jackson II, A. Nápoles, EJ. Pérez-Stable, CL. Jackson.

*Administrative, technical, and material support:* CL. Jackson.

*Obtaining funding and study supervision:* CL. Jackson.

*Final Approval:* SA. Gaston, EE. Martinez-Miller, J. McGrath, WB. Jackson II, A. Nápoles, EJ. Pérez-Stable, CL. Jackson.

## REFERENCES


1 Institute of Medicine Committee on Sleep Medicine Research. The National Academies Collection: Reports funded by National Institutes of Health. In: Colten HR, Altevogt BM, eds. *Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem*. Washington (DC): National Academies Press (US) National Academy of Sciences. 2006.

2 Liu Y, Wheaton AG, Chapman DP*, et al.* Prevalence of Healthy Sleep Duration among Adults--United States, 2014. *MMWR Morbidity and mortality weekly report* 2016;**65**:137-41.

3 Johnson DA, Jackson CL, Williams NJ*, et al.* Are sleep patterns influenced by race/ethnicity - a marker of relative advantage or disadvantage? Evidence to date. *Nature and science of sleep* 2019;**11**:79-95.

4 Jackson CL, Redline S, Emmons KM. Sleep as a potential fundamental contributor to disparities in cardiovascular health. *Annual review of public health* 2015;**36**:417-40.

5 Jackson CL. Determinants of racial/ethnic disparities in disordered sleep and obesity. *Sleep Health* 2017;**3**:401-15.

6 Jackson CL, Walker JR, Brown MK*, et al.* A workshop report on the causes and consequences of sleep health disparities. *Sleep* 2020;**43**.

7 Whinnery J, Jackson N, Rattanaumpawan P*, et al.* Short and long sleep duration associated with race/ethnicity, sociodemographics, and socioeconomic position. *Sleep* 2014;**37**:601-11.

8 Berge JM, Fertig A, Tate A*, et al.* Who is meeting the Healthy People 2020 objectives?: Comparisons between racially/ethnically diverse and immigrant children and adults. *Families, systems & health : the journal of collaborative family healthcare* 2018;**36**:451-70.

9 Cunningham TJ, Wheaton AG, Ford ES*, et al.* Racial/ethnic disparities in self-reported short sleep duration among US-born and foreign-born adults. *Ethnicity & health* 2016;**21**:628-38.

10 Hale L, Troxel WM, Kravitz HM*, et al.* Acculturation and sleep among a multiethnic sample of women: the Study of Women's Health Across the Nation (SWAN). *Sleep* 2014;**37**:309-17.

11 Newsome V, Seixas A, Iwelunmor J*, et al.* Place of birth and sleep duration: Analysis of the national health interview survey (NHIS). *International journal of environmental research and public health* 2017;**14**.

12 *Principles of Community Engagement*. Atlanta, GA: Clinical and Translational Science Awards (CTSA) Community Engagement Key Function Committee Task Force on the Principles of Community Engagement. Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry. National Institutes of Health 2011.

13 Lara M, Gamboa C, Kahramanian MI, *et al.* Acculturation and Latino health in the United States: a review of the literature and its sociopolitical context. *Annual review of public health* 2005;**26**:367-97.

14 Grandner MA, Khader WS, Warlick CD, *et al.* Acculturation and sleep: implications for sleep and health disparities. *Sleep* 2019;**42**.

15 Hale L, Rivero-Fuentes E. Negative acculturation in sleep duration among Mexican immigrants and Mexican Americans. *Journal of immigrant and minority health* 2011;**13**:402-7.

16 Seicean S, Neuhauser D, Strohl K, *et al.* An exploration of differences in sleep characteristics between Mexico-born US immigrants and other Americans to address the Hispanic Paradox. *Sleep* 2011;**34**:1021-31.

17 Garcia C, Sheehan CM, Flores-Gonzalez N, *et al.* Sleep Patterns among US Latinos by Nativity and Country of Origin: Results from the National Health Interview Survey. *Ethnicity & disease* 2020;**30**:119-28.

18 Buysse DJ. Sleep health: can we define it? Does it matter? *Sleep* 2014;**37**:9-17.

19 Statistics NCfH. Survey Description, National Health Interview Survey, 2015. Hyattsville, Maryland 2016.

20 Blewett LA, Rivera-Drew JA, Griffin R, *et al.* IPUMS Health Surveys: National Health Interview Survey, Version 6.2. Minneapolis: University of Minnesota 2016.

21 OMB. Standards for Maintaining, Collecting, and Presenting Federal Data on Race and Ethnicity. A Notice by the Management and Budget Office on 09/30/2016. In: Budget OoMa, ed. *The Daily Journal of the United States Government* 2016.

22 Watson NF, Badr MS, Belenky G, *et al.* Recommended Amount of Sleep for a Healthy Adult: A Joint Consensus Statement of the American Academy of Sleep Medicine and Sleep Research Society. *Journal of clinical sleep medicine : JCSM : official publication of the American Academy of Sleep Medicine* 2015;**11**:591-2.

23 Hirshkowitz M, Whiton K, Albert SM, *et al.* National Sleep Foundation's updated sleep duration recommendations: final report. *Sleep health* 2015;**1**:233-43.

24 U.S. Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans. Washington, DC 2008.

25 U. S. Preventive Services Task Force. Screening for obesity in adults: recommendations and rationale. *American family physician* 2004;**69**:1973-6.

26 Kessler RC, Green JG, Gruber MJ, *et al.* Screening for serious mental illness in the general population with the K6 screening scale: results from the WHO World Mental Health (WMH) survey initiative. *International journal of methods in psychiatric research* 2010;**19 Suppl 1**:4-22.

27 Lloyd-Jones DM, Hong Y, Labarthe D*, et al.* Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation* 2010;**121**:586-613.

28 Manber R, Steidtmann D, Chambers AS*, et al.* Factors Associated with Clinically Significant Insomnia Among Pregnant Low-Income Latinas. *Journal of Womens Health* 2013;**22**:694-701.

29 Green R, Santoro NF, McGinn AP*, et al.* The relationship between psychosocial status, acculturation and country of origin in mid-life Hispanic women: data from the Study of Women's Health Across the Nation (SWAN). *Climacteric : the journal of the International Menopause Society* 2010;**13**:534-43.

30 Heilemann MV, Choudhury SM, Kury FS*, et al.* Factors associated with sleep disturbance in women of Mexican descent. *Journal of advanced nursing* 2012;**68**:2256-66.

31 Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Medical Research Methodology* 2003;**3**:21.

32 Cuevas AG, Dawson BA, Williams DR. Race and Skin Color in Latino Health: An Analytic Review. *Am J Public Health* 2016;**106**:2131-6.

33 Garcia JA, Sanchez GR, Sanchez-Youngman S*, et al.* RACE AS LIVED EXPERIENCE: The Impact of Multi-Dimensional Measures of Race/Ethnicity on the Self-Reported Health Status of Latinos. *Du Bois Rev* 2015;**12**:349-73.

34 Alcántara C, Gallo LC, Wen J*, et al.* Employment status and the association of sociocultural stress with sleep in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). *Sleep* 2019;**42**.

35 Dominguez K, Penman-Aguilar A, Chang MH*, et al.* Vital signs: leading causes of death, prevalence of diseases and risk factors, and use of health services among Hispanics in the United States - 2009-2013. *MMWR Morbidity and mortality weekly report* 2015;**64**:469-78.

36 Loredo JS, Soler X, Bardwell W*, et al.* Sleep health in U.S. Hispanic population. *Sleep* 2010;**33**:962-7.

37 Alcantara C, Patel SR, Carnethon M*, et al.* Stress and Sleep: Results from the Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study. *SSM - population health* 2017;**3**:713-21.

38 Gaston SA, Nguyen-Rodriguez S, Aiello AE*, et al.* Hispanic/Latino heritage group disparities in sleep and the sleep-cardiovascular health relationship by housing tenure status in the United States. *Sleep health* 2020.

39 Jackson CL, Patel SR, Jackson WB, 2nd*, et al.* Agreement between self-reported and objectively measured sleep duration among white, black, Hispanic, and Chinese adults in the United States: Multi-Ethnic Study of Atherosclerosis. *Sleep* 2018;**41**.

40 Martinez-Miller EE, Prather AA, Robinson WR*, et al.* US acculturation and poor sleep among an intergenerational cohort of adult Latinos in Sacramento, California. *Sleep* 2018.

**Table 1. Age-standardized Sociodemographic, Health Behavior, and Clinical Characteristics among non-Hispanic White and Hispanic/Latino Adults, National Health Interview Survey, 2004-2017 (N=254,669) [a]**

| Race/Ethnicity and Heritage | Overall | White (n=207,154) | | | Mexican (n=30,100) | | | Puerto Rican (n=5,077) | | | Cuban (n=2,518) | | | Dominican (n=1,658) | | | Central/ South American (n=8,162) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nativity** | | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** |
| **n (%)** | 254,699 | 207,154 (81%) | 198,297 (96%) | 8,857 (4%) | 30,100 (12%) | 14,282 (47%) | 15,818 (53%) | 5,077 (2%) | 2,544 (50%) | 2,533 (50%) | 2,518 (1%) | 559 (22%) | 1,959 (78%) | 1,658 (1%) | 264 (16%) | 1,394 (84%) | 8,162 (3%) | 1,113 (14%) | 7,049 (86%) |
| **Sociodemographic Characteristics** | | | | | | | | | | | | | | | | | | | |
| **Age, mean ± SE (years)** | 46.8±0.9 | 48.0±0.1 | 47.9±0.1 | 48.7±0.2 | 39.4±0.2 | 38.1±0.2 | 40.5±0.2 | 43.0±0.3 | 37.6±0.3 | 49.2±0.5 | 47.8±0.4 | 35.8±0.8 | 51.9±0.5 | 41.8±0.5 | 30.8±0.9 | 44.6±0.5 | 40.4±0.2 | 30.1±0.4 | 42.2±0.2 |
| **Female (%)** | 49 | 50 | 50 | 49 | 45 | 49 | 40 | 48 | 47 | 48 | 44 | 42 | 44 | 56 | 53 | 57 | 49 | 55 | 48 |
| **Annual Household Income (%)** | | | | | | | | | | | | | | | | | | | |
| <$35,000 | 30 | 28 | 28 | 27 | 44 | 37 | 51 | 46 | 35 | 52 | 42 | 25 | 45 | 54 | 36 | 56 | 43 | 24 | 44 |
| $35,000-$74,999 | 33 | 32 | 32 | 29 | 34 | 35 | 34 | 30 | 31 | 31 | 32 | 29 | 34 | 30 | 38 | 30 | 34 | 39 | 34 |
| ≥$75,000 | 37 | 40 | 40 | 44 | 21 | 29 | 15 | 24 | 33 | 17 | 26 | 46 | 21 | 16 | 26 | 14 | 23 | 37 | 21 |
| **Educational Attainment** | | | | | | | | | | | | | | | | | | | |
| <High school | 11 | 8 | 8 | 7 | 40 | 19 | 60 | 25 | 13 | 30 | 14 | 4 | 15 | 36 | 10 | 38 | 27 | 7 | 29 |
| High school graduate | 29 | 28 | 29 | 22 | 28 | 34 | 22 | 30 | 31 | 29 | 32 | 18 | 36 | 25 | 16 | 27 | 27 | 18 | 27 |
| Some college | 30 | 31 | 31 | 26 | 22 | 33 | 12 | 27 | 35 | 23 | 26 | 39 | 22 | 23 | 55 | 20 | 23 | 36 | 22 |
| ≥ College | 30 | 33 | 32 | 45 | 10 | 14 | 6 | 18 | 22 | 18 | 29 | 39 | 26 | 16 | 20 | 14 | 23 | 39 | 22 |
| **Unemployed/Not in the Labor Force (%)** | 38 | 38 | 38 | 36 | 38 | 40 | 36 | 46 | 43 | 49 | 37 | 33 | 37 | 40 | 47 | 39 | 33 | 27 | 33 |
| **Occupational Class (%)** | | | | | | | | | | | | | | | | | | | |
| Professional/ management | 21 | 22 | 22 | 27 | 9 | 13 | 5 | 12 | 17 | 9 | 18 | 32 | 15 | 9 | 20 | 7 | 11 | 24 | 10 |
| Support Services | 35 | 46 | 46 | 45 | 31 | 44 | 19 | 41 | 45 | 39 | 40 | 49 | 37 | 39 | 52 | 37 | 34 | 54 | 32 |
| Laborers | 45 | 31 | 32 | 28 | 60 | 43 | 76 | 47 | 38 | 52 | 42 | 19 | 48 | 53 | 28 | 55 | 55 | 22 | 58 |
| **Marital/Co-habiting Status (%)** | | | | | | | | | | | | | | | | | | | |
| Married/living with partner or cohabitating | 65 | 65 | 65 | 68 | 64 | 58 | 70 | 55 | 56 | 56 | 65 | 69 | 67 | 51 | 43 | 52 | 60 | 51 | 62 |
| Divorced/widowed/no live-In partner | 21 | 20 | 20 | 20 | 21 | 23 | 20 | 26 | 23 | 28 | 22 | 12 | 23 | 32 | 37 | 33 | 24 | 25 | 24 |
| Single/no live-in partner | 14 | 14 | 14 | 12 | 14 | 18 | 11 | 19 | 21 | 16 | 14 | 19 | 10 | 17 | 20 | 14 | 16 | 24 | 14 |
| **Language of Interview (%)** | | | | | | | | | | | | | | | | | | | |
| English | 95 | 100 | 100 | 99 | 64 | 91 | 39 | 81 | 91 | 73 | 45 | 85 | 36 | 45 | 88 | 40 | 54 | 88 | 51 |
| English and Spanish | 2 | 0 | 0 | 0 | 15 | 6 | 23 | 9 | 6 | 11 | 10 | 8 | 11 | 14 | 9 | 14 | 16 | 7 | 16 |
| Spanish | 3 | 0 | 0 | 0 | 21 | 2 | 38 | 11 | 3 | 16 | 45 | 7 | 54 | 42 | 3 | 46 | 30 | 5 | 33 |
| **Time in the US (states) (%)** | | | | | | | | | | | | | | | | | | | |
| ≥15 years | 24 | 22 | 100 | 78 | 77 | 100 | 77 | 80 | 100 | 80 | 66 | 100 | 66 | 75 | 100 | 75 | 70 | 100 | 70 |
| <15 years | 76 | 78 | 0 | 22 | 23 | 0 | 23 | 20 | 0 | 20 | 34 | 0 | 34 | 25 | 0 | 25 | 30 | 0 | 30 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Region of Residence (%)** | | | | | | | | | | | | | | | | | | | |
| Northeast | 18 | 19 | 19 | 29 | 2 | 1 | 3 | 50 | 46 | 49 | 9 | 12 | 8 | 75 | 54 | 77 | 23 | 13 | 23 |
| Midwest | 25 | 28 | 29 | 17 | 10 | 10 | 10 | 9 | 9 | 9 | 4 | 12 | 2 | 2 | 3 | 1 | 5 | 5 | 5 |
| South | 34 | 34 | 34 | 26 | 35 | 40 | 31 | 32 | 31 | 36 | 82 | 68 | 85 | 21 | 38 | 20 | 43 | 37 | 44 |
| West | 22 | 20 | 19 | 29 | 53 | 49 | 56 | 8 | 14 | 6 | 5 | 8 | 4 | 2 | 5 | 2 | 30 | 45 | 28 |
| **Health Behaviors** | | | | | | | | | | | | | | | | | | | |
| **Sleep duration (%)** | | | | | | | | | | | | | | | | | | | |
| <6 hours | 8 | 8 | 8 | 7 | 8 | 9 | 7 | 15 | 14 | 15 | 8 | 11 | 8 | 13 | 12 | 13 | 8 | 8 | 8 |
| <7 hours | 29 | 29 | 28 | 27 | 28 | 31 | 25 | 39 | 39 | 39 | 29 | 30 | 28 | 34 | 31 | 34 | 31 | 30 | 31 |
| 7-9 hours | 67 | 67 | 67 | 69 | 67 | 64 | 70 | 56 | 57 | 57 | 68 | 69 | 69 | 63 | 67 | 64 | 67 | 68 | 67 |
| >9 hours | 4 | 4 | 4 | 3 | 4 | 5 | 5 | 4 | 4 | 5 | 3 | 1 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |
| **Sleep Characteristics (%)** | | | | | | | | | | | | | | | | | | | |
| **Trouble falling asleep** (≥3 nights) | 20 | 21 | 21 | 17 | 19 | 22 | 17 | 27 | 26 | 27 | 18 | 30 | 16 | 19 | 15 | 19 | 18 | 31 | 16 |
| **Trouble Staying Asleep** (≥3 nights) | 29 | 30 | 30 | 23 | 22 | 26 | 18 | 29 | 29 | 28 | 20 | 33 | 19 | 21 | 18 | 21 | 20 | 28 | 19 |
| **Sleep Medication Use** (≥3 nights) | 11 | 11 | 11 | 8 | 7 | 8 | 6 | 12 | 13 | 12 | 8 | 7 | 7 | 10 | 6 | 10 | 5 | 14 | 5 |
| **Nonrestorative Sleep: Did not wake feeling rested** (≥3 days) | 64 | 63 | 63 | 66 | 65 | 63 | 67 | 61 | 63 | 61 | 66 | 55 | 67 | 63 | 52 | 64 | 67 | 71 | 67 |
| **Smoking status (%)** | | | | | | | | | | | | | | | | | | | |
| Never/ quit >12 months prior * | 80 | 79 | 79 | 83 | 86 | 84 | 88 | 81 | 79 | 81 | 84 | 88 | 84 | 93 | 92 | 93 | 91 | 86 | 91 |
| Quit ≤12 months ago | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 1 |
| Current | 18 | 20 | 20 | 15 | 13 | 15 | 11 | 18 | 19 | 17 | 15 | 11 | 15 | 6 | 8 | 6 | 9 | 12 | 8 |
| **Leisure-time Physical Activity (%)** | | | | | | | | | | | | | | | | | | | |
| Never/unable | 33 | 32 | 32 | 31 | 44 | 39 | 48 | 47 | 39 | 52 | 52 | 35 | 56 | 59 | 57 | 60 | 43 | 30 | 45 |
| Does not meet PA guidelines | 19 | 19 | 19 | 18 | 18 | 18 | 18 | 17 | 18 | 16 | 12 | 9 | 12 | 14 | 12 | 14 | 18 | 20 | 17 |
| Meets PA guidelines [b] * | 47 | 49 | 49 | 51 | 38 | 43 | 34 | 37 | 43 | 32 | 36 | 56 | 31 | 27 | 30 | 26 | 39 | 50 | 38 |
| **Alcohol Consumption (%)[c]** | | | | | | | | | | | | | | | | | | | |
| Lifetime abstainer | 16 | 14 | 14 | 18 | 25 | 19 | 30 | 26 | 20 | 30 | 30 | 18 | 32 | 35 | 21 | 36 | 29 | 15 | 30 |
| Former | 16 | 16 | 16 | 10 | 18 | 17 | 19 | 18 | 15 | 19 | 10 | 8 | 11 | 13 | 17 | 13 | 16 | 9 | 17 |
| Current | 68 | 70 | 70 | 72 | 57 | 64 | 51 | 56 | 65 | 51 | 60 | 74 | 57 | 52 | 62 | 50 | 55 | 75 | 53 |
| **Clinical Characteristics (%)** | | | | | | | | | | | | | | | | | | | |
| **Body Mass Index (BMI)** | | | | | | | | | | | | | | | | | | | |
| **Normal** (BMI 18.5 - <24.9 kg/m$^2$) * | 34 | 35 | 35 | 40 | 24 | 24 | 24 | 26 | 22 | 27 | 33 | 40 | 31 | 30 | 17 | 32 | 31 | 33 | 31 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overweight** (BMI 25.0-29.9 kg/m²) | 37 | 36 | 36 | 39 | 41 | 37 | 44 | 39 | 40 | 39 | 41 | 29 | 44 | 44 | 49 | 43 | 45 | 38 | 45 |
| **Obese** (BMI ≥30.0 kg/m²) | 29 | 29 | 29 | 21 | 35 | 38 | 32 | 36 | 38 | 34 | 26 | 31 | 25 | 26 | 34 | 25 | 25 | 30 | 24 |
| **Serious Psychological Distress** [d] (% yes) | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 3 | 4 | 6 | 2 | 6 | 3 | 3 | 3 |
| **Dyslipidemia** (% yes) [e] * | 52 | 52 | 52 | 52 | 51 | 49 | 53 | 56 | 60 | 52 | 52 | 58 | 53 | 54 | 45 | 54 | 51 | 49 | 52 |
| **Hypertension** (% yes) * | 34 | 34 | 35 | 30 | 34 | 37 | 32 | 37 | 35 | 39 | 33 | 23 | 35 | 37 | 41 | 37 | 28 | 27 | 29 |
| **Prediabetes/diabetes** (% yes) * | 15 | 14 | 14 | 12 | 24 | 25 | 23 | 23 | 21 | 24 | 14 | 19 | 15 | 20 | 29 | 20 | 15 | 12 | 16 |
| **"Ideal" Cardiovascular Health** [f] **(% yes)** | 12 | 12 | 12 | 15 | 7 | 8 | 6 | 6 | 7 | 5 | 7 | 13 | 6 | 6 | 8 | 5 | 9 | 13 | 9 |
| **Cancer (% yes)** | 12 | 12 | 12 | 10 | 5 | 7 | 4 | 8 | 11 | 7 | 6 | 7 | 6 | 3 | 7 | 3 | 5 | 8 | 5 |

Note. Data is presented as percentages or means ± standard errors. All estimates are weighted for the survey's complex sampling design. All estimates except for age are age-standardized to the US 2010 population. SE=standard error

[a] Data are presented as unweighted n's and weighted percentages. Percentages may not sum to 100 due to missing values or rounding.

[b] Weighted percentages for all represent the percentage of participants who self-identified as each racial/ethnic/heritage group in the study population. Weighted percentages for US-born (yes vs. no) represent the percentage of participants within each racial/ethnic/heritage group who are either US-born or foreign-born.

[c] Meets PA guidelines defined as ≥150 minutes/week of moderate intensity or ≥75 minutes/week of vigorous intensity or ≥150 minutes/week of moderate + vigorous intensity physical activity.

[d] Heavy alcohol consumption defined as ≥2 drinks/day for women and ≥3 drinks/day for men.

[e] Kessler-6 psychological distress scale score ≥13

[f] Dyslipidemia defined as high cholesterol in the 12 months prior to interview. Available for survey years 2011-2017.

[g] "Ideal" cardiovascular health includes never smoking/quit >12 months prior to interview, BMI 18.5 - <25 kg/m², meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes.

* Indicator of "ideal" cardiovascular health

**Table 2. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Foreign-born non-Hispanic Whites and Hispanic/Latino Heritage Groups compared to U.S.-born non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality in the Past Week | | | |
| **Group *(n)*** | **Very Short (≤5-hours) (n=21,227)** | **Short (<7-hours) (n=75,139)** | **Long (>9-hours) (n=9,190)** | **Trouble Falling Asleep (≥3 nights) (n=22,038)** | **Trouble Staying Asleep (≥3 nights) (n=30,013)** | **Non-restorative Sleep (≥3 days) (n=46,103)** | **Sleep Medication Use (≥3 nights) (n=11,097)** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | 1.03 (0.93-1.13) | 1.03 (0.99-1.08) | 1.07 (0.92-1.24) | 1.09 (0.99-1.19) | **1.27 (1.17-1.37)** | **1.06 (1.00-1.12)** | **1.34 (1.16-1.55)** |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | **0.76 (0.71-0.81)** | **0.87 (0.85-0.90)** | **0.87 (0.79-0.96)** | **0.77 (0.72-0.82)** | **0.65 (0.62-0.69)** | **0.90 (0.87-0.94)** | **0.52 (0.46-0.58)** |
| **U.S.-born (yes)** *(n=14,282)* | 1.04 (0.97-1.12) | 1.04 (1.00-1.08) | 0.98 (0.87-1.11) | **0.92 (0.85-0.99)** | **0.80 (0.74-0.85)** | 0.97 (0.93-1.01) | **0.66 (0.58-0.76)** |
| **U.S.-born (no)** *(n=15,818)* | **0.52 (0.47-0.57)** | **0.70 (0.67-0.73)** | **0.75 (0.66-0.85)** | **0.59 (0.54-0.65)** | **0.50 (0.46-0.55)** | **0.81 (0.77-0.85)** | **0.36 (0.29-0.43)** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.39 (1.26-1.53)** | **1.20 (1.14-1.25)** | 1.00 (0.84-1.20) | 1.05 (0.95-1.17) | 0.91 (0.83-1.00) | 0.98 (0.92-1.05) | 0.99 (0.85-1.15) |
| **U.S.-born (yes)** *(n=2,544)* | **1.44 (1.27-1.64)** | **1.23 (1.16-1.31)** | 1.08 (0.84-1.37) | 1.05 (0.91-1.21) | 0.97 (0.85-1.12) | 1.00 (0.92-1.09) | 0.96 (0.77-1.21) |
| **U.S.-born (no)** *(n=2,533)* | **1.32 (1.16-1.51)** | **1.15 (1.08-1.24)** | 0.94 (0.74-1.19) | 1.06 (0.92-1.22) | **0.84 (0.73-0.97)** | 0.95 (0.86-1.05) | 1.02 (0.83-1.25) |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | **0.83 (0.70-0.99)** | **0.89 (0.81-0.98)** | **0.69 (0.55-0.87)** | **0.78 (0.62-0.97)** | **0.70 (0.58-0.83)** | 0.90 (0.82-1.00) | **0.68 (0.53-0.89)** |
| **U.S.-born (yes)** *(n=559)* | 0.93 (0.66-1.29) | 1.04 (0.89-1.21) | 0.71 (0.34-1.47) | 0.97 (0.72-1.31) | 0.94 (0.70-1.26) | 0.98 (0.82-1.17) | 0.98 (0.57-1.69) |
| **U.S.-born (no)** *(n=1,959)* | **0.81 (0.66-0.99)** | **0.85 (0.76-0.95)** | **0.69 (0.54-0.88)** | **0.71 (0.53-0.95)** | **0.63 (0.49-0.79)** | **0.87 (0.78-0.98)** | **0.61 (0.43-0.85)** |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 0.90 (0.76-1.08) | 0.92 (0.83-1.01) | 0.72 (0.49-1.05) | **0.76 (0.62-0.92)** | **0.67 (0.55-0.83)** | 0.93 (0.82-1.05) | 0.81 (0.54-1.20) |
| **U.S.-born (yes)** *(n=264)* | 1.09 (0.68-1.74) | 1.09 (0.85-1.40) | 1.15 (0.49-2.73) | 0.73 (0.47-1.13) | 0.97 (0.65-1.43) | 0.98 (0.77-1.26) | 0.64 (0.31-1.31) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **U.S.-born (no)** *(n=1,394)* | 0.87 (0.73-1.03) | **0.88 (0.79-0.98)** | **0.60 (0.38-0.93)** | **0.76 (0.62-0.95)** | **0.61 (0.48-0.78)** | 0.92 (0.79-1.07) | 0.84 (0.54-1.30) |
| **Central/South American** | | | | | | | |
| **Overall** *(n=8,162)* | **0.78 (0.71-0.87)** | **0.93 (0.89-0.98)** | **0.68 (0.56-0.83)** | **0.76 (0.67-0.87)** | **0.65 (0.58-0.73)** | **0.89 (0.83-0.94)** | **0.42 (0.34-0.53)** |
| **U.S.-born (yes)** *(n=1,113)* | **1.30 (1.03-1.65)** | **1.18 (1.04-1.33)** | 0.82 (0.51-1.30) | 1.21 (0.96-1.51) | 0.98 (0.73-1.30) | 1.05 (0.93-1.19) | 0.64 (0.38-1.10) |
| **U.S.-born (no)** *(n=7,049)* | **0.72 (0.64-0.80)** | **0.89 (0.85-0.94)** | **0.66 (0.54-0.82)** | **0.68 (0.59-0.77)** | **0.59 (0.53-0.67)** | **0.85 (0.80-0.90)** | **0.39 (0.30-0.50)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Table 3. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to Foreign-born non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=56,372)**

| Group *(n)* | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality in the Past Week | | | |
| | Very Short (≤5-hours) (n=4,115) | Short (<7-hours) (n=14,048) | Long (>9-hours) (n=1,586) | Trouble Falling Asleep (≥3 nights) (n=3,431) | Trouble Staying Asleep (≥3 nights) (n=3,520) | Non-restorative Sleep (≥3 days) (n=7,734) | Sleep Medication Use (≥3 nights) (n=1,073) |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | 1.10 (0.96-1.26) | **1.12 (1.05-1.18)** | 1.06 (0.86-1.31) | 0.92 (0.81-1.05) | **0.87 (0.78-0.97)** | 1.06 (0.99-1.14) | 0.92 (0.73-1.14) |
| **U.S.-born (yes)** *(n=14,282)* | **1.17 (1.02-1.34)** | **1.19 (1.12-1.26)** | 1.04 (0.84-1.29) | 1.00 (0.87-1.14) | 0.97 (0.86-1.10) | 1.07 (0.99-1.15) | 0.98 (0.78-1.23) |
| **U.S.-born (no)** *(n=15,818)* | 0.89 (0.73-1.08) | 0.98 (0.90-1.06) | 1.05 (0.81-1.36) | **0.78 (0.66-0.94)** | **0.72 (0.62-0.84)** | 1.02 (0.93-1.12) | **0.68 (0.48-0.96)** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.75 (1.51-2.02)** | **1.34 (1.25-1.44)** | 1.13 (0.88-1.44) | **1.19 (1.03-1.39)** | 1.14 (0.99-1.31) | 1.06 (0.96-1.16) | **1.33 (1.07-1.64)** |
| **U.S.-born (yes)** *(n=2,544)* | **1.85 (1.54-2.22)** | **1.39 (1.27-1.51)** | 1.33 (0.95-1.85) | 1.20 (0.99-1.46) | **1.22 (1.02-1.46)** | 1.06 (0.95-1.18) | **1.32 (1.01-1.73)** |
| **U.S.-born (no)** *(n=2,533)* | **1.58 (1.32-1.90)** | **1.27 (1.16-1.39)** | 1.02 (0.77-1.35) | **1.22 (1.01-1.46)** | 1.09 (0.91-1.30) | 1.06 (0.94-1.20) | **1.41 (1.09-1.83)** |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | 0.97 (0.76-1.22) | 0.98 (0.88-1.10) | **0.69 (0.49-0.97)** | 0.92 (0.70-1.20) | 0.93 (0.76-1.15) | 1.03 (0.90-1.18) | 1.09 (0.77-1.55) |
| **U.S.-born (yes)** *(n=559)* | 1.03 (0.69-1.53) | 1.15 (0.96-1.37) | 0.83 (0.39-1.75) | 1.14 (0.79-1.65) | 1.17 (0.84-1.65) | 1.05 (0.85-1.29) | 1.63 (0.91-2.93) |
| **U.S.-born (no)** *(n=1,959)* | 0.94 (0.72-1.22) | 0.92 (0.81-1.05) | **0.66 (0.46-0.94)** | 0.82 (0.59-1.14) | 0.85 (0.65-1.10) | 1.04 (0.89-1.21) | 0.96 (0.63-1.45) |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 1.12 (0.89-1.43) | 1.02 (0.90-1.16) | 0.91 (0.57-1.45) | 0.88 (0.68-1.13) | 0.94 (0.72-1.23) | 1.00 (0.87-1.15) | 1.03 (0.67-1.59) |
| **U.S.-born (yes)** *(n=264)* | 1.40 (0.82-2.41) | 1.24 (0.97-1.60) | 1.80 (0.68-4.79) | 0.82 (0.51-1.31) | 1.25 (0.81-1.93) | 1.01 (0.78-1.32) | 0.97 (0.42-2.20) |
| **U.S.-born (no)** *(n=1,394)* | 1.06 (0.84-1.34) | 0.96 (0.84-1.10) | 0.73 (0.45-1.20) | 0.88 (0.68-1.16) | 0.87 (0.65-1.18) | 0.99 (0.84-1.18) | 1.02 (0.64-1.63) |

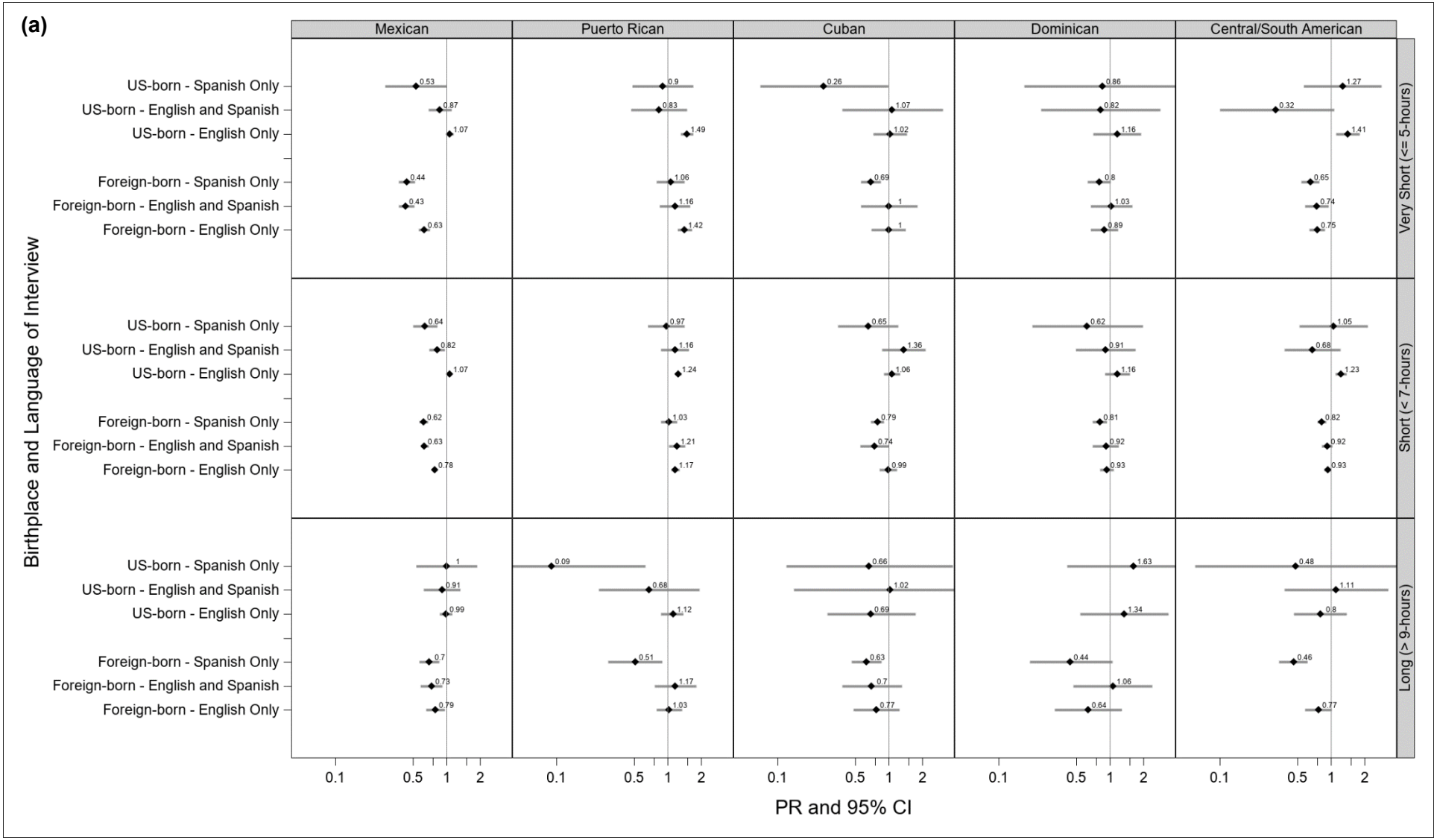
| Central/South American | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Overall** *(n=8,162)* | 1.00 (0.86-1.17) | **1.10 (1.02-1.17)** | 0.76 (0.57-1.02) | 0.94 (0.78-1.13) | 0.89 (0.76-1.04) | 1.02 (0.95-1.11) | **0.69 (0.51-0.91)** |
| **U.S.-born (yes)** *(n=1,113)* | **1.42 (1.06-1.92)** | **1.30 (1.13-1.49)** | 1.02 (0.59-1.75) | 1.27 (0.96-1.67) | 1.14 (0.86-1.52) | 1.08 (0.94-1.25) | 0.95 (0.56-1.62) |
| **U.S.-born (no)** *(n=7,049)* | 0.92 (0.78-1.08) | 1.05 (0.98-1.13) | 0.77 (0.56-1.05) | 0.84 (0.69-1.02) | **0.84 (0.72-0.99)** | 1.00 (0.92-1.09) | **0.64 (0.47-0.88)** |

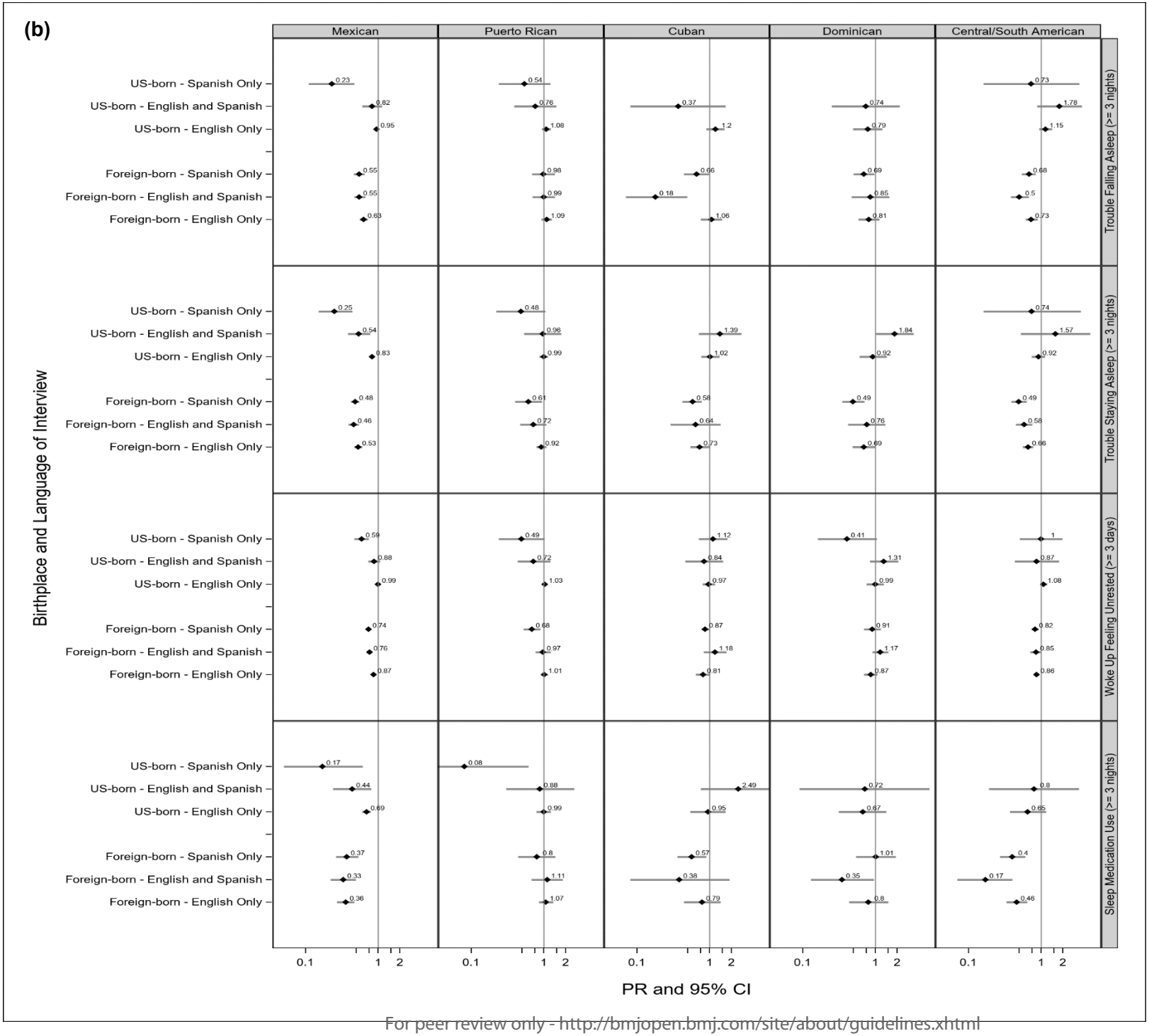
Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Figure 1. Fully-Adjusted Prevalence Ratios of Sleep (a) Duration and (b) Quality* Characteristics for Hispanic/Latino Heritage Groups compared to non-Hispanic Whites by Language Acculturation Status**, National Health Interview Survey, 2004-2017 (N=245,812)**





* Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.
** Language acculturation categories include high (English only interview), medium (English and Spanish interview), and low (Spanish only interview).

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/$m^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

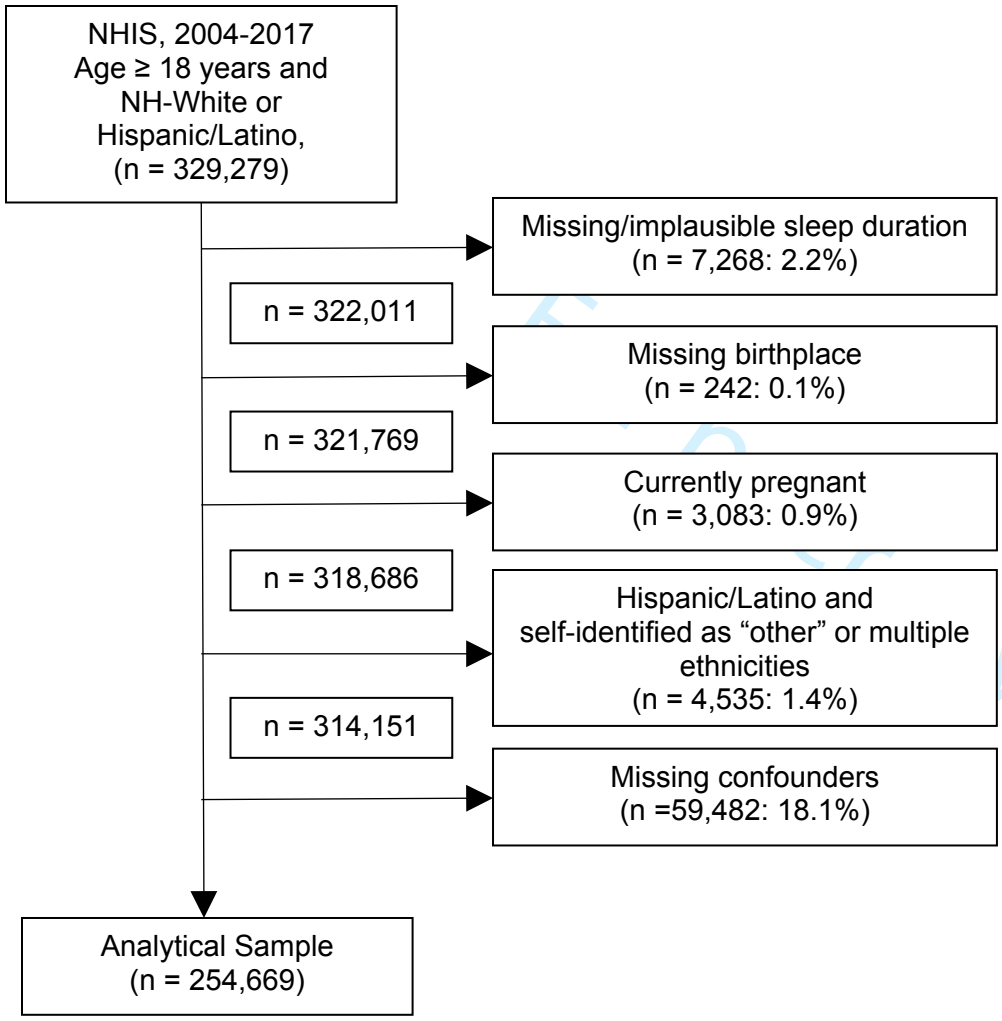
Note. All estimates are weighted for the survey's complex sampling design. Certain associations were not estimable due to small sample sizes and are, therefore, not provided (e.g., long sleep duration among Central/South Americans with medium acculturation compared to non-Hispanic Whites).

**Table 4. Summary of Sensitivity Analyses**

| Sensitivity Analysis Number | Purpose of Sensitivity Analysis | Method Employed | Summary of Results of Sensitivity Analysis |
|---|---|---|---|
| 1 | To investigate how results would be affected if we did not consider nativity/birthplace as a modifier of racial/ethnic differences in sleep | We combined both US-born and foreign-born participants; we then compared sleep characteristics among Hispanic/Latino heritage groups versus NHWs. | Combining foreign-born and US-born participants across both Hispanic/Latino heritage groups and NHWs would have missed important differences by nativity status (Supplemental Table S2). For instance, the lower prevalence of non-recommended sleep duration observed among foreign-born Mexicans vs. US-born NHWs (Table 2) would either have been underestimated or not have been observed if participants were not stratified by birthplace. |
| 2 | To investigate how results would be affected if we considered sex/gender and age as potential modifiers [40] | We stratified the original models by sex/gender (men, women) and by age category (18-30 years, 31-49 years, ≥50 years), separately. In models that were also stratified by language acculturation, we combined low and medium acculturation to increase sample sizes and improve statistical stability. | After stratification by sex/gender (Supplemental Table S3), point estimates were slightly stronger among men vs. women for sleep quality across comparisons with foreign-born NHWs and for very short as well as short sleep across comparisons with non-US born Mexicans. Sex/gender did not modify the remaining associations among Mexicans or Puerto Ricans.<br><br>The differences among both foreign-born NHWs and Mexicans compared to US-born NHWs that were observed in the main analysis were greater among younger and middle vs. older aged adults (Supplemental Table S4).<br><br>Across comparisons to non-US born NHWs, there was little variation by sex/gender for Mexicans and Puerto Ricans, but the differences were greater among younger vs. older aged adults (Supplemental Tables S5 and S6). |

| | | | |
|---|---|---|---|
| | | | In analyses stratified by language acculturation, lower prevalence of shorter sleep duration among foreign-born Mexicans compared to NHWs was stronger for men vs. women and for younger vs. older adults (Supplemental Tables S7 and S8). |
| 3 | To investigate how results would be affected if we adjusted for time in the US in the comparisons between foreign-born Hispanic/Latino heritage groups to their NHW counterparts [9, 17, 30] | Across comparisons of foreign-born Hispanic/Latino heritage groups to their foreign-born NHW counterparts, we additionally adjusted for time in the US. | Results (Supplemental Table S9) were consistent with the main analysis (Table 3), which suggested that time spent in the US was not a strong confounder across comparisons between foreign-born Hispanic/Latino heritage groups and their NHW counterparts. |
| 4 | To investigate how results would be affected if we used a different measure of acculturation in models [9, 17] | We separated foreign-born NHWs and Hispanic/Latino heritage groups by a different metric of acculturation, time lived in the US (<15 years in the US, ≥15 years in the US) [9, 17, 30], when compared to US-born NHWs. | Results (Supplemental Table S10) were consistent with those of the language acculturation-stratified analyses (Figure 1). |

**Supplemental Figure S1. Flow Chart Diagram of Final Analytic Sample**



**Supplemental Table S1. Global Region of Birth among Foreign-born Non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=8,857)**

| Region of Birth | n (%) |
|---|---|
| Mexico, Central American, Caribbean Islands | 238 (2.7%) |
| South America | 236 (2.7%) |
| Europe | 4,670 (52.7%) |
| Russia | 838 (9.5%) |
| Africa | 368 (4.2%) |
| Middle East | 895 (10.1%) |
| Indian Subcontinent | 64 (0.7%) |
| Asia | 177 (2.0%) |
| Southeast Asia | 117 (1.3%) |
| Elsewhere | 1,254 (14.2%) |

Note: Data are presented as absolute counts and age-standardized, weighted percentages.

**Supplemental Table S2. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality [a] | | | |
| **Heritage Group Compared to non-Hispanic Whites, Overall** (n=207,154) | **Very Short (≤5-hours) (n=21,227)** | **Short (<7-hours) (n=75,139)** | **Long (>9-hours) (n=9,190)** | **Trouble Falling Asleep (≥3 nights) (n=22,038)** | **Trouble Staying Asleep (≥3 nights) (n=30,013)** | **Non-restorative Sleep (≥3 days) (n=46,103)** | **Sleep Medication Use (≥3 nights) (n=11,097)** |
| **Mexican** (n=30,100 Mexican) | **0.89 (0.82-0.95)** | 0.95 (0.92-0.98) | 0.94 (0.84-1.04) | **0.85 (0.79-0.91)** | **0.75 (0.71-0.80)** | **0.95 (0.91-0.99)** | **0.62 (0.54-0.70)** |
| **Puerto Rican** (n=5,077) | **1.41 (1.27-1.57)** | **1.21 (1.16-1.27)** | 1.05 (0.87-1.27) | 1.10 (0.99-1.22) | 1.02 (0.92-1.12) | 1.01 (0.94-1.08) | 1.10 (0.94-1.30) |
| **Cuban** (n=2,518) | 0.90 (0.75-1.07) | 0.94 (0.86-1.04) | **0.75 (0.58-0.97)** | 0.88 (0.71-1.09) | 0.88 (0.74-1.05) | 0.96 (0.87-1.07) | 0.93 (0.70-1.23) |
| **Dominican** (n=1,658) | 0.95 (0.78-1.16) | 0.96 (0.86-1.06) | 0.79 (0.53-1.18) | 0.82 (0.66-1.02) | 0.84 (0.68-1.04) | 0.98 (0.87-1.11) | 1.04 (0.69-1.58) |
| **Central/South American** (n=8,162) | 0.89 (0.78-1.01) | 1.01 (0.95-1.07) | **0.75 (0.60-0.94)** | 0.88 (0.75-1.03) | **0.83 (0.73-0.95)** | 0.95 (0.88-1.02) | **0.57 (0.44-0.73)** |

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (lifetime abstainer, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), and "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), cancer, and US nativity status/years lived in the US (US-born, 15+ years in the US, <15 years in the US).

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, awakening feeling rested, and sleep medication were measured during the survey years 2013-2017.

**Supplemental Table S3. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for (1) foreign-born non-Hispanic Whites and (2) Hispanic/Latino Heritage Groups compared to US-born non-Hispanic Whites, Stratified by Sex/Gender, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | Sleep Quality in the Past Week | | | | | | | |
| | Very Short (≤5-hours) (n=21,227) | | Short (<7-hours) (n=75,139) | | Long (>9-hours) (n=9,190) | | Trouble Falling Asleep (≥3 nights) (n=22,038) | | Trouble Staying Asleep (≥3 nights) (n=30,013) | | Non-restorative Sleep (≥3 days) (n=46,103) | | Sleep Medication Use (≥3 nights) (n=11,097) | |
| **Group *(n)*** | | | | | | | | | | | | | | |
| **Sex/Gender** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | 1.12 (0.98-1.30) | 0.94 (0.83-1.06) | 1.07 (1.00-1.13) | 1.00 (0.95-1.06) | 1.18 (0.94-1.47) | 1.00 (0.82-1.21) | 1.08 (0.92-1.27) | 1.09 (0.97-1.21) | **1.31 (1.16-1.49)** | **1.22 (1.11-1.35)** | **1.11 (1.02-1.21)** | 1.01 (0.95-1.08) | **1.44 (1.12-1.85)** | **1.28 (1.07-1.52)** |
| **Mexican** | | | | | | | | | | | | | | |
| **Overall** *(n=30,100)* | **0.70 (0.63-0.77)** | **0.83 (0.76-0.91)** | **0.83 (0.79-0.86)** | **0.94 (0.90-0.97)** | 0.96 (0.84-1.10) | **0.77 (0.68-0.87)** | **0.77 (0.73-0.82)** | **0.80 (0.74-0.86)** | **0.66 (0.62-0.70)** | **0.68 (0.63-0.73)** | **0.91 (0.87-0.94)** | **0.91 (0.87-0.95)** | **0.52 (0.46-0.59)** | **0.48 (0.41-0.56)** |
| **U.S.-born (yes)** *(n=14,282)* | 1.02 (0.91-1.14) | 1.05 (0.96-1.15) | 1.01 (0.96-1.07) | **1.07 (1.03-1.12)** | 1.09 (0.91-1.31) | 0.88 (0.75-1.03) | **0.92 (0.85-0.99)** | 0.92 (0.84-1.00) | **0.80 (0.74-0.86)** | **0.77 (0.71-0.85)** | 0.97 (0.93-1.01) | 0.95 (0.90-1.00) | **0.66 (0.58-0.76)** | **0.59 (0.50-0.70)** |
| **U.S.-born (no)** *(n=15,818)* | **0.47 (0.40-0.54)** | **0.60 (0.52-0.69)** | **0.66 (0.62-0.70)** | **0.77 (0.71-0.82)** | **0.83 (0.70-0.99)** | **0.65 (0.54-0.78)** | **0.60 (0.55-0.66)** | **0.64 (0.58-0.71)** | **0.51 (0.46-0.55)** | **0.55 (0.49-0.62)** | **0.82 (0.77-0.86)** | **0.85 (0.80-0.90)** | **0.36 (0.30-0.44)** | **0.34 (0.27-0.42)** |
| **Puerto Rican** | | | | | | | | | | | | | | |
| **Overall** *(n=5,077)* | **1.31 (1.13-1.53)** | **1.45 (1.29-1.63)** | **1.19 (1.11-1.28)** | **1.21 (1.14-1.28)** | 1.05 (0.82-1.34) | 0.95 (0.74-1.21) | 1.05 (0.94-1.16) | 1.08 (0.96-1.22) | 0.91 (0.83-1.00) | **0.87 (0.78-0.97)** | 0.98 (0.91-1.05) | 1.04 (0.97-1.12) | 0.98 (0.84-1.15) | 1.02 (0.84-1.23) |
| **U.S.-born (yes)** *(n=2,544)* | **1.33 (1.08-1.63)** | **1.53 (1.30-1.81)** | **1.21 (1.11-1.33)** | **1.24 (1.15-1.35)** | 1.26 (0.89-1.77) | 0.94 (0.66-1.33) | 1.04 (0.90-1.21) | 1.14 (0.98-1.33) | 0.97 (0.85-1.11) | 0.91 (0.78-1.05) | 1.00 (0.92-1.09) | **1.10 (1.01-1.20)** | 0.96 (0.76-1.19) | 0.97 (0.73-1.30) |
| **U.S.-born (no)** *(n=2,533)* | **1.29 (1.03-1.61)** | **1.36 (1.17-1.58)** | **1.15 (1.04-1.27)** | **1.16 (1.06-1.26)** | 0.89 (0.63-1.26) | 0.96 (0.72-1.28) | 1.05 (0.91-1.21) | 1.01 (0.86-1.18) | 0.84 (0.73-0.97) | **0.82 (0.70-0.97)** | 0.95 (0.86-1.04) | 0.96 (0.85-1.08) | 1.01 (0.83-1.24) | 1.08 (0.86-1.35) |
| **Cuban** | | | | | | | | | | | | | | |
| **Overall** *(n=2,518)* | **0.75 (0.59-0.96)** | 0.94 (0.75-1.18) | **0.84 (0.74-0.95)** | 0.97 (0.87-1.09) | **0.73 (0.54-0.99)** | **0.63 (0.42-0.93)** | **0.76 (0.61-0.94)** | 0.78 (0.60-1.01) | **0.68 (0.57-0.81)** | **0.72 (0.57-0.91)** | **0.89 (0.81-0.99)** | 0.98 (0.85-1.14) | **0.66 (0.51-0.87)** | 0.77 (0.55-1.06) |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.78 (0.44-1.39) | 1.08 (0.74-1.58) | 1.01 (0.81-1.25) | 1.08 (0.89-1.31) | 0.49 (0.18-1.29) | 0.95 (0.39-2.31) | 0.95 (0.70-1.28) | 0.96 (0.66-1.39) | 0.92 (0.69-1.23) | 0.83 (0.53-1.31) | 0.96 (0.80-1.16) | 1.07 (0.86-1.34) | 0.95 (0.54-1.66) | 1.37 (0.78-2.42) |
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.75 (0.56-1.00) | 0.90 (0.69-1.18) | **0.78 (0.67-0.91)** | 0.94 (0.82-1.07) | 0.78 (0.57-1.05) | **0.55 (0.35-0.87)** | **0.69 (0.52-0.92)** | **0.71 (0.52-0.98)** | **0.61 (0.48-0.78)** | **0.68 (0.50-0.94)** | **0.87 (0.77-0.97)** | 0.95 (0.80-1.13) | **0.59 (0.42-0.83)** | **0.60 (0.40-0.89)** |
| **Dominican** | | | | | | | | | | | | | | |
| **Overall** *(n=1,658)* | 0.82 (0.60-1.11) | 0.96 (0.79-1.16) | 0.83 (0.71-0.97) | 0.98 (0.88-1.10) | 1.05 (0.68-1.61) | 0.49 (0.24-1.00) | **0.77 (0.63-0.94)** | 0.83 (0.66-1.03) | **0.68 (0.56-0.84)** | **0.77 (0.61-0.97)** | 0.94 (0.83-1.06) | 0.96 (0.84-1.09) | 0.83 (0.55-1.23) | 0.93 (0.60-1.45) |
| **U.S.-born (yes)** | 1.13 (0.60-2.11) | 1.02 (0.58-1.79) | 0.86 (0.60-1.23) | 1.32 (0.98-1.77) | 0.96 (0.30-3.07) | 1.35 (0.48-3.80) | 0.73 (0.48-1.12) | 0.62 (0.36-1.07) | 0.97 (0.65-1.44) | 0.91 (0.53-1.57) | 0.99 (0.78-1.26) | 0.93 (0.68-1.29) | 0.64 (0.31-1.30) | 0.57 (0.23-1.43) |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *(n=264)* | | | | | | | | | | | | | | |
| **U.S.-born (no)** *(n=1,394)* | 0.74 (0.52-1.04) | 0.95 (0.78-1.15) | 0.82 (0.69-0.97) | 0.92 (0.81-1.04) | 1.08 (0.63-1.85) | **0.29 (0.15-0.53)** | **0.78 (0.63-0.97)** | 0.88 (0.69-1.12) | **0.62 (0.49-0.80)** | **0.74 (0.57-0.97)** | 0.92 (0.79-1.08) | 0.96 (0.83-1.13) | 0.86 (0.55-1.34) | 1.00 (0.61-1.63) |
| **Central/South American** | | | | | | | | | | | | | | |
| **Overall** *(n=8,162)* | **0.71 (0.61-0.83)** | **0.87 (0.76-0.99)** | **0.93 (0.87-0.99)** | 0.94 (0.88-1.01) | **0.66 (0.48-0.91)** | **0.70 (0.56-0.89)** | **0.78 (0.68-0.88)** | **0.83 (0.71-0.97)** | **0.65 (0.58-0.73)** | **0.73 (0.63-0.86)** | **0.89 (0.84-0.95)** | 0.96 (0.89-1.04) | **0.43 (0.34-0.54)** | **0.46 (0.35-0.61)** |
| **U.S.-born (yes)** *(n=1,113)* | 1.31 (0.92-1.87) | 1.31 (0.96-1.77) | 1.25 (1.08-1.45) | 1.10 (0.92-1.30) | 0.64 (0.35-1.16) | 0.95 (0.52-1.74) | 1.21 (0.96-1.53) | **1.40 (1.06-1.86)** | 0.97 (0.73-1.30) | 1.13 (0.80-1.61) | 1.05 (0.92-1.20) | 1.13 (0.97-1.32) | 0.64 (0.38-1.10) | **0.47 (0.24-0.94)** |
| **U.S.-born (no)** *(n=7,049)* | **0.64 (0.54-0.76)** | **0.80 (0.70-0.93)** | **0.88 (0.82-0.94)** | **0.92 (0.85-0.98)** | **0.66 (0.47-0.94)** | **0.67 (0.52-0.87)** | **0.69 (0.60-0.78)** | **0.71 (0.61-0.83)** | **0.60 (0.53-0.68)** | **0.66 (0.57-0.77)** | **0.85 (0.80-0.91)** | **0.92 (0.85-0.99)** | **0.40 (0.31-0.51)** | **0.46 (0.34-0.62)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S4. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for (1) foreign-born non-Hispanic Whites and (2) Hispanic/Latino Heritage Groups compared to US-born non-Hispanic Whites, Stratified by Age Group, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | | | | Sleep Quality in the Past Week | | | | | | | | | | | |
| | Very Short (≤5-hours) (n=21,227) | | | Short (≤7-hours) (n=75,139) | | | Long (>9-hours) (n=9,190) | | | Trouble Falling Asleep (≥3 nights) (n=22,038) | | | Trouble Staying Asleep (≥3 nights) (n=30,013) | | | Non-restorative Sleep (≥3 days) (n=46,103) | | | Sleep Medication Use (≥3 nights) (n=11,097) | | |
| **Group *(n)*** | | | | | | | | | | | | | | | | | | | | | |
| **Age (years) Group** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | 0.93 (0.71-1.23) | **1.33 (1.13-1.56)** | 0.89 (0.80-1.00) | 1.08 (0.95-1.22) | **1.13 (1.05-1.21)** | 0.96 (0.91-1.01) | 1.24 (0.80-1.92) | 1.12 (0.79-1.59) | 0.96 (0.82-1.13) | 0.98 (0.74-1.31) | **1.24 (1.06-1.44)** | 1.04 (0.92-1.17) | 1.11 (0.79-1.56) | **1.44 (1.24-1.68)** | **1.20 (1.10-1.31)** | 1.02 (0.89-1.16) | **1.15 (1.07-1.25)** | 1.00 (0.92-1.08) | 1.64 (0.95-2.85) | **1.64 (1.21-2.22)** | **1.22 (1.03-1.44)** |
| **Mexican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=30,100)* | **0.78 (0.69-0.89)** | **0.69 (0.62-0.76)** | 0.98 (0.87-1.10) | **0.88 (0.83-0.93)** | **0.87 (0.83-0.90)** | 0.96 (0.91-1.02) | 0.96 (0.80-1.15) | **0.72 (0.61-0.87)** | **0.86 (0.75-0.98)** | **0.81 (0.76-0.86)** | **0.66 (0.60-0.73)** | 0.92 (0.83-1.01) | **0.65 (0.61-0.69)** | **0.58 (0.53-0.64)** | **0.71 (0.64-0.78)** | **0.95 (0.92-0.99)** | **0.88 (0.84-0.92)** | 0.93 (0.87-1.00) | **0.50 (0.44-0.56)** | **0.41 (0.33-0.51)** | **0.61 (0.52-0.72)** |
| **U.S.-born (yes)** *(n=14,282)* | 1.03 (0.90-1.18) | 1.03 (0.91-1.15) | **1.14 (1.01-1.27)** | 1.00 (0.93-1.06) | **1.09 (1.03-1.15)** | 1.06 (0.99-1.13) | 1.04 (0.85-1.26) | 0.85 (0.67-1.09) | 0.96 (0.81-1.13) | 0.96 (0.89-1.03) | **0.81 (0.73-0.91)** | 1.01 (0.90-1.15) | **0.77 (0.71-0.82)** | **0.73 (0.65-0.82)** | **0.84 (0.75-0.95)** | 1.02 (0.98-1.06) | 0.96 (0.91-1.03) | 1.00 (0.92-1.09) | **0.61 (0.53-0.70)** | **0.64 (0.51-0.80)** | **0.64 (0.54-0.76)** |
| **U.S.-born (no)** *(n=15,818)* | **0.43 (0.34-0.54)** | **0.48 (0.41-0.55)** | **0.82 (0.68-0.98)** | **0.67 (0.61-0.74)** | **0.69 (0.65-0.74)** | **0.86 (0.79-0.93)** | 0.81 (0.62-1.06) | **0.65 (0.51-0.82)** | **0.76 (0.63-0.92)** | **0.63 (0.58-0.69)** | **0.54 (0.46-0.62)** | **0.80 (0.69-0.93)** | **0.51 (0.47-0.56)** | **0.46 (0.40-0.52)** | **0.57 (0.50-0.65)** | **0.86 (0.82-0.91)** | **0.79 (0.74-0.85)** | **0.85 (0.77-0.94)** | **0.36 (0.29-0.43)** | **0.22 (0.15-0.32)** | **0.57 (0.44-0.75)** |
| **Puerto Rican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=5,077)* | **1.47 (1.17-1.83)** | **1.30 (1.12-1.51)** | **1.56 (1.36-1.78)** | **1.26 (1.13-1.39)** | **1.15 (1.07-1.24)** | **1.27 (1.18-1.36)** | 1.28 (0.94-1.75) | 0.88 (0.64-1.20) | 0.88 (0.69-1.14) | **1.12 (1.01-1.23)** | 0.93 (0.78-1.11) | **1.35 (1.18-1.56)** | 0.92 (0.84-1.02) | 0.92 (0.77-1.09) | 0.92 (0.80-1.07) | 1.04 (0.97-1.10) | 0.97 (0.87-1.07) | 1.04 (0.93-1.17) | 0.98 (0.84-1.15) | 0.83 (0.62-1.12) | 1.15 (0.93-1.40) |
| **U.S.-born (yes)** *(n=2,544)* | **1.53 (1.19-1.96)** | **1.47 (1.24-1.74)** | **1.55 (1.17-2.06)** | **1.26 (1.12-1.42)** | **1.25 (1.15-1.36)** | **1.28 (1.11-1.48)** | 1.36 (0.97-1.91) | 1.00 (0.66-1.54) | 0.64 (0.35-1.19) | 1.14 (0.99-1.31) | 0.93 (0.75-1.14) | **1.49 (1.20-1.86)** | 0.98 (0.85-1.12) | 1.02 (0.82-1.25) | 1.01 (0.79-1.28) | 1.08 (0.99-1.18) | 0.99 (0.87-1.12) | 1.11 (0.94-1.31) | 0.93 (0.74-1.17) | 0.79 (0.52-1.19) | 1.25 (0.92-1.69) |
| **U.S.-born (no)** *(n=2,533)* | 1.27 (0.86-1.87) | 1.08 (0.85-1.38) | **1.56 (1.34-1.81)** | **1.23 (1.01-1.51)** | 1.01 (0.90-1.14) | **1.26 (1.16-1.37)** | 1.03 (0.53-2.02) | 0.75 (0.47-1.18) | 0.96 (0.74-1.25) | 1.09 (0.94-1.25) | 0.95 (0.73-1.22) | **1.27 (1.06-1.51)** | **0.86 (0.75-0.99)** | 0.77 (0.58-1.02) | 0.87 (0.73-1.03) | 0.98 (0.88-1.08) | 0.94 (0.80-1.10) | 1.00 (0.87-1.14) | 1.04 (0.85-1.27) | 0.90 (0.60-1.35) | 1.08 (0.85-1.37) |
| **Cuban** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=2,518)* | 0.69 (0.40-1.17) | **0.66 (0.50-0.86)** | 1.08 (0.87-1.34) | **0.75 (0.59-0.95)** | **0.79 (0.67-0.93)** | 1.06 (0.96-1.18) | 0.64 (0.32-1.26) | 0.69 (0.42-1.14) | **0.71 (0.55-0.93)** | **0.78 (0.63-0.97)** | 0.72 (0.52-1.00) | 1.00 (0.79-1.26) | **0.70 (0.59-0.84)** | **0.73 (0.56-0.94)** | **0.73 (0.58-0.91)** | 0.91 (0.83-1.01) | **0.81 (0.70-0.94)** | 0.98 (0.84-1.14) | **0.69 (0.53-0.90)** | 0.66 (0.43-1.04) | 0.76 (0.56-1.04) |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **U.S.-born Cuban (yes)** *(n=559)* | 0.81 (0.47-1.42) | 0.83 (0.49-1.41) | 1.65 (0.93-2.94) | 0.98 (0.76-1.26) | 1.11 (0.91-1.35) | 1.04 (0.69-1.57) | 0.93 (0.39-2.23) | 0.45 (0.14-1.41) | 0.21 (0.03-1.53) | 1.05 (0.78-1.41) | 1.11 (0.72-1.71) | 1.54 (0.85-2.78) | 0.91 (0.68-1.22) | 1.02 (0.68-1.53) | 1.04 (0.62-1.75) | 1.05 (0.87-1.26) | 0.94 (0.72-1.24) | 0.99 (0.61-1.63) | 0.91 (0.52-1.60) | 1.53 (0.83-2.80) | 0.63 (0.26-1.49) |
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.59 (0.24-1.43) | **0.61 (0.44-0.84)** | 1.03 (0.81-1.31) | **0.48 (0.31-0.75)** | **0.67 (0.53-0.83)** | 1.06 (0.95-1.18) | 0.32 (0.08-1.34) | 0.75 (0.42-1.34) | **0.74 (0.56-0.96)** | **0.70 (0.53-0.93)** | **0.57 (0.35-0.95)** | 0.94 (0.74-1.20) | **0.64 (0.50-0.81)** | **0.61 (0.41-0.90)** | **0.69 (0.54-0.89)** | **0.87 (0.78-0.97)** | **0.76 (0.64-0.89)** | 0.98 (0.83-1.16) | **0.62 (0.44-0.88)** | **0.30 (0.13-0.66)** | 0.77 (0.56-1.07) |
| **Dominican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=1,658)* | **0.64 (0.41-0.99)** | 0.90 (0.68-1.19) | 1.18 (0.95-1.46) | 0.81 (0.62-1.05) | 0.94 (0.82-1.08) | 1.02 (0.89-1.17) | 1.32 (0.73-2.36) | 0.48 (0.22-1.03) | **0.42 (0.21-0.84)** | **0.80 (0.66-0.97)** | 0.69 (0.47-1.01) | 0.90 (0.68-1.18) | **0.68 (0.55-0.83)** | **0.51 (0.33-0.77)** | **0.71 (0.53-0.96)** | 0.98 (0.86-1.11) | **0.79 (0.65-0.97)** | 1.12 (0.94-1.34) | 0.79 (0.53-1.18) | **0.37 (0.20-0.69)** | 1.31 (0.82-2.07) |
| **U.S.-born (yes)** *(n=264)* | 0.63 (0.31-1.30) | **2.17 (1.33-3.55)** | 1.65 (0.41-6.68) | 0.87 (0.58-1.31) | **1.62 (1.30-2.02)** | 0.98 (0.43-2.20) | 1.32 (0.52-3.33) | 2.50 (0.76-8.25) | NE | 0.78 (0.50-1.21) | 0.88 (0.44-1.76) | 0.82 (0.12-5.75) | 0.85 (0.56-1.28) | 1.05 (0.55-2.02) | 0.46 (0.07-3.02) | 1.06 (0.82-1.36) | 1.05 (0.77-1.42) | 1.60 (0.70-3.67) | 0.50 (0.24-1.02) | 1.26 (0.52-3.02) | 0.69 (0.08-5.75) |
| **U.S.-born (no)** *(n=1,394)* | 0.63 (0.37-1.08) | 0.76 (0.55-1.04) | 1.16 (0.94-1.44) | 0.75 (0.55-1.03) | **0.84 (0.72-0.99)** | 1.02 (0.89-1.17) | 1.31 (0.64-2.68) | 0.33 (0.12-0.87) | **0.44 (0.22-0.87)** | **0.80 (0.65-0.99)** | **0.66 (0.44-0.97)** | 0.90 (0.69-1.18) | **0.63 (0.50-0.81)** | **0.41 (0.26-0.64)** | **0.72 (0.54-0.96)** | 0.96 (0.82-1.12) | **0.75 (0.59-0.94)** | 1.11 (0.91-1.35) | 0.87 (0.56-1.35) | **0.20 (0.09-0.47)** | 1.33 (0.84-2.12) |
| **Central/South American** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=8,162)* | 0.90 (0.72-1.12) | **0.72 (0.62-0.84)** | 0.92 (0.78-1.09) | 0.97 (0.87-1.08) | **0.92 (0.86-0.99)** | 0.99 (0.91-1.07) | 0.90 (0.63-1.27) | **0.63 (0.45-0.87)** | **0.51 (0.36-0.72)** | **0.81 (0.71-0.92)** | **0.70 (0.58-0.85)** | 0.85 (0.71-1.02) | **0.65 (0.58-0.73)** | **0.55 (0.46-0.66)** | **0.66 (0.55-0.79)** | **0.93 (0.88-0.99)** | **0.85 (0.79-0.93)** | 0.91 (0.81-1.02) | **0.41 (0.33-0.52)** | **0.33 (0.21-0.51)** | **0.50 (0.38-0.67)** |
| **U.S.-born Central/South American (yes)** *(n=1,113)* | 1.31 (0.94-1.82) | **1.52 (1.07-2.16)** | 0.98 (0.43-2.25) | **1.19 (1.02-1.40)** | **1.23 (1.04-1.45)** | 1.02 (0.65-1.58) | 0.82 (0.48-1.40) | 0.96 (0.34-2.74) | 0.36 (0.08-1.54) | 1.26 (1.01-1.55) | 1.28 (0.90-1.83) | **1.66 (1.01-2.73)** | 0.87 (0.65-1.15) | 0.73 (0.53-1.03) | 0.93 (0.53-1.63) | 1.10 (0.97-1.25) | 1.02 (0.84-1.23) | 0.80 (0.46-1.41) | **0.52 (0.30-0.89)** | **0.23 (0.11-0.49)** | 1.41 (0.67-2.95) |
| **U.S.-born Central/South American (no)** *(n=7,049)* | **0.73 (0.56-0.96)** | **0.65 (0.55-0.77)** | 0.92 (0.77-1.09) | **0.86 (0.76-0.98)** | **0.89 (0.83-0.96)** | 0.99 (0.91-1.07) | 0.93 (0.61-1.41) | **0.61 (0.44-0.85)** | **0.51 (0.36-0.73)** | **0.72 (0.63-0.82)** | **0.63 (0.51-0.78)** | **0.83 (0.69-0.99)** | **0.61 (0.54-0.69)** | **0.53 (0.43-0.65)** | **0.65 (0.54-0.78)** | **0.90 (0.84-0.96)** | **0.83 (0.76-0.91)** | 0.91 (0.81-1.03) | **0.40 (0.31-0.51)** | **0.34 (0.22-0.55)** | **0.47 (0.35-0.64)** |

Abbreviations: ref (reference)

Adjusted for sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S5. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to foreign-born non-Hispanic Whites, Stratified by Sex/Gender, National Health Interview Survey, 2004-2017 (N=56,372)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | Sleep Quality in the Past Week | | | | | | | |
| | Very Short (≤5-hours) (n=4,115) | | Short (<7-hours) (n=14,048) | | Long (>9-hours) (n=1,586) | | Trouble Falling Asleep (≥3 nights) (n=3,431) | | Trouble Staying Asleep (≥3 nights) (n=3,520) | | Non-restorative Sleep (≥3 days) (n=7,734) | | Sleep Medication Use (≥3 nights) (n=1,073) | |
| **Group *(n)*** | | | | | | | | | | | | | | |
| **Sex/Gender** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Mexican** | | | | | | | | | | | | | | |
| **Overall** *(n=30,100)* | 1.23 (1.00-1.51) | 1.00 (0.84-1.19) | **1.14 (1.05-1.24)** | **1.09 (1.02-1.18)** | 1.26 (0.92-1.73) | 0.90 (0.68-1.19) | 0.87 (0.69-1.09) | 0.97 (0.84-1.12) | 0.85 (0.70-1.02) | 0.87 (0.76-1.01) | **1.15 (1.03-1.29)** | 0.99 (0.91-1.08) | 1.03 (0.72-1.47) | 0.85 (0.65-1.13) |
| **U.S.-born (yes)** *(n=14,282)* | **1.31 (1.06-1.61)** | 1.06 (0.88-1.26) | **1.23 (1.12-1.35)** | **1.15 (1.06-1.24)** | 1.20 (0.86-1.68) | 0.91 (0.69-1.20) | 1.00 (0.79-1.27) | 1.00 (0.85-1.17) | 1.03 (0.84-1.27) | 0.92 (0.78-1.08) | **1.17 (1.04-1.31)** | 0.99 (0.90-1.09) | 1.06 (0.75-1.50) | 0.91 (0.69-1.22) |
| **U.S.-born (no)** *(n=15,818)* | 0.99 (0.73-1.34) | 0.80 (0.62-1.02) | 1.00 (0.89-1.12) | 0.96 (0.87-1.07) | 1.20 (0.82-1.76) | 0.92 (0.63-1.34) | **0.71 (0.52-0.96)** | 0.86 (0.71-1.05) | **0.62 (0.48-0.79)** | **0.80 (0.66-0.98)** | 1.07 (0.92-1.24) | 0.97 (0.87-1.08) | 0.80 (0.45-1.40) | **0.64 (0.42-0.99)** |
| **Puerto Rican** | | | | | | | | | | | | | | |
| **Overall** *(n=5,077)* | **1.84 (1.46-2.30)** | **1.64 (1.36-1.99)** | **1.39 (1.26-1.54)** | **1.29 (1.17-1.42)** | 1.27 (0.90-1.81) | 0.97 (0.71-1.33) | 1.13 (0.88-1.47) | **1.24 (1.05-1.47)** | 1.26 (0.99-1.60) | 1.04 (0.88-1.22) | 1.02 (0.88-1.18) | 1.08 (0.97-1.20) | **1.62 (1.11-2.37)** | 1.19 (0.92-1.56) |
| **U.S.-born (yes)** *(n=2,544)* | **1.83 (1.37-2.45)** | **1.79 (1.39-2.29)** | **1.43 (1.26-1.62)** | **1.32 (1.19-1.49)** | 1.63 (0.99-2.70) | 1.11 (0.74-1.66) | 1.05 (0.75-1.47) | **1.32 (1.07-1.62)** | 1.36 (1.00-1.85) | 1.08 (0.88-1.33) | 0.96 (0.80-1.16) | 1.12 (0.99-1.26) | **1.68 (1.08-2.63)** | 1.12 (0.81-1.55) |
| **U.S.-born (no)** *(n=2,533)* | **1.77 (1.31-2.37)** | **1.44 (1.15-1.81)** | **1.33 (1.17-1.51)** | **1.20 (1.07-1.35)** | 1.07 (0.70-1.65) | 0.92 (0.64-1.34) | 1.24 (0.91-1.68) | 1.20 (0.97-1.48) | 1.15 (0.85-1.55) | 1.02 (0.83-1.26) | 1.10 (0.91-1.33) | 1.02 (0.89-1.18) | **1.74 (1.06-2.83)** | 1.31 (0.95-1.81) |
| **Cuban** | | | | | | | | | | | | | | |
| **Overall** *(n=2,518)* | 1.01 (0.71-1.45) | 0.92 (0.68-1.26) | 0.95 (0.81-1.12) | 1.02 (0.88-1.17) | 0.81 (0.47-1.39) | **056 (0.35-0.91)** | 0.91 (0.65-1.36) | 0.96 (0.72-1.30) | 0.90 (0.66-1.22) | 0.97 (0.74-1.28) | 1.02 (0.83-1.24) | 1.07 (0.88-1.28) | 0.98 (0.57-1.70) | 1.13 (0.75-1.69) |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.93 (0.48-1.80) | 1.11 (0.71-1.74) | 1.12 (0.88-1.43) | 1.16 (0.93-1.44) | 0.59 (0.19-1.85) | 1.05 (0.43-2.52) | 1.14 (0.64-2.02) | 1.18 (0.76-1.83) | 1.28 (0.79-2.09) | 1.04 (0.63-1.73) | 0.98 (0.72-1.35) | 1.13 (0.86-1.49) | 0.85 (0.24-2.99) | **2.09 (1.08-4.01)** |
| **U.S.-born Cuban (no)** *(n=1,959)* | 1.04 (0.70-1.57) | 0.85 (0.59-1.22) | 0.89 (0.74-1.08) | 0.96 (0.81-1.13) | 0.85 (0.49-1.49) | **0.47 (0.27-0.80)** | 0.83 (0.52-1.32) | 0.86 (0.60-1.23) | 0.76 (0.54-1.07) | 0.94 (0.66-1.35) | 1.02 (0.81-1.29) | 1.05 (0.85-1.31) | 1.01 (0.55-1.85) | 0.87 (0.55-1.38) |
| **Dominican** | | | | | | | | | | | | | | |
| **Overall** *(n=1,658)* | 1.21 (0.81-1.78) | 1.07 (0.79-1.43) | 1.00 (0.83-1.21) | 1.03 (0.87-1.21) | 1.39 (0.81-2.40) | 0.61 (0.27-1.38) | 0.76 (0.47-1.23) | 0.97 (0.73-1.29) | 0.77 (0.47-1.27) | 0.99 (0.72-1.36) | 1.01 (0.80-1.26) | 0.98 (0.82-1.17) | 1.11 (0.54-2.29) | 0.94 (0.59-1.51) |
| **U.S.-born (yes)** *(n=264)* | 1.61 (0.78-3.30) | 1.15 (0.58-2.26) | 1.05 (0.73-1.52) | **1.42 (1.04-1.95)** | 1.40 (0.32-6.12) | 2.40 (0.83-6.95) | 1.06 (0.52-2.17) | 0.72 (0.40-1.31) | 1.30 (0.51-3.34) | 1.18 (0.64-2.18) | 1.10 (0.72-1.67) | 0.97 (0.68-1.37) | 1.88 (0.57-6.19) | 0.68 (0.23-1.98) |
| **U.S.-born (no)** *(n=1,394)* | 1.09 (0.72-1.64) | 1.04 (0.77-1.39) | 0.99 (0.81-1.21) | 0.92 (0.78-1.09) | 1.42 (0.79-2.54) | **0.34 (0.16-0.72)** | 0.67 (0.39-1.15) | 1.03 (0.76-1.40) | 0.65 (0.36-1.17) | 0.96 (0.68-1.35) | 0.99 (0.74-1.32) | 0.98 (0.81-1.19) | 0.96 (0.43-2.14) | 0.98 (0.58-1.65) |
| **Central/South American** | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overall** *(n=8,162)* | 1.12 (0.87-1.45) | 0.91 (0.76-1.10) | **1.17 (1.06-1.30)** | 1.02 (0.93-1.12) | 0.92 (0.56-1.51) | **0.68 (0.48-0.94)** | 0.86 (0.63-1.16) | 1.01 (0.83-1.24) | 0.77 (0.59-1.01) | 0.99 (0.81-1.21) | 1.02 (0.89-1.16) | 1.03 (0.93-1.14) | **0.62 (0.39-0.99)** | 0.73 (0.51-1.06) |
| **U.S.-born Central/South American (yes)** *(n=1,113)* | **1.62 (1.03-2.54)** | 1.26 (0.86-1.84) | **1.45 (1.21-1.74)** | 1.15 (0.95-1.38) | 0.76 (0.34-1.70) | 1.22 (0.64-2.30) | 1.01 (0.61-1.67) | **1.47 (1.09-1.99)** | 0.83 (0.51-1.36) | **1.43 (1.03-1.99)** | 1.05 (0.83-1.33) | 1.11 (0.93-1.31) | 1.56 (0.72-3.38) | 0.67 (0.31-1.45) |
| **U.S.-born Central/South American (no)** *(n=7,049)* | 1.02 (0.78-1.35) | 0.84 (0.69-1.04) | **1.13 (1.02-1.25)** | 0.99 (0.89-1.09) | 0.98 (0.58-1.67) | **0.65 (0.45-0.93)** | 0.79 (0.57-1.09) | 0.90 (0.72-1.11) | 0.77 (0.58-1.02) | 0.90 (0.74-1.11) | 1.00 (0.86-1.15) | 1.01 (0.91-1.12) | **0.48 (0.29-0.79)** | 0.74 (0.50-1.10) |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S6. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to foreign-born non-Hispanic Whites, Stratified by Age Group, National Health Interview Survey, 2004-2017 (N=56,372)**

| Group *(n)* | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | | | | Sleep Quality in the Past Week | | | | | | | | | | | |
| | Very Short (≤5-hours) (n=4,115) | | | Short (<7-hours) (n=14,048) | | | Long (>9-hours) (n=1,586) | | | Trouble Falling Asleep (≥3 nights) (n=3,431) | | | Trouble Staying Asleep (≥3 nights) (n=3,520) | | | Non-restorative Sleep (≥3 days) (n=7,734) | | | Sleep Medication Use (≥3 nights) (n=1,073) | | |
| **Age (years) Group** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Mexican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=30,100)* | 1.04 (0.76-1.44) | 1.26 (1.00-1.58) | 0.99 (0.83-1.19) | 1.15 (0.99-1.33) | **1.17 (1.08-1.28)** | 1.03 (0.94-1.13) | 1.51 (0.96-2.38) | 1.02 (0.65-1.61) | 0.79 (0.60-1.04) | 0.97 (0.71-1.32) | **0.81 (0.67-0.98)** | 1.01 (0.84-1.21) | 0.97 (0.67-1.40) | 0.82 (0.67-1.01) | 0.90 (0.78-1.04) | 1.09 (0.93-1.27) | 1.10 (0.99-1.21) | 1.04 (0.93-1.17) | 1.17 (0.59-2.32) | 0.81 (0.51-1.28) | 0.89 (0.70-1.15) |
| **U.S.-born (yes)** *(n=14,282)* | 1.12 (0.80-1.58) | **1.43 (1.14-1.81)** | 1.02 (0.86-1.21) | 1.19 (1.02-1.39) | **1.31 (1.20-1.43)** | 1.07 (0.97-1.17) | 1.45 (0.93-2.26) | 1.06 (0.64-1.75) | 0.81 (0.61-1.07) | 1.07 (0.77-1.48) | 0.93 (0.75-1.15) | 1.02 (0.84-1.25) | 1.08 (0.73-1.60) | 0.94 (0.75-1.17) | 0.98 (0.84-1.16) | 1.06 (0.90-1.24) | 1.13 (1.01-1.26) | 1.04 (0.92-1.18) | 1.44 (0.70-2.95) | 1.02 (0.63-1.63) | 0.85 (0.66-1.11) |
| **U.S.-born (no)** *(n=15,818)* | 0.84 (0.54-1.29) | 0.97 (0.72-1.30) | 0.87 (0.64-1.17) | 0.96 (0.77-1.20) | 1.03 (0.92-1.16) | 0.94 (0.83-1.07) | 1.67 (0.99-2.82) | 1.04 (0.62-1.74) | **0.67 (0.47-0.94)** | 0.76 (0.53-1.10) | **0.71 (0.54-0.92)** | 0.91 (0.72-1.15) | 0.85 (0.54-1.32) | **0.65 (0.50-0.85)** | **0.76 (0.62-0.93)** | 1.12 (0.92-1.37) | 1.01 (0.89-1.15) | 1.01 (0.87-1.19) | NE | **0.41 (0.22-0.76)** | 0.91 (0.60-1.39) |
| **Puerto Rican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=5,077)* | **1.87 (1.24-2.81)** | **1.92 (1.49-2.47)** | **1.58 (1.32-1.90)** | **1.44 (1.20-1.73)** | **1.37 (1.22-1.53)** | **1.27 (1.15-1.40)** | 1.67 (0.92-3.02) | 1.30 (0.78-2.14) | 0.80 (0.59-1.09) | 1.01 (0.71-1.45) | 1.07 (0.82-1.39) | **1.45 (1.18-1.78)** | 1.05 (0.67-1.64) | 1.21 (0.92-1.58) | 1.14 (0.95-1.37) | 1.03 (0.85-1.25) | 1.07 (0.92-1.25) | 1.13 (0.98-1.32) | 1.61 (0.87-2.96) | 1.20 (0.78-1.86) | 1.30 (1.00-1.68) |
| **U.S.-born (yes)** *(n=2,544)* | **1.88 (1.22-2.90)** | **2.08 (1.59-2.72)** | **1.56 (1.14-2.13)** | **1.40 (1.15-1.70)** | **1.43 (1.27-1.62)** | **1.27 (1.08-1.49)** | 1.71 (0.91-3.19) | 1.51 (0.85-2.68) | 0.58 (0.31-1.07) | 1.11 (0.76-1.63) | 1.01 (0.75-1.35) | **1.61 (1.23-2.11)** | 1.02 (0.62-1.67) | 1.28 (0.94-1.75) | 1.25 (0.95-1.65) | 1.06 (0.87-1.29) | 1.07 (0.90-1.27) | 1.17 (0.97-1.42) | 1.33 (0.66-2.69) | 0.99 (0.65-1.51) | 1.34 (0.95-1.91) |
| **U.S.-born (no)** *(n=2,533)* | 1.69 (0.99-2.88) | **1.51 (1.04-2.20)** | **1.61 (1.31-1.97)** | **1.38 (1.05-1.79)** | **1.20 (1.02-1.42)** | **1.27 (1.14-1.42)** | 0.77 (0.37-1.58) | 1.25 (0.68-2.32) | 0.87 (0.63-1.21) | 0.87 (0.49-1.53) | 1.22 (0.87-1.71) | **1.40 (1.11-1.78)** | 1.17 (0.62-2.22) | 1.08 (0.76-1.53) | 1.09 (0.88-1.33) | 1.01 (0.75-1.37) | 1.08 (0.89-1.32) | 1.12 (0.94-1.33) | NE | 1.59 (0.90-2.84) | 1.27 (0.93-1.73) |
| **Cuban** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=2,518)* | 0.77 (0.37-1.58) | 0.99 (0.67-1.47) | 1.02 (0.74-1.40) | 0.77 (0.56-1.04) | 1.01 (0.84-1.21) | 1.03 (0.90-1.19) | NE | 0.92 (0.42-2.03) | **0.55 (0.37-0.81)** | **0.42 (0.21-0.85)** | 1.00 (0.67-1.51) | 1.10 (0.81-1.50) | 0.58 (0.26-1.31) | 1.05 (0.75-1.47) | 0.98 (0.76-1.27) | 0.99 (0.73-1.34) | 0.97 (0.80-1.18) | 1.11 (0.91-1.34) | NE | 1.58 (0.77-3.23) | 1.06 (0.71-1.58) |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.70 (0.34-1.44) | 1.11 (0.61-2.00) | 1.45 (0.81-2.59) | 0.97 (0.71-1.33) | 1.28 (1.03-1.58) | 0.97 (0.64-1.48) | NE | 0.59 (0.14-2.51) | 0.16 (0.02-1.23) | 0.73 (0.38-1.40) | 1.39 (0.85-2.27) | 1.64 (0.88-3.08) | 0.90 (0.42-1.91) | 1.37 (0.84-2.22) | 1.27 (0.76-2.11) | 1.08 (0.78-1.50) | 1.05 (0.79-1.38) | 0.98 (0.57-1.68) | NE | 2.92 (1.39-6.12) | 0.75 (0.31-1.83) |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.80 (0.28-2.27) | 0.94 (0.60-1.49) | 0.97 (0.69-1.37) | **0.49 (0.29-0.82)** | 0.88 (0.68-1.13) | 1.04 (0.90-1.20) | NE | 1.06 (0.43-2.64) | **0.57 (0.39-0.84)** | **0.08 (0.01-0.61)** | 0.79 (0.44-1.39) | 1.04 (0.76-1.43) | **0.15 (0.03-0.72)** | 0.89 (0.55-1.44) | 0.95 (0.71-1.27) | 0.87 (0.55-1.36) | 0.93 (0.74-1.18) | 1.14 (0.93-1.40) | NE | 0.75 (0.25-2.23) | 1.10 (0.72-1.69) |
| **Dominican** | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=1,658)* | 0.81 (0.44-1.48) | 1.18 (0.77-1.79) | 1.29 (0.98-1.70) | 0.96 (0.69-1.34) | 1.08 (0.89-1.32) | 1.02 (0.87-1.21) | NE | 0.92 (0.36-2.39) | **0.41 (0.19-0.85)** | 0.80 (0.46-1.39) | 0.92 (0.58-1.44) | 1.00 (0.72-1.39) | 1.22 (0.63-2.35) | 0.74 (0.44-1.24) | 1.00 (0.72-1.39) | 0.96 (0.72-1.29) | 0.86 (0.68-1.08) | 1.25 (1.01-1.56) | NE | 0.58 (0.28-1.23) | 1.33 (0.79-2.23) |
| **U.S.-born (yes)** *(n=264)* | 0.80 (0.35-1.84) | **2.84 (1.64-4.93)** | 1.80 (0.42-7.78) | 0.98 (0.65-1.49) | 1.70 (1.34-2.16) | 0.97 (0.43-2.17) | NE | 4.28 (1.23-14.91) | NE | 0.81 (0.41-1.63) | 1.09 (0.52-2.33) | 0.91 (0.14-6.03) | 1.22 (0.62-2.39) | 1.53 (0.77-3.03) | 0.60 (0.84-4.34) | 0.93 (0.64-1.37) | 1.11 (0.79-1.57) | 1.74 (0.73-4.13) | NE | 2.01 (0.76-5.34) | 0.69 (0.08-6.05) |
| **U.S.-born (no)** *(n=1,394)* | 0.78 (0.40-1.54) | 0.95 (0.59-1.51) | 1.28 (0.97-1.68) | 0.86 (0.57-1.29) | 0.96 (0.76-1.21) | 1.03 (0.87-1.21) | NE | 0.59 (0.20-1.76) | **0.43 (0.20-0.90)** | 0.77 (0.37-1.63) | 0.86 (0.53-1.39) | 1.00 (0.72-1.39) | 1.16 (0.41-3.31) | 0.60 (0.34-1.06) | 1.01 (0.73-1.41) | 1.04 (0.70-1.54) | 0.80 (0.62-1.04) | 1.24 (0.98-1.57) | NE | **0.31 (0.13-0.73)** | 1.36 (0.80-2.30) |
| **Central/South American** | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=8,162)* | 1.02 (0.69-1.51) | 1.12 (0.87-1.46) | 0.88 (0.71-1.10) | 1.13 (0.94-1.36) | **1.17 (1.06-1.29)** | 0.98 (0.89-1.10) | 1.44 (0.84-2.46) | 0.91 (0.54-1.54) | **0.42 (0.26-0.67)** | 0.83 (0.59-1.17) | 1.04 (0.78-1.39) | 0.94 (0.75-1.17) | 1.07 (0.72-1.59) | 0.84 (0.65-1.09) | 0.83 (0.67-1.02) | 1.06 (0.89-1.25) | 1.03 (0.92-1.15) | 1.02 (0.88-1.18) | NE | 0.65 (0.38-1.12) | **0.65 (0.46-0.90)** |
| **U.S.-born Central/South American (yes)** *(n=1,113)* | 1.25 (0.79-1.98) | **1.80 (1.22-2.65)** | 0.86 (0.37-1.97) | **1.28 (1.03-1.59)** | **1.33 (1.11-1.58)** | 0.96 (0.62-1.49) | 1.22 (0.67-2.23) | 1.14 (0.38-3.41) | 0.28 (0.06-1.27) | 1.04 (0.71-1.52) | 1.40 (0.97-2.04) | 1.65 (1.03-2.64) | 1.21 (0.77-1.90) | 0.99 (0.68-1.44) | 1.10 (0.65-1.87) | 1.08 (0.90-1.31) | 1.10 (0.90-1.33) | 0.81 (0.47-1.40) | NE | **0.31 (0.13-0.69)** | 1.79 (0.86-3.70) |
| **U.S.-born Central/South American (no)** *(n=7,049)* | 0.89 (0.57-1.40) | 1.00 (0.75-1.33) | 0.88 (0.71-1.10) | 1.02 (0.82-1.26) | **1.14 (1.02-1.27)** | 0.98 (0.88-1.09) | NE | 0.92 (0.53-1.61) | **0.42 (0.26-0.68)** | 0.67 (0.44-1.03) | 0.94 (0.68-1.32) | 0.90 (0.71-1.13) | 0.95 (0.59-1.52) | 0.83 (0.62-1.11) | 0.81 (0.65-1.01) | 1.00 (0.81-1.24) | 1.01 (0.90-1.13) | 1.03 (0.89-1.19) | NE | 0.75 (0.41-1.38) | **0.60 (0.42-0.84)** |

Abbreviations: ref (reference)

Adjusted for sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S7. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to US-born non-Hispanic Whites by Language Acculturation Status*, Stratified by Sex/Gender, National Health Interview Survey, 2004-2017 (N=245,812)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | Sleep Quality in the Past Week | | | | | | | |
| | Very Short (≤5-hours) (n=17,112) | | Short (<7-hours) (n=61,091) | | Long (>9-hours) (n=7,604) | | Trouble Falling Asleep (≥3 nights) (n=18,607) | | Trouble Staying Asleep (≥3 nights) (n=26,493) | | Non-restorative Sleep (≥3 days) (n=38,369) | | Sleep Medication Use (≥3 nights) (n=10,024) | |
| **Group *(n)*** | | | | | | | | | | | | | | |
| **Sex/Gender** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref |
| **Mexican** | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=14,282)* | 1.02 (0.91-1.14) | 1.05 (0.96-1.15) | 1.01 (0.96-1.07) | **1.07 (1.03-1.12)** | 1.09 (0.91-1.31) | 0.88 (0.75-1.03) | **0.92 (0.85-0.99)** | 0.92 (0.84-1.00) | **0.80 (0.74-0.86)** | **0.77 (0.71-0.85)** | 0.97 (0.93-1.01) | 0.95 (0.90-1.00) | **0.66 (0.58-0.76)** | **0.59 (0.50-0.70)** |
| **High Acculturation** (n=13,075) | 1.05 (0.93-1.19) | 1.08 (0.98-1.19) | 1.04 (0.98-1.10) | **1.09 (1.05-1.14)** | 1.12 (0.93-1.36) | 0.86 (0.74-1.01) | 0.94 (0.84-1.06) | 0.95 (0.87-1.03) | **0.86 (0.76-0.97)** | **0.80 (0.73-0.88)** | 1.01 (0.95-1.08) | 0.97 (0.92-1.02) | **0.78 (0.62-0.99)** | **0.63 (0.53-0.75)** |
| **Medium/Low Acculturation** (n=1,188) | 0.75 (0.56-1.01) | 0.79 (0.58-1.09) | **0.71 (0.60-0.85)** | 0.84 (0.70-1.00) | 0.89 (0.58-1.38) | 0.97 (0.60-1.59) | 0.63 (0.40-1.00) | **0.59 (0.43-0.83)** | **0.46 (0.28-0.74)** | **0.43 (0.29-0.64)** | 0.82 (0.64-1.04) | **0.75 (0.61-0.92)** | 0.56 (0.29-1.08) | **0.15 (0.06-0.40)** |
| **U.S.-born (no)** *(n=15,818)* | **0.47 (0.40-0.54)** | **0.60 (0.52-0.69)** | **0.66 (0.62-0.70)** | **0.77 (0.71-0.82)** | **0.83 (0.70-0.99)** | **0.65 (0.54-0.78)** | **0.60 (0.55-0.66)** | **0.64 (0.58-0.71)** | **0.51 (0.46-0.55)** | **0.55 (0.49-0.62)** | **0.82 (0.77-0.86)** | **0.85 (0.80-0.90)** | **0.36 (0.30-0.44)** | **0.34 (0.27-0.42)** |
| **High Acculturation** (n=6,141) | **0.59 (0.50-0.70)** | **0.69 (0.58-0.83)** | **0.76 (0.71-0.82)** | **0.81 (0.74-0.88)** | 0.88 (0.68-1.14) | **0.69 (0.52-0.91)** | **0.57 (0.46-0.69)** | **0.70 (0.61-0.81)** | **0.47 (0.39-0.58)** | **0.59 (0.50-0.69)** | **0.83 (0.75-0.92)** | **0.90 (0.83-0.98)** | **0.30 (0.19-0.47)** | **0.40 (0.29-0.57)** |
| **Medium/Low Acculturation** (n=9,666) | **0.38 (0.31-0.46)** | **0.54 (0.45-0.64)** | **0.57 (0.53-0.62)** | **0.73 (0.66-0.80)** | 0.81 (0.66-1.00) | **0.61 (0.49-0.75)** | **0.53 (0.43-0.66)** | **0.58 (0.50-0.67)** | **0.44 (0.36-0.53)** | **0.52 (0.44-0.60)** | **0.71 (0.64-0.79)** | **0.78 (0.72-0.85)** | **0.45 (0.31-0.67)** | **0.29 (0.21-0.39)** |
| **Puerto Rican** | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=2,544)* | **1.33 (1.08-1.63)** | **1.53 (1.30-1.81)** | **1.21 (1.11-1.33)** | **1.24 (1.15-1.35)** | 1.26 (0.89-1.77) | 0.94 (0.66-1.33) | 1.04 (0.90-1.21) | 1.14 (0.98-1.33) | 0.97 (0.85-1.11) | 0.91 (0.78-1.05) | 1.00 (0.92-1.09) | **1.10 (1.01-1.20)** | 0.96 (0.76-1.19) | 0.97 (0.73-1.30) |
| **High Acculturation** (n=2,359) | **1.36 (1.11-1.68)** | **1.59 (1.34-1.89)** | **1.22 (1.11-1.34)** | **1.26 (1.16-1.37)** | 1.32 (0.93-1.86) | 0.98 (0.68-1.40) | 0.93 (0.72-1.21) | 1.17 (1.00-1.38) | 1.08 (0.84-1.39) | 0.92 (0.79-1.07) | 0.92 (0.79-1.06) | **1.11 (1.02-1.22)** | 1.00 (0.69-1.44) | 1.00 (0.74-1.35) |
| **Medium/Low Acculturation** (n=184) | 0.79 (0.36-1.74) | 0.89 (0.56-1.42) | 1.17 (0.83-1.65) | 1.01 (0.73-1.40) | 0.48 (0.10-2.30) | 0.51 (0.19-1.31) | 0.72 (0.32-1.66) | 0.61 (0.32-1.16) | 0.74 (0.35-1.54) | 0.75 (0.39-1.44) | **0.36 (0.16-0.81)** | 0.87 (0.55-1.39) | 0.52 (0.10-2.77) | 0.60 (0.17-2.10) |
| **U.S.-born (no)** *(n=2,533)* | **1.29 (1.03-1.61)** | **1.36 (1.17-1.58)** | **1.15 (1.04-1.27)** | **1.16 (1.06-1.26)** | 0.89 (0.63-1.26) | 0.96 (0.72-1.28) | 1.05 (0.91-1.21) | 1.01 (0.86-1.18) | 0.84 (0.73-0.97) | **0.82 (0.70-0.97)** | 0.95 (0.86-1.04) | 0.96 (0.85-1.08) | 1.01 (0.83-1.24) | 1.08 (0.86-1.35) |
| **High Acculturation** (n=1,773) | **1.48 (1.16-1.90)** | **1.37 (1.14-1.64)** | 1.14 (1.00-1.30) | **1.20 (1.09-1.33)** | 1.06 (0.72-1.57) | 0.97 (0.69-1.37) | 1.14 (0.85-1.52) | 1.06 (0.88-1.28) | 0.98 (0.76-1.26) | 0.87 (0.72-1.05) | 1.02 (0.88-1.20) | 1.00 (0.87-1.14) | 0.97 (0.62-1.52) | 1.14 (0.88-1.48) |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Medium/Low Acculturation** (n=755) | 0.81 (0.48-1.37) | **1.32 (1.07-1.64)** | 1.15 (0.95-1.40) | 1.05 (0.91-1.22) | 0.57 (0.30-1.07) | 0.96 (0.60-1.53) | 1.16 (0.76-1.77) | 0.86 (0.64-1.16) | **0.60 (0.38-0.95)** | **0.69 (0.50-0.95)** | 0.73 (0.53-1.01) | 0.84 (0.69-1.02) | 0.87 (0.41-1.86) | 0.92 (0.63-1.36) |
| **Cuban** | | | | | | | | | | | | | | |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.78 (0.44-1.39) | 1.08 (0.74-1.58) | 1.01 (0.81-1.25) | 1.08 (0.89-1.31) | 0.49 (0.18-1.29) | 0.95 (0.39-2.31) | 0.95 (0.70-1.28) | 0.96 (0.66-1.39) | 0.92 (0.69-1.23) | 0.83 (0.53-1.31) | 0.96 (0.80-1.16) | 1.07 (0.86-1.34) | 0.95 (0.54-1.66) | 1.37 (0.78-2.42) |
| **High Acculturation** (n=440) | 0.89 (0.49-1.62) | 1.16 (0.79-1.71) | 1.08 (0.86-1.35) | 1.05 (0.85-1.30) | **0.29 (0.09-0.96)** | 1.06 (0.38-2.97) | 1.34 (0.85-2.10) | 1.17 (0.82-1.67) | 1.24 (0.82-1.88) | 0.84 (0.54-1.29) | 0.93 (0.68-1.28) | 1.03 (0.78-1.36) | 0.53 (0.17-1.64) | 1.30 (0.71-2.38) |
| **Medium/Low Acculturation** (n=119) | 0.37 (0.11-1.22) | 0.72 (0.21-2.46) | 0.69 (0.40-1.20) | 1.21 (0.71-2.06) | 0.88 (0.20-3.91) | 0.63 (0.16-2.51) | NE | 0.27 (0.06-1.23) | 0.28 (0.06-1.40) | 0.82 (0.29-2.28) | 0.76 (0.38-1.51) | 1.21 (0.90-1.62) | 0.25 (0.03-1.90) | 1.65 (0.39-6.94) |
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.75 (0.56-1.00) | 0.90 (0.69-1.18) | **0.78 (0.67-0.91)** | 0.94 (0.82-1.07) | 0.78 (0.57-1.05) | **0.55 (0.35-0.87)** | **0.69 (0.52-0.92)** | **0.71 (0.52-0.98)** | **0.61 (0.48-0.78)** | **0.68 (0.50-0.94)** | **0.87 (0.77-0.97)** | 0.95 (0.80-1.13) | **0.59 (0.42-0.83)** | **0.60 (0.40-0.89)** |
| **High Acculturation** (n=571) | 0.90 (0.54-1.51) | 1.13 (0.70-1.82) | 0.91 (0.68-1.22) | 1.09 (0.89-1.34) | 0.87 (0.48-1.58) | 0.63 (0.30-1.34) | 1.08 (0.64-1.82) | 1.04 (0.68-1.59) | **0.58 (0.36-0.91)** | 0.95 (0.62-1.46) | 0.75 (0.53-1.04) | 0.89 (0.65-1.23) | 0.93 (0.43-2.01) | 0.61 (0.30-1.25) |
| **Medium/Low Acculturation** (n=1,386) | **0.68 (0.50-0.93)** | 0.82 (0.58-1.16) | **0.71 (0.61-0.84)** | 0.87 (0.74-1.03) | 0.71 (0.49-1.01) | **0.53 (0.30-0.94)** | **0.52 (0.31-0.89)** | **0.64 (0.42-0.95)** | **0.56 (0.39-0.80)** | **0.61 (0.40-0.92)** | 0.84 (0.68-1.04) | 1.00 (0.84-1.21) | **0.46 (0.26-0.80)** | **0.60 (0.37-0.98)** |
| **Dominican** | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=264)* | 1.13 (0.60-2.11) | 1.02 (0.58-1.79) | 0.86 (0.60-1.23) | 1.32 (0.98-1.77) | 0.96 (0.30-3.07) | 1.35 (0.48-3.80) | 0.73 (0.48-1.12) | 0.62 (0.36-1.07) | 0.97 (0.65-1.44) | 0.91 (0.53-1.57) | 0.99 (0.78-1.26) | 0.93 (0.68-1.29) | 0.64 (0.31-1.30) | 0.57 (0.23-1.43) |
| **High Acculturation** (n=208) | 1.30 (0.67-2.55) | 1.00 (0.54-1.08) | 0.94 (0.64-1.38) | 1.38 (1.00-1.90) | 1.32 (0.40-4.36) | 1.36 (0.42-4.40) | 1.01 (0.58-1.76) | 0.62 (0.34-1.15) | 1.12 (0.47-2.67) | 0.79 (0.41-1.50) | 1.10 (0.76-1.60) | 0.90 (0.63-1.30) | 0.80 (0.26-2.47) | 0.56 (0.20-1.56) |
| **Medium/Low Acculturation** (n=56) | 0.63 (0.12-3.25) | 1.11 (0.34-3.57) | 0.58 (0.23-1.47) | 1.05 (0.56-1.97) | 0.23 (0.03-1.74) | 1.30 (0.19-8.81) | NE | 0.62 (0.22-1.79) | NE | 1.42 (0.69-2.94) | 0.47 (0.11-1.96) | 1.06 (0.61-1.84) | NE | 0.62 (0.08-4.72) |
| **U.S.-born (no)** *(n=1,394)* | 0.74 (0.52-1.04) | 0.95 (0.78-1.15) | 0.82 (0.69-0.97) | 0.92 (0.81-1.04) | 1.08 (0.63-1.85) | **0.29 (0.15-0.53)** | **0.78 (0.63-0.97)** | 0.88 (0.69-1.12) | **0.62 (0.49-0.80)** | **0.74 (0.57-0.97)** | 0.92 (0.79-1.08) | 0.96 (0.83-1.13) | 0.86 (0.55-1.34) | 1.00 (0.61-1.63) |
| **High Acculturation** (n=594) | 0.89 (0.56-1.39) | 0.88 (0.63-1.24) | 0.94 (0.75-1.18) | 0.92 (0.76-1.11) | 1.51 (0.67-3.40) | **0.15 (0.06-0.35)** | 0.79 (0.44-1.40) | 0.81 (0.54-1.22) | 0.62 (0.31-1.21) | 0.73 (0.48-1.11) | 0.72 (0.51-1.00) | 0.96 (0.75-1.23) | 0.67 (0.21-2.10) | 0.85 (0.43-1.70) |
| **Medium/Low Acculturation** (n=800) | 0.63 (0.38-1.03) | 0.98 (0.76-1.26) | **0.72 (0.55-0.93)** | 0.91 (0.79-1.06) | 0.90 (0.41-1.94) | **0.36 (0.17-0.74)** | **0.34 (0.18-0.65)** | 0.94 (0.71-1.25) | **0.22 (0.11-0.44)** | 0.76 (0.56-1.03) | 0.96 (0.67-1.37) | 0.97 (0.78-1.21) | 0.38 (0.12-1.13) | 1.13 (0.60-2.11) |
| **Central/South American** | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=1,113)* | 1.31 (0.92-1.87) | 1.31 (0.96-1.77) | 1.25 (1.08-1.45) | 1.10 (0.92-1.30) | 0.64 (0.35-1.16) | 0.95 (0.52-1.74) | 1.21 (0.96-1.53) | **1.40 (1.06-1.86)** | 0.97 (0.73-1.30) | 1.13 (0.80-1.61) | 1.05 (0.92-1.20) | 1.13 (0.97-1.32) | 0.64 (0.38-1.10) | **0.47 (0.24-0.94)** |
| **High Acculturation** (n=994) | 1.40 (0.97-2.04) | **1.42 (1.04-1.94)** | **1.30 (1.11-1.51)** | 1.15 (0.97-1.36) | 0.48 (0.22-1.07) | 1.03 (0.53-2.00) | 0.97 (0.64-1.47) | **1.30 (1.04-1.63)** | 0.71 (0.46-1.10) | 1.06 (0.82-1.37) | 0.99 (0.80-1.23) | 1.14 (1.00-1.30) | 1.01 (0.45-2.27) | 0.44 (0.21-0.90) |
| **Medium/Low Acculturation** | 0.73 (0.29-1.83) | 0.61 (0.22-1.69) | 0.92 (0.51-1.64) | 0.74 (0.36-1.52) | 1.26 (0.51-3.12) | 0.52 (0.11-2.62) | 0.86 (0.27-2.75) | 1.90 (0.87-4.12) | 0.89 (0.24-3.25) | 1.50 (0.48-4.75) | 0.60 (0.28-1.32) | 1.07 (0.61-1.87) | 0.43 (0.06-3.19) | 0.66 (0.11-3.91) |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (n=119) | | | | | | | | | | | | | | |
| **U.S.-born (no)** *(n=7,049)* | **0.64 (0.54-0.76)** | **0.80 (0.70-0.93)** | **0.88 (0.82-0.94)** | **0.92 (0.85-0.98)** | **0.66 (0.47-0.94)** | **0.67 (0.52-0.87)** | **0.69 (0.60-0.78)** | **0.71 (0.61-0.83)** | **0.60 (0.53-0.68)** | **0.66 (0.57-0.77)** | **0.85 (0.80-0.91)** | **0.92 (0.85-0.99)** | **0.40 (0.31-0.51)** | **0.46 (0.34-0.62)** |
| **High Acculturation** (n=3,366) | **0.72 (0.57-0.91)** | **0.79 (0.63-0.98)** | 0.94 (0.85-1.04) | 0.91 (0.82-1.02) | 0.77 (0.50-1.17) | 0.76 (0.53-1.11) | **0.66 (0.50-0.88)** | **0.80 (0.64-0.98** | **0.57 (0.42-0.76)** | **0.74 (0.61-0.89)** | **0.75 (0.65-0.86)** | 0.96 (0.87-1.06) | **0.38 (0.22-0.67)** | **0.52 (0.36-0.76)** |
| **Medium/Low Acculturation** (n=3,664) | **0.56 (0.45-0.72)** | **0.82 (0.68-0.98)** | **0.80 (0.72-0.89)** | 0.92 (0.84-1.00) | **0.58 (0.34-0.98)** | **0.59 (0.42-0.84)** | **0.60 (0.43-0.84)** | **0.63 (0.51-0.79)** | **0.44 (0.32-0.61)** | **0.59 (0.47-0.74)** | **0.80 (0.67-0.94)** | **0.87 (0.77-0.97)** | **0.19 (0.09-0.38)** | **0.40 (0.26-0.63)** |

Abbreviations: ref (reference); NE (non-estimable)

* Language acculturation categories include high (English only interview) and medium/low (English and Spanish interview or Spanish only interview).

Adjusted for age (18-30, 31-49, 50-64, 65+ years), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S8. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to non-Hispanic Whites by Language Acculturation Status*, Stratified by Age Group, National Health Interview Survey, 2004-2017 (N=245,812)**

| Group *(n)* | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | | | | Sleep Quality in the Past Week | | | | | | | | | | | |
| | Very Short (≤5-hours) (n=17,112) | | | Short (<7-hours) (n=61,091) | | | Long (>9-hours) (n=7,604) | | | Trouble Falling Asleep (≥3 nights) (n=18,607) | | | Trouble Staying Asleep (≥3 nights) (n=26,493) | | | Non-restorative Sleep (≥3 days) (n=38,369) | | | Sleep Medication Use (≥3 nights) (n=10,024) | | |
| **Age (years) Group** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Mexican** | | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=14,282)* | 1.03 (0.90-1.18) | 1.03 (0.91-1.15) | **1.14 (1.01-1.27)** | 1.00 (0.93-1.06) | **1.09 (1.03-1.15)** | 1.06 (0.99-1.13) | 1.04 (0.85-1.26) | 0.85 (0.67-1.09) | 0.96 (0.81-1.13) | 0.96 (0.89-1.03) | **0.81 (0.73-0.91)** | 1.01 (0.90-1.15) | **0.77 (0.71-0.82)** | **0.73 (0.65-0.82)** | **0.84 (0.75-0.95)** | 1.02 (0.98-1.06) | 0.96 (0.91-1.03) | 1.00 (0.92-1.09) | **0.61 (0.53-0.70)** | **0.64 (0.51-0.80)** | **0.64 (0.54-0.76)** |
| **High Acculturation** (n=13,075) | 1.07 (0.93-1.23) | 1.03 (0.92-1.16) | **1.18 (1.05-1.33)** | 1.04 (0.97-1.11) | **1.09 (1.04-1.15)** | **1.09 (1.02-1.17)** | 1.03 (0.84-1.27) | 0.86 (0.67-1.10) | 0.98 (0.82-1.17) | 1.02 (0.89-1.17) | **0.83 (0.74-0.94)** | 1.03 (0.91-1.17) | 0.89 (0.76-1.04) | **0.76 (0.67-0.85)** | **0.87 (0.77-0.97)** | 1.02 (0.94-1.09) | 0.97 (0.91-1.03) | 1.03 (0.94-1.13) | 0.87 (0.60-1.25) | **0.65 (0.52-0.83)** | **0.65 (0.54-0.77)** |
| **Medium/Low Acculturation** (n=1,188) | 0.77 (0.54-1.10) | 0.95 (0.67-1.35) | 0.69 (0.42-1.14) | **0.72 (0.59-0.88)** | 1.00 (0.83-1.21) | **0.64 (0.49-0.86)** | 1.00 (0.62-1.60) | 0.79 (0.30-2.11) | 0.83 (0.59-1.15) | **0.64 (0.41-0.99)** | **0.49 (0.28-0.88)** | 0.78 (0.51-1.18) | **0.47 (0.27-0.81)** | **0.31 (0.16-0.59)** | **0.57 (0.38-0.84)** | 0.82 (0.67-1.01) | 0.88 (0.71-1.09) | **0.61 (0.41-0.89)** | **0.08 (0.01-0.60)** | 0.38 (0.12-1.19) | 0.58 (0.30-1.10) |
| **U.S.-born (no)** *(n=15,818)* | **0.43 (0.34-0.54)** | **0.48 (0.41-0.55)** | **0.82 (0.68-0.98)** | **0.67 (0.61-0.74)** | **0.69 (0.65-0.74)** | **0.86 (0.79-0.93)** | 0.81 (0.62-1.06) | **0.65 (0.51-0.82)** | **0.76 (0.63-0.92)** | **0.63 (0.58-0.69)** | **0.54 (0.46-0.62)** | **0.80 (0.69-0.93)** | **0.51 (0.47-0.56)** | **0.46 (0.40-0.52)** | **0.57 (0.50-0.65)** | **0.86 (0.82-0.91)** | **0.79 (0.74-0.85)** | **0.85 (0.77-0.94)** | **0.36 (0.29-0.43)** | **0.22 (0.15-0.32)** | **0.57 (0.44-0.75)** |
| **High Acculturation** (n=6,141) | **0.62 (0.48-0.81)** | **0.55 (0.46-0.65)** | 0.98 (0.76-1.25) | **0.79 (0.70-0.90)** | **0.76 (0.70-0.81)** | 0.92 (0.82-1.03) | 0.80 (0.57-1.13) | **0.65 (0.46-0.92)** | 0.91 (0.66-1.25) | **0.63 (0.50-0.80)** | **0.57 (0.47-0.69)** | 0.86 (0.69-1.08) | **0.68 (0.52-0.90)** | **0.48 (0.40-0.57)** | **0.57 (0.46-0.69)** | 1.06 (0.94-1.20) | **0.83 (0.76-0.90)** | 0.86 (0.74-1.00) | **0.22 (0.08-0.60)** | **0.26 (0.17-0.41)** | **0.58 (0.40-0.84)** |
| **Medium/Low Acculturation** (n=9,666) | **0.29 (0.20-0.41)** | **0.41 (0.34-0.49)** | **0.74 (0.58-0.94)** | **0.56 (0.48-0.65)** | **0.62 (0.56-0.68)** | **0.82 (0.74-0.91)** | 0.80 (0.58-1.10) | **0.64 (0.49-0.83)** | **0.69 (0.55-0.87)** | **0.45 (0.32-0.64)** | **0.50 (0.41-0.60)** | **0.77 (0.64-0.93)** | **0.46 (0.32-0.68)** | **0.44 (0.37-0.52)** | **0.57 (0.48-0.67)** | **0.79 (0.66-0.96)** | **0.75 (0.68-0.82)** | **0.84 (0.74-0.95)** | 0.27 (0.07-1.02) | **0.19 (0.12-0.31)** | **0.56 (0.40-0.80)** |
| **Puerto Rican** | | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=2,544)* | **1.53 (1.19-1.96)** | **1.47 (1.24-1.74)** | **1.55 (1.17-2.06)** | **1.26 (1.12-1.42)** | **1.25 (1.15-1.36)** | **1.28 (1.11-1.48)** | 1.36 (0.97-1.91) | 1.00 (0.66-1.54) | 0.64 (0.35-1.19) | 1.14 (0.99-1.31) | 0.93 (0.75-1.14) | **1.49 (1.20-1.86)** | 0.98 (0.85-1.12) | 1.02 (0.82-1.25) | 1.01 (0.79-1.28) | 1.08 (0.99-1.18) | 0.99 (0.87-1.12) | 1.11 (0.94-1.31) | 0.93 (0.74-1.17) | 0.79 (0.52-1.19) | 1.25 (0.92-1.69) |
| **High Acculturation** (n=2,359) | **1.50 (1.17-1.94)** | **1.52 (1.28-1.81)** | **1.71 (1.28-2.30)** | **1.25 (1.10-1.42)** | **1.25 (1.14-1.36)** | **1.35 (1.17-1.55)** | 1.40 (0.99-1.97) | 1.03 (0.66-1.61) | 0.73 (0.40-1.34) | 1.02 (0.78-1.33) | 0.94 (0.75-1.17) | **1.58 (1.27-1.97)** | 0.89 (0.62-1.28) | 1.01 (0.81-1.26) | 1.07 (0.84-1.36) | 1.04 (0.91-1.20) | 1.01 (0.89-1.14) | 1.17 (0.99-1.38) | 0.81 (0.41-1.60) | 0.81 (0.53-1.23) | 1.32 (0.97-1.78) |
| **Medium/Low Acculturation** (n=184) | **1.88 (1.07-3.31)** | 0.64 (0.27-1.51) | 0.55 (0.25-1.18) | 1.38 (0.93-2.05) | 1.25 (0.93-1.68) | 0.71 (0.34-1.47) | 0.78 (0.24-2.52) | 0.75 (0.25-2.24) | NE | NE | 0.73 (0.36-1.49) | 0.80 (0.35-1.84) | 0.44 (0.06-3.38) | 1.08 (0.58-2.01) | 0.54 (0.23-1.23) | 0.36 (0.07-1.79) | 0.68 (0.38-1.23) | 0.67 (0.33-1.38) | NE | 0.45 (0.09-2.24) | 0.67 (0.18-2.52) |
| **U.S.-born (no)** | 1.27 | 1.08 | **1.56** | **1.23** | 1.01 | **1.26** | 1.03 | 0.75 | 0.96 | 1.09 | 0.95 | **1.27** | **0.86** | 0.77 | 0.87 | 0.98 | 0.94 | 1.00 | 1.04 | 0.90 | 1.08 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *(n=2,533)* | (0.86-1.87) | (0.85-1.38) | **(1.34-1.81)** | **(1.01-1.51)** | (0.90-1.14) | **(1.16-1.37)** | (0.53-2.02) | (0.47-1.18) | (0.74-1.25) | (0.94-1.25) | (0.73-1.22) | **(1.06-1.51)** | **(0.75-0.99)** | (0.58-1.02) | (0.73-1.03) | (0.88-1.08) | (0.80-1.10) | (0.87-1.14) | (0.85-1.27) | (0.60-1.35) | (0.85-1.37) |
| **High Acculturation** (n=1,773) | 1.25 (0.82-1.91) | 1.05 (0.78-1.42) | 1.85 (1.56-2.19) | 1.20 (0.94-1.53) | 0.99 (0.86-1.14) | **1.35 (1.23-1.48)** | 0.87 (0.35-2.21) | 0.91 (0.57-1.43) | 1.09 (0.79-1.52) | **0.51 (0.28-0.93)** | 0.95 (0.72-1.24) | **1.41 (1.14-1.74)** | 0.99 (0.63-1.56) | 0.82 (0.60-1.12) | 0.98 (0.81-1.18) | 0.98 (0.71-1.35) | 1.05 (0.91-1.22) | 1.01 (0.86-1.20) | 0.73 (0.21-2.53) | 1.06 (0.69-1.64) | 1.09 (0.82-1.46) |
| **Medium/Low Acculturation** (n=755) | 1.31 (0.62-2.79) | 1.16 (0.78-1.72) | 1.04 (0.84-1.29) | 1.33 (0.99-1.78) | 1.08 (0.87-1.32) | 1.08 (0.92-1.27) | 1.48 (0.66-3.36) | **0.28 (0.08-0.94)** | 0.76 (0.48-1.20) | 1.25 (0.60-2.60) | 0.93 (0.51-1.68) | 0.97 (0.70-1.36) | 1.19 (0.46-3.13) | 0.62 (0.35-1.12) | **0.61 (0.43-0.86)** | 0.74 (0.35-1.60) | **0.62 (0.42-0.91)** | 0.95 (0.76-1.19) | 2.05 (0.61-6.90) | **0.41 (0.19-0.86)** | 1.05 (0.66-1.67) |
| **Cuban** | | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.81 (0.47-1.42) | 0.83 (0.49-1.41) | 1.65 (0.93-2.94) | 0.98 (0.76-1.26) | 1.11 (0.91-1.35) | 1.04 (0.69-1.57) | 0.93 (0.39-2.23) | 0.45 (0.14-1.41) | 0.21 (0.03-1.53) | 1.05 (0.78-1.41) | 1.11 (0.72-1.71) | 1.54 (0.85-2.78) | 0.91 (0.68-1.22) | 1.02 (0.68-1.53) | 1.04 (0.62-1.75) | 1.05 (0.87-1.26) | 0.94 (0.72-1.24) | 0.99 (0.61-1.63) | 0.91 (0.52-1.60) | 1.53 (0.83-2.80) | 0.63 (0.26-1.49) |
| **High Acculturation** (n=440) | 1.00 (0.56-1.77) | 0.84 (0.47-1.50) | 1.69 (0.92-3.10) | 1.01 (0.78-1.32) | 1.12 (0.90-1.39) | 1.06 (0.68-1.63) | 1.06 (0.37-3.04) | 0.30 (0.07-1.21) | 0.25 (0.04-1.82) | 0.92 (0.55-1.53) | 1.32 (0.86-2.03) | 1.66 (0.90-3.06) | 1.04 (0.57-1.90) | 0.97 (0.62-1.54) | 1.11 (0.64-1.90) | 1.05 (0.80-1.40) | 0.92 (0.67-1.26) | 1.00 (0.59-1.70) | **0.10 (0.01-0.76)** | 1.45 (0.78-2.69) | 0.63 (0.24-1.64) |
| **Medium/Low Acculturation** (n=119) | 0.22 (0.03-1.53) | 0.81 (0.30-2.19) | 1.13 (0.26-4.86) | 0.87 (0.42-1.82) | 1.06 (0.69-1.61) | 0.85 (0.25-2.91) | 0.73 (0.17-3.17) | 1.02 (0.23-4.51) | NE | NE | 0.30 (0.05-1.92) | 0.50 (0.11-2.21) | NE | 1.18 (0.51-2.74) | 0.36 (0.07-2.00) | 1.10 (0.63-1.93) | 1.03 (0.66-1.63) | 0.88 (0.27-2.90) | NE | 1.84 (0.48-7.11) | 0.64 (0.14-2.89) |
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.59 (0.24-1.43) | **0.61 (0.44-0.84)** | 1.03 (0.81-1.31) | **0.48 (0.31-0.75)** | **0.67 (0.53-0.83)** | 1.06 (0.95-1.18) | 0.32 (0.08-1.34) | 0.75 (0.42-1.34) | **0.74 (0.56-0.96)** | **0.70 (0.53-0.93)** | **0.57 (0.35-0.95)** | 0.94 (0.74-1.20) | **0.64 (0.50-0.81)** | **0.61 (0.41-0.90)** | **0.69 (0.54-0.89)** | **0.87 (0.78-0.97)** | **0.76 (0.64-0.89)** | 0.98 (0.83-1.16) | **0.62 (0.44-0.88)** | **0.30 (0.13-0.66)** | 0.77 (0.56-1.07) |
| **High Acculturation** (n=571) | 0.55 (0.16-1.91) | 0.75 (0.44-1.28) | 1.31 (0.82-2.09) | 0.55 (0.27-1.12) | 0.87 (0.67-1.11) | 1.18 (0.95-1.47) | 0.91 (0.21-4.01) | 0.76 (0.21-2.83) | 0.75 (0.45-1.26) | NE | **0.38 (0.14-0.98)** | 1.66 (1.20-2.30) | 0.20 (0.03-1.47) | 0.58 (0.25-1.37) | 0.85 (0.61-1.19) | 0.66 (0.31-1.40) | 0.65 (0.41-1.04) | 0.95 (0.70-1.28) | NE | 0.16 (0.02-1.11) | 1.03 (0.58-1.85) |
| **Medium/Low Acculturation** (n=1,386) | 0.62 (0.20-1.92) | **0.55 (0.37-0.82)** | 0.92 (0.71-1.19) | **0.47 (0.27-0.83)** | **0.57 (0.41-0.78)** | 1.00 (0.90-1.12) | 0.13 (0.01-1.08) | 0.75 (0.40-1.41) | **0.69 (0.49-0.99)** | **0.11 (0.02-0.74)** | 0.64 (0.36-1.12)) | **0.62 (0.45-0.86)** | **0.12 (0.02-0.85)** | **0.62 (0.40-0.96)** | **0.62 (0.43-0.89)** | 1.01 (0.63-1.64) | **0.79 (0.68-0.92)** | 1.00 (0.83-1.20) | NE | **0.33 (0.14-0.82)** | **0.66 (0.47-0.94)** |
| **Dominican** | | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=264)* | 0.63 (0.31-1.30) | 2.17 (1.33-3.55) | 1.65 (0.41-6.68) | 0.87 (0.58-1.31) | **1.62 (1.30-2.02)** | 0.98 (0.43-2.20) | 1.32 (0.52-3.33) | 2.50 (0.76-8.25) | NE | 0.78 (0.50-1.21) | 0.88 (0.44-1.76) | 0.82 (0.12-5.75) | 0.85 (0.56-1.28) | 1.05 (0.55-2.02) | 0.46 (0.07-3.02) | 1.06 (0.82-1.36) | 1.05 (0.77-1.42) | 1.60 (0.70-3.67) | 0.50 (0.24-1.02) | 1.26 (0.52-3.02) | 0.69 (0.08-5.75) |
| **High Acculturation** (n=208) | 0.68 (0.31-1.51) | 2.15 (1.25-3.69) | 1.85 (0.46-7.43) | 0.99 (0.64-1.51) | **1.60 (1.27-2.02)** | 1.05 (0.46-2.44) | 1.45 (0.52-4.00) | **3.32 (1.11-9.93)** | NE | 0.77 (0.41-1.45) | 1.04 (0.54-2.02) | 0.82 (0.12-5.75) | 1.15 (0.59-2.27) | 0.83 (0.35-1.99) | 0.46 (0.07-3.02) | 0.97 (0.66-1.43) | 1.06 (0.77-1.46) | 1.60 (0.70-3.67) | 0.23 (0.03-1.62) | 1.45 (0.57-3.66) | 0.69 (0.08-5.75) |
| **Medium/Low Acculturation** (n=56) | 0.49 (0.11-2.16) | 2.28 (0.86-6.06) | NE | 0.44 (0.18-1.09) | **1.72 (1.11-2.67)** | 0.38 (0.05-2.93) | 0.97 (0.22-4.36) | NE | NE | 0.44 (0.20-1.01) | 0.52 (0.10-2.59) | NE | 0.62 (0.25-1.50) | 1.63 (0.74-3.57) | NE | 0.99 (0.45-2.17) | 1.00 (0.48-2.10) | NE | NE | 0.78 (0.10-6.23) | NE |
| **U.S.-born (no)** *(n=1,394)* | 0.63 (0.37-1.08) | 0.76 (0.55-1.04) | 1.16 (0.94-1.44) | 0.75 (0.55-1.03) | **0.84 (0.72-0.99)** | 1.02 (0.89-1.17) | 1.31 (0.64-2.68) | 0.33 (0.12-0.87) | **0.44 (0.22-0.87)** | **0.80 (0.65-0.99)** | **0.66 (0.44-0.97)** | 0.90 (0.69-1.18) | **0.63 (0.50-0.81)** | **0.41 (0.26-0.64)** | **0.72 (0.54-0.96)** | 0.96 (0.82-1.12) | **0.75 (0.59-0.94)** | 1.11 (0.91-1.35) | 0.87 (0.56-1.35) | **0.20 (0.09-0.47)** | 1.33 (0.84-2.12) |
| **High Acculturation** (n=594) | 1.08 (0.61-1.92) | 0.72 (0.45-1.14) | 1.23 (0.81-1.88) | 1.04 (0.75-1.46) | 0.90 (0.74-1.09) | 1.00 (0.78-1.27) | 1.12 (0.41-3.04) | 0.26 (0.05-1.41) | 0.72 (0.22-2.40) | 0.99 (0.47-2.10) | 0.77 (0.47-1.27) | 0.87 (0.48-1.56) | 1.41 (0.64-3.10) | **0.37 (0.21-0.67)** | 0.93 (0.57-1.54) | 1.11 (0.80-1.55) | **0.65 (0.48-0.89)** | 1.18 (0.84-1.65) | **0.06 (0.01-0.54)** | **0.10 (0.03-0.32)** | 1.65 (0.91-2.99) |
| **Medium/Low Acculturation** (n=800) | **0.21 (0.08-0.56)** | 0.79 (0.54-1.15) | 1.14 (0.85-1.51) | **0.43 (0.25-0.75)** | **0.78 (0.63-0.97)** | 1.03 (0.87-1.21) | 1.42 (0.56-3.61) | 0.38 (0.12-1.25) | **0.34 (0.15-0.76)** | 0.43 (0.16-1.11) | **0.51 (0.27-0.95)** | 0.92 (0.67-1.25) | 0.53 (0.18-1.56) | **0.46 (0.25-0.83)** | **0.60 (0.41-0.90)** | 0.92 (0.41-2.04) | 0.87 (0.62-1.23) | 1.07 (0.85-1.33) | 0.28 (0.04-1.91) | **0.34 (0.13-0.93)** | 1.16 (0.60-2.26) |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Central/South American** | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=1,113)* | 1.31 (0.94-1.82) | **1.52 (1.07-2.16)** | 0.98 (0.43-2.25) | **1.19 (1.02-1.40)** | **1.23 (1.04-1.45)** | 1.02 (0.65-1.58) | 0.82 (0.48-1.40) | 0.96 (0.34-2.74) | 0.36 (0.08-1.54) | 1.26 (1.01-1.55) | 1.28 (0.90-1.83) | **1.66 (1.01-2.73)** | 0.87 (0.65-1.15) | 0.73 (0.53-1.03) | 0.93 (0.53-1.63) | 1.10 (0.97-1.25) | 1.02 (0.84-1.23) | 0.80 (0.46-1.41) | **0.52 (0.30-0.89)** | **0.23 (0.11-0.49)** | 1.41 (0.67-2.95) |
| **High Acculturation** (n=994) | **1.43 (1.02-2.02)** | **1.59 (1.10-2.30)** | 1.08 (0.47-2.45) | **1.28 (1.09-1.49)** | **1.24 (1.05-1.45)** | 1.04 (0.66-1.64) | 0.81 (0.42-1.57) | 1.04 (0.36-2.98) | 0.45 (0.11-1.86) | 1.08 (0.81-1.46) | 1.30 (0.91-1.84) | 1.47 (0.85-2.55) | 1.01 (0.72-1.42) | 0.80 (0.57-1.12) | 1.08 (0.64-1.81) | 1.10 (0.94-1.29) | 1.07 (0.89-1.29) | 0.91 (0.53-1.56) | 0.96 (0.43-2.13) | **0.24 (0.11-0.53)** | 1.00 (0.43-2.34) |
| **Medium/Low Acculturation** (n=119) | 0.74 (0.32-1.72) | 0.67 (0.16-2.90) | NE | 0.74 (0.45-1.22) | 1.15 (0.46-2.85) | 0.77 (0.16-3.66) | 0.85 (0.36-1.99) | NE | NE | 1.52 (0.69-3.34) | 1.12 (0.18-7.07) | **2.78 (1.47-5.24)** | 1.87 (0.86-4.05) | NE | NE | 1.06 (0.66-1.70) | 0.46 (0.11-1.83) | NE | 0.19 (0.02-1.49) | NE | 3.59 (2.21-5.82) |
| **U.S.-born (no)** *(n=7,049)* | **0.73 (0.56-0.96)** | **0.65 (0.55-0.77)** | 0.92 (0.77-1.09) | **0.86 (0.76-0.98)** | **0.89 (0.83-0.96)** | 0.99 (0.91-1.07) | 0.93 (0.61-1.41) | **0.61 (0.44-0.85)** | **0.51 (0.36-0.73)** | **0.72 (0.63-0.82)** | **0.63 (0.51-0.78)** | **0.83 (0.69-0.99)** | **0.61 (0.54-0.69)** | **0.53 (0.43-0.65)** | **0.65 (0.54-0.78)** | **0.90 (0.84-0.96)** | **0.83 (0.76-0.91)** | 0.91 (0.81-1.03) | **0.40 (0.31-0.51)** | **0.34 (0.22-0.55)** | **0.47 (0.35-0.64)** |
| **High Acculturation** (n=3,366) | 0.75 (0.50-1.12) | **0.70 (0.55-0.88)** | 0.92 (0.70-1.20) | 1.00 (0.85-1.18) | 0.92 (0.84-1.01) | 0.94 (0.82-1.07) | 1.11 (0.72-1.70) | 0.74 (0.49-1.11) | **0.56 (0.33-0.94)** | 0.75 (0.51-1.11) | **0.68 (0.51-0.90)** | 0.87 (0.64-1.18) | 1.12 (0.80-1.56) | **0.59 (0.46-0.76)** | **0.62 (0.46-0.83)** | 0.96 (0.80-1.16) | **0.82 (0.74-0.92)** | 0.91 (0.76-1.09) | 0.44 (0.16-1.21) | **0.39 (0.22-0.68)** | **0.56 (0.37-0.85)** |
| **Medium/Low Acculturation** (n=3,664) | 0.71 (0.49-1.03) | **0.60 (0.48-0.75)** | 0.91 (0.73-1.12) | **0.70 (0.57-0.87)** | **0.84 (0.76-0.93)** | 1.04 (0.94-1.15) | 0.79 (0.41-1.52) | **0.51 (0.32-0.81)** | **0.47 (0.30-0.75)** | **0.47 (0.28-0.79)** | **0.57 (0.42-0.79)** | 0.80 (0.63-1.02) | **0.40 (0.21-0.74)** | **0.44 (0.31-0.61)** | **0.68 (0.55-0.86)** | 0.86 (0.67-1.11) | **0.84 (0.73-0.95)** | 0.91 (0.77-1.07) | **0.09 (0.02-0.46)** | **0.29 (0.14-0.60)** | **0.39 (0.25-0.60)** |

Abbreviations: ref (reference); NE (not estimable)

* Language acculturation categories include high (English only interview) and medium/low (English and Spanish interview or Spanish only interview).

Adjusted for sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S9. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for (a) US-Born Hispanic/Latino Heritage Groups and (b) Foreign-born Hispanic/Latino Heritage Groups With and Without Adjustment for Time in the US Compared Foreign-born non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=56,372)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality | | | |
| **Group *(n)*<br>Compared to Foreign-born Non-Hispanic Whites (n=8,857)** | **Very Short (≤5-hours) (n=4,115)** | **Short (<7-hours) (n=14,048)** | **Long (>9-hours) (n=1,586)** | **Trouble Falling Asleep (≥3 nights) (n=3,431)** | **Trouble Staying Asleep (≥3 nights) (n=3,520)** | **Non-restorative Sleep (≥3 days) (n=7,734)** | **Sleep Medication Use (≥3 nights) (n=1,073)** |
| **Foreign-born Non-Hispanic Whites** *(n=8,857)* | ref | ref | ref | ref | ref | ref | ref |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | 1.09 (0.96-1.25) | **1.14 (1.06-1.22)** | 1.00 (0.88-1.13) | 0.92 (0.81-1.05) | **0.87 (0.78-0.97)** | 0.97 (0.92-1.01) | 0.92 (0.73-1.14) |
| **US-born (yes)** *(n=14,282)* | **1.17 (1.02-1.33)** | **1.23 (1.14-1.33)** | 1.01 (0.88-1.15) | 1.00 (0.87-1.14) | 0.97 (0.86-1.10) | 0.96 (0.91-1.01) | 0.98 (0.78-1.23) |
| **US-born (no)** *(n=15,818)* | | | | | | | |
| **Not Adjusted for Time in the US** | 0.88 (0.73-1.07) | 1.00 (0.91-1.10) | 1.00 (0.86-1.17) | **0.78 (0.66-0.94)** | **0.72 (0.62-0.84)** | 0.98 (0.93-1.04) | **0.68 (0.48-0.96)** |
| **Adjusted for Time in the US** | 0.88 (0.73-1.06) | 0.97 (0.90-1.06) | 1.05 (0.81-1.36) | **0.79 (0.66-0.94)** | **0.72 (0.62-0.84)** | 1.03 (0.94-1.13) | **0.69 (0.49-0.97)** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.73 (1.49-2.00)** | **1.30 (1.19-1.41)** | 1.06 (0.89-1.25) | **1.19 (1.03-1.39)** | 1.14 (0.99-1.31) | 0.95 (0.90-1.01) | **1.33 (1.07-1.64)** |
| **US-born (yes)** *(n=2,544)* | **1.81 (1.51-2.17)** | **1.33 (1.19-1.48)** | 1.04 (0.82-1.33) | 1.20 (0.99-1.46) | **1.22 (1.02-1.46)** | 0.94 (0.87-1.02) | **1.32 (1.01-1.73)** |
| **US-born (no)** *(n=2,533)* | | | | | | | |
| **Not Adjusted for Time in the US** | **1.58 (1.32-1.89)** | **1.23 (1.10-1.38)** | 1.11 (0.92-1.33) | **1.22 (1.01-1.46)** | 1.09 (0.91-1.30) | 0.95 (0.88-1.02) | **1.41 (1.09-1.83)** |
| **Adjusted for Time in the US** | **1.56 (1.20-1.88)** | **1.26 (1.15-1.38)** | 1.02 (0.77-1.36) | **1.24 (1.04-1.50)** | 1.11 (0.93-1.33) | 1.07 (0.95-1.21) | **1.40 (1.08-1.82)** |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | 0.95 (0.75-1.20) | 0.99 (0.86-1.14) | **0.76 (0.60-0.98)** | 0.92 (0.70-1.20) | 0.93 (0.76-1.15) | 0.97 (0.90-1.04) | 1.09 (0.77-1.55) |
| **US-born Cuban (yes)** *(n=559)* | 1.01 (0.67-1.51) | 1.20 (0.98-1.47) | 0.79 (0.47-1.33) | 1.14 (0.79-1.65) | 1.17 (0.84-1.65) | 0.91 (0.78-1.06) | 1.63 (0.91-2.93) |
| **US-born Cuban (no)** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *(n=1,959)* | | | | | | | |
| **Not Adjusted for Time in the US** | 0.92 (0.71-1.20) | 0.90 (0.77-1.06) | 0.76 (0.58-1.00) | 0.82 (0.59-1.14) | 0.85 (0.65-1.10) | 0.99 (0.91-1.06) | 0.96 (0.63-1.45) |
| **Adjusted for Time in the US** | 0.99 (0.76-1.28) | 0.95 (0.84-1.08) | **0.69 (0.48-0.99)** | 0.88 (0.64-1.22) | 0.90 (0.69-1.17) | 1.05 (0.90-1.23) | 1.03 (0.68-1.57) |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 1.11 (0.88-1.41) | 0.98 (0.83-1.16) | 0.91 (0.64-1.28) | 0.88 (0.68-1.13) | 0.94 (0.72-1.23) | 1.02 (0.94-1.12) | 1.03 (0.67-1.59) |
| **US-born (yes)** *(n=264)* | 1.38 (0.80-2.38) | 1.21 (0.88-1.67) | 0.98 (0.49-1.99) | 0.82 (0.51-1.31) | 1.25 (0.81-1.93) | 0.92 (0.75-1.13) | 0.97 (0.42-2.20) |
| **US-born (no)** *(n=1,394)* | | | | | | | |
| **Not Adjusted for Time in the US** | 1.05 (0.84-1.33) | 0.92 (0.76-1.10) | 0.89 (0.60-1.32) | 0.88 (0.68-1.16) | 0.87 (0.65-1.18) | 1.05 (0.95-1.17) | 1.02 (0.64-1.63) |
| **Adjusted for Time in the US** | 1.07 (0.85-1.34) | 0.96 (0.84-1.10) | 0.74 (0.45-1.20) | 0.90 (0.69-1.19) | 0.89 (0.66-1.21) | 1.00 (0.84-1.19) | 1.05 (0.65-1.68) |
| **Central/South American** | | | | | | | |
| **Overall** *(n=8,162)* | 0.99 (0.85-1.15) | **1.13 (1.04-1.23)** | **0.81 (0.69-0.96)** | 0.94 (0.78-1.13) | 0.89 (0.76-1.04) | 0.98 (0.94-1.03) | **0.69 (0.51-0.91)** |
| **US-born (yes)** *(n=1,113)* | **1.41 (1.05-1.90)** | **1.30 (1.10-1.53)** | 0.85 (0.60-1.20) | 1.27 (0.96-1.67) | 1.14 (0.86-1.52) | 0.95 (0.85-1.06) | 0.95 (0.56-1.62) |
| **US-born (no)** *(n=7,049)* | | | | | | | |
| **Not Adjusted for Time in the US** | 0.91 (0.77-1.07) | **1.10 (1.01-1.20)** | **0.83 (0.70-1.00)** | 0.84 (0.69-1.02) | **0.84 (0.72-0.99)** | 0.99 (0.94-1.04) | **0.64 (0.47-0.88)** |
| **Adjusted for Time in the US** | 0.94 (0.80-1.11) | 1.07 (1.00-1.15) | 0.78 (0.57-1.06) | 0.86 (0.71-1.05) | 0.87 (0.74-1.02) | 1.01 (0.93-1.10) | **0.66 (0.48-0.90)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, nonrestorative sleep, and sleep medication were measured during the survey years 2013-2017. Time in the US was defined as 15 years, 15+ years.

**Supplemental Table S10. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for (a) Foreign-born Whites Stratified by Time in the US, (b) US-Born Hispanic/Latino Heritage Groups, and (c) Foreign-born Hispanic/Latino Heritage Groups Stratified by Time in the US Compared to US-born non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality | | | |
| **Group (*n*)** | **Very Short (≤5-hours) (n=21,227)** | **Short (<7-hours) (n=75,139)** | **Long (>9-hours) (n=9,190)** | **Trouble Falling Asleep (≥3 nights) (n=22,038)** | **Trouble Staying Asleep (≥3 nights) (n=30,013)** | **Non-restorative Sleep (≥3 days) (n=46,103)** | **Sleep Medication Use (≥3 nights) (n=11,097)** |
| **US-born Non-Hispanic Whites** *(n=198,297)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | 1.03 (0.94-1.14) | 1.05 (1.00-1.11) | **1.11 (1.01-1.21)** | 1.09 (0.99-1.19) | **1.27 (1.17-1.37)** | **0.96 (0.93-0.99)** | **1.34 (1.16-1.55)** |
| **Time in the US (<15 years)** *(n=2,169)* | **0.70 (0.54-0.91)** | **0.80 (0.71-0.90)** | 0.69 (0.43-1.12) | **0.76 (0.58-0.98)** | **0.76 (0.59-0.98)** | 0.92 (0.81-1.06) | 0.72 (0.46-1.13) |
| **Time in the US (15+ years)** *(n=6,657)* | **1.42 (1.09-1.85)** | **1.25 (1.11-1.40)** | 1.44 (0.90-2.33) | **1.32 (1.02-1.71)** | **1.31 (1.02-1.68)** | 1.08 (0.94-1.24) | 1.38 (0.88-2.16) |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | **0.75 (0.71-0.80)** | **0.88 (0.85-0.92)** | **0.87 (0.81-0.93)** | **0.77 (0.72-0.82)** | **0.65 (0.62-0.69)** | **1.08 (1.05-1.11)** | **0.52 (0.46-0.58)** |
| **US-born (yes)** *(n=14,282)* | 1.04 (0.97-1.12) | 1.04 (0.99-1.09) | 0.95 (0.87-1.03) | **0.92 (0.85-0.99)** | **0.80 (0.74-0.85)** | 1.02 (0.98-1.05) | **0.66 (0.58-0.76)** |
| **US-born (no)** *(n=15,818)* | **0.52 (0.47-0.57)** | **0.72 (0.68-0.76)** | **0.79 (0.72-0.86)** | **0.59 (0.54-0.65)** | **0.50 (0.46-0.55)** | **1.17 (1.13-1.21)** | **0.36 (0.29-0.43)** |
| **Time in the US (<15 years)** *(n=5,739)* | **0.31 (0.27-0.37)** | **0.56 (0.52-0.60)** | **0.81 (0.68-0.98)** | **0.42 (0.36-0.50)** | **0.39 (0.32-0.47)** | **0.80 (0.74-0.87)** | **0.25 (0.15-0.42)** |
| **Time in the US (15+ years)** *(n=9,919)* | **0.63 (0.56-0.70)** | **0.77 (0.73-0.81)** | **0.70 (0.60-0.81)** | **0.65 (0.59-0.72)** | **0.53 (0.49-0.59)** | **0.81 (0.76-0.86)** | **0.39 (0.32-0.48)** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.37 (1.24-1.51)** | **1.15 (1.08-1.22)** | 0.92 (0.81-1.03) | 1.05 (0.95-1.17) | 0.91 (0.83-1.00) | 1.01 (0.96-1.07) | 0.99 (0.85-1.15) |
| **US-born (yes)** *(n=2,544)* | **1.41 (1.24-1.60)** | **1.19 (1.09-1.29)** | 0.87 (0.73-1.04) | 1.05 (0.91-1.21) | 0.97 (0.85-1.12) | 1.00 (0.93-1.07) | 0.96 (0.77-1.21) |
| **US-born (no)** *(n=2,533)* | **1.31 (1.15-1.49)** | **1.11 (1.01-1.21)** | 0.97 (0.83-1.12) | 1.06 (0.92-1.22) | **0.84 (0.73-0.97)** | 1.03 (0.96-1.10) | 1.02 (0.83-1.25) |
| **Time in the US (<15 years)** *(n=550)* | 1.26 (0.91-1.76) | **1.17 (1.01-1.35)** | 1.16 (0.73-1.83) | 0.77 (0.54-1.08) | **0.61 (0.40-0.94)** | 0.82 (0.66-1.02) | 0.98 (0.64-1.52) |
| **Time in the US (15+ years)** *(n=1,969)* | **1.33** | **1.15** | 0.89 | **1.17** | 0.92 | 1.01 | 1.01 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **(1.16-1.52)** | **(1.06-1.23)** | (0.69-1.14) | **(1.02-1.36)** | (0.80-1.06) | (0.91-1.12) | (0.80-1.26) |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | **0.81 (0.68-0.96)** | **0.88 (0.78-1.00)** | **0.68 (0.56-0.82)** | **0.78 (0.62-0.97)** | **0.70 (0.58-0.83)** | 1.06 (1.00-1.12) | **0.68 (0.53-0.89)** |
| **US-born Cuban (yes)** *(n=559)* | 0.90 (0.64-1.27) | 1.07 (0.89-1.29) | 0.66 (0.40-1.09) | 0.97 (0.72-1.31) | 0.94 (0.70-1.26) | 0.97 (0.84-1.12) | 0.98 (0.57-1.69) |
| **US-born Cuban (no)** *(n=1,959)* | **0.79 (0.65-0.96)** | **0.82 (0.71-0.94)** | **0.68 (0.55-0.85)** | **0.71 (0.53-0.95)** | **0.63 (0.49-0.79)** | **1.09 (1.03-1.15)** | **0.61 (0.43-0.85)** |
| **Time in the US (<15 years)** *(n=634)* | **0.56 (0.37-0.83)** | **0.61 (0.51-0.74)** | **0.57 (0.36-0.92)** | **0.46 (0.26-0.81)** | **0.45 (0.29-0.69)** | **0.75 (0.61-0.93)** | **0.17 (0.08-0.38)** |
| **Time in the US (15+ years)** *(n=1,319)* | 1.00 (0.80-1.26) | 1.00 (0.89-1.12) | 0.74 (0.55-1.00) | 0.92 (0.72-1.19) | **0.75 (0.59-0.95)** | 0.97 (0.85-1.10) | 0.85 (0.59-1.21) |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 0.89 (0.75-1.06) | 0.88 (0.77-1.01) | **0.73 (0.54-0.98)** | **0.76 (0.62-0.92)** | **0.67 (0.55-0.83)** | **1.09 (1.00-1.20)** | 0.81 (0.54-1.20) |
| **US-born (yes)** *(n=264)* | 1.08 (0.68-1.73) | 1.06 (0.78-1.46) | 0.77 (0.40-1.48) | 0.73 (0.47-1.13) | 0.97 (0.65-1.43) | 0.97 (0.79-1.20) | 0.64 (0.31-1.31) |
| **US-born (no)** *(n=1,394)* | 0.85 (0.72-1.01) | **0.84 (0.72-0.97)** | 0.72 (0.50-1.03) | **0.76 (0.62-0.95)** | **0.61 (0.48-0.78)** | **1.13 (1.01-1.25)** | 0.84 (0.54-1.30) |
| **Time in the US (<15 years) (n=426)** | **0.59 (0.40-0.88)** | **0.65 (0.51-0.82)** | 0.60 (0.29-1.24) | 0.71 (0.50-1.01) | **0.54 (0.34-0.85)** | 0.79 (0.57-1.11) | 0.49 (0.18-1.29) |
| **Time in the US (15+ years) (n=962)** | 1.00 (0.84-1.20) | 0.99 (0.89-1.10) | 0.60 (0.35-1.04) | 0.79 (0.59-1.04) | **0.64 (0.49-0.84)** | **0.98 (0.84-1.15)** | 0.97 (0.62-1.51) |
| **Central/South American** | | | | | | | |
| **Overall** *(n=8,162)* | **0.78 (0.70-0.86)** | 0.96 (0.90-1.02) | **0.73 (0.64-0.82)** | **0.76 (0.67-0.87)** | **0.65 (0.58-0.73)** | **1.09 (1.05-1.13)** | **0.42 (0.34-0.53)** |
| **US-born (yes)** *(n=1,113)* | **1.29 (1.02-1.63)** | 1.15 (1.00-1.33) | **0.74 (0.55-0.99)** | 1.21 (0.96-1.51) | 0.98 (0.73-1.30) | 0.99 (0.89-1.11) | 0.64 (0.38-1.10) |
| **US-born (no)** *(n=7,049)* | **0.71 (0.64-0.79)** | **0.93 (0.87-0.98)** | **0.72 (0.64-0.82)** | **0.68 (0.59-0.77)** | **0.59 (0.53-0.67)** | **1.11 (1.07-1.16)** | **0.39 (0.30-0.50)** |
| **Time in the US (<15 years)** *(n=3,032)* | **0.55 (0.46-0.67)** | **0.80 (0.73-0.87)** | 0.74 (0.53-1.03) | **0.54 (0.42-0.69)** | **0.43 (0.34-0.55)** | **0.79 (0.70-0.89** | **0.30 (0.16-0.58)** |
| **Time in the US (15+ years)** *(n=3,989)* | **0.85 (0.74-0.96)** | 0.96 (0.91-1.02) | **0.60 (0.47-0.78)** | **0.75 (0.64-0.87)** | **0.67 (0.58-0.77)** | **0.87 (0.80-0.95)** | **0.43 (0.33-0.55)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale

score ≥13), “ideal” cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey’s complex sampling design. Trouble falling asleep, trouble staying asleep, nonrestorative sleep, and sleep medication were measured during the survey years 2013-2017.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

| | Item No | Recommendation |
|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found |
| **Introduction** | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses |
| **Methods** | | |
| Study design | 4 | Present key elements of study design early in the paper |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection |
| Participants | 6 | (*a*) Give the eligibility criteria, and the sources and methods of selection of participants |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group |
| Bias | 9 | Describe any efforts to address potential sources of bias |
| Study size | 10 | Explain how the study size was arrived at |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding |
| | | (*b*) Describe any methods used to examine subgroups and interactions |
| | | (*c*) Explain how missing data were addressed |
| | | (*d*) If applicable, describe analytical methods taking account of sampling strategy |
| | | (*e*) Describe any sensitivity analyses |
| **Results** | | |
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed |
| | | (b) Give reasons for non-participation at each stage |
| | | (c) Consider use of a flow diagram |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders |
| | | (b) Indicate number of participants with missing data for each variable of interest |
| Outcome data | 15* | Report numbers of outcome events or summary measures |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included |
| | | (*b*) Report category boundaries when continuous variables were categorized |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses |

| | | |
|---|---|---|
| **Discussion** | | |
| Key results | 18 | Summarise key results with reference to study objectives |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results |
| **Other information** | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based |

*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

# Disparities in Multiple Sleep Characteristics among Non-Hispanic Whites and Hispanic/Latino Heritage Groups by Birthplace and Language Preference: Cross-sectional Results from the United States National Health Interview Survey



| | |
|---|---|
| Journal: | *BMJ Open* |
| Manuscript ID | bmjopen-2020-047834.R1 |
| Article Type: | Original research |
| Date Submitted by the Author: | 15-Apr-2021 |
| Complete List of Authors: | Gaston, Symielle; National Institute of Environmental Health Sciences, Martinez-Miller, Erline; Social & Scientific Systems Inc Durham; The University of Texas Southwestern Medical Center, Department of Population and Data Sciences<br>McGrath, John; Social & Scientific Systems Inc Durham<br>Jackson II, W. Braxton; Social & Scientific Systems Inc Durham<br>Napoles, Anna; National Institute on Minority Health and Health Disparities, Office of the Scientific Director<br>Pérez-Stable, Eliseo; National Institute on Minority Health and Health Disparities, Office of the Director; National Heart Lung and Blood Institute, Division of Intramural Research<br>Jackson, Chandra; National Institute of Environmental Health Sciences, Epidemiology Branch; National Institute on Minority Health and Health Disparities, Division of Intramural Research |
| Primary Subject Heading: | Epidemiology |
| Secondary Subject Heading: | Public health |
| Keywords: | SLEEP MEDICINE, EPIDEMIOLOGY, PUBLIC HEALTH, SOCIAL MEDICINE |
| | |

*I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.*

*The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.*

*Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.*

1

2

3

1

**Reviewer Information Page**

| | |
|---|---|
| Article Type: | Original research |
| Abstract Word Count: | 298/300 |
| Word Count of Manuscript | 3,921/4,000 |
| Number of Figures & Tables: | 8 |
| References | 47 |
| Number of Supplemental Figures & Tables: | 14 |

2

3

# Disparities in Multiple Sleep Characteristics among Non-Hispanic Whites and Hispanic/Latino Heritage Groups by Birthplace and Language Preference: Cross-sectional Results from the United States National Health Interview Survey

Symielle A. Gaston, PhD, MPH [1]

Erline E. Martinez-Miller, PhD, MPH [2,3]

John McGrath, MA [2]

W. Braxton Jackson, II, MPH [2]

Anna Nápoles, PhD, MPH [4]

Eliseo J. Pérez-Stable, MD [5]

Chandra L. Jackson, PhD, MS [1,6]

[1] Epidemiology Branch, National Institute of Environmental Health Sciences, National Institutes of Health, Department of Health and Human Services, Research Triangle Park, NC, USA

[2] Social & Scientific Systems, a DLH Holding Company, Durham, NC, USA

[3]Department of Population and Data Sciences, University of Texas Southwestern Medical Center, Dallas, TX

[4]Office of the Scientific Director, National Institute on Minority Health and Health Disparities, National Institutes of Health, Department of Health and Human Services, Bethesda, MD, USA

[5]Office of the Director, National Institute on Minority Health and Health Disparities and the Division of Intramural Research, National Heart, Lung and Blood Institute, National Institutes of Health, Department of Health and Human Services, Bethesda, MD, USA

[6]Divison of Intramural Research, National Institute on Minority Health and Health Disparities, National Institutes of Health, Department of Health and Human Services, Bethesda, MD, USA

Please direct correspondence to Dr. Chandra L. Jackson at 111 TW Alexander Drive, Research Triangle Park, N.C. 27709; telephone: 984-287-3701; fax: 301-480-3290; email: Chandra.Jackson@nih.gov.

**ACKNOWLEDGEMENTS:**

The authors would like to thank the National Center for Health Statistics for designing, conducting, and disseminating the survey and data files. We would like to thank all respondents who participated in the survey. This research was presented, in part, at the SLEEP 2020 Virtual Meeting, August 27-30, 2020.

**FUNDING:**

This work was funded by the Intramural Program at the National Institutes of Health (NIH), National Institute of Environmental Health Sciences (NIEHS, Z1AES103325) and the Division of Intramural Research, National Institute on Minority Health and Health Disparities.

**CONFLICT OF INTEREST:**

The authors declare they have no conflict of interest.

**DATA SHARING STATEMENT:**

The data are publicly available at https://nhis.ipums.org/nhis/. No additional data are available.

**RESEARCH ETHICS APPROVAL: HUMAN PARTICIPANTS**

Research approval is not required for the analysis of de-identified, publicly available data. This was an analysis of secondary data collected by the National Center for Health Statistics. National Health Interview Survey recruitment and data collection protocols were approved by the National Center for Health Statistics Review Board. All participants gave informed consent.

## ABSTRACT

**Objective:** To investigate whether sleep disparities vary by birthplace among adult non-Hispanic Whites (NHWs) and Hispanic/Latino heritage groups in the United States (US) and to investigate language preference as an effect modifier.

**Design:** Cross-sectional

**Setting:** United States

**Participants:** 254,699 men and women

**Methods:** We used pooled 2004-2017 National Health Interview Survey data. Adjusting for sociodemographic and behavioral/clinical characteristics, survey-weighted Poisson regressions with robust variance estimated prevalence ratios (PRs) and 95% confidence intervals (CIs) of self-reported sleep characteristics (e.g., sleep duration, trouble and staying asleep) among (1) foreign-born NHWs and Hispanic/Latino heritage groups vs. US-born NHWs and (2) Hispanic/Latino heritage groups vs. foreign-born NHWs. We further stratified by language preference in comparisons of Hispanic/Latino heritage groups to US-born NHWs.

**Results:** Among 254,699 participants with a mean age±standard error 47±0.9 years, 81% self-identified as NHW, 12% Mexican, 2% Puerto Rican, 1% Cuban, 1% Dominican, and 3% Central/South American. Compared to US-born NHWs, foreign-born NHWs were more likely to report poor sleep quality (e.g., $PR_{\text{trouble staying asleep}}$=1.27 [95% CI:1.17-1.37]), and US-born Mexicans were no more likely to report non-recommended sleep duration while foreign-born Mexicans were less likely (e.g., $PR_{\leq 5\text{-hours}}$=0.52 [0.47-0.57]). Overall, Mexicans had lower prevalence of poor sleep quality vs. US-born NHWs, and PRs were lowest for foreign-born

Mexicans. US-born Mexicans were more likely than foreign-born NHWs to report shorter sleep duration. Regardless of birthplace, Puerto Ricans were more likely to report shorter sleep durations vs. NHWs. Generally, sleep duration and quality were better among Cubans and Dominicans vs. US-born NHWs but were similar vs. foreign-born NHWs. Despite imprecision in certain estimates, Spanish language preference was generally associated with increasingly better sleep among Hispanic/Latino heritage groups compared to US-born NHWs.

**Conclusion:** Sleep disparities varied by birthplace, Hispanic/Latino heritage, and language preference, and each characteristic should be considered in sleep disparities research.

**Keywords:** Sleep; Emigrants and Immigrants; Hispanic Americans; European Continental Ancestry Group; Health Status Disparities; Acculturation

## Strengths and limitations of this study

- Although limited by the cross-sectional study design, the use of recent nationally representative data consisting of a large sample size allowed for robust stratification by race/ethnicity, birthplace, and language preference in this timely investigation of sleep disparities.
- Data limitations included use of self-reports, use of a unidimensional proxy measure of language acculturation, and potential for residual confounding
- However, study strengths included the assessment of several important sleep health dimensions and adjustment for multiple relevant confounders.

## INTRODUCTION

Over one-third of United States (US) adults report insufficient sleep duration (<7 hours/night), and 50-70 million adults have a sleep disorder [1, 2]. Related to the high prevalence of poor sleep as well as its association with an increased risk of a variety of poor mental and physical health outcomes, poor sleep is recognized as a public health problem by the Institute of Medicine [1]. In addition to being a burden in the overall US population, poor sleep health has been shown to vary by social determinants of health with disadvantaged populations being more likely have worse objective and subjective sleep compared to populations with greater social advantages [3, 4].

Poor sleep disproportionately affects certain racial/ethnic minority groups compared to non-Hispanic Whites (NHWs) [3] and may partially explain racial/ethnic disparities in poor health indicators like obesity [5-7]. However, studies of racial/ethnic disparities in sleep to date may be limited by imprecise measurement of characteristics related to the social construct of race/ethnicity. For instance, evidence suggests that certain Hispanic/Latino heritage groups (e.g., Puerto Ricans) but not others (e.g., Mexicans) are more likely to report worse sleep compared to NHWs [4]. However, heterogenous heritage groups within the Hispanic/Latino community are often combined into one category [4, 8-10]. Further, the reference group of NHWs is also heterogenous and usually comprises both US-born and foreign-born NHWs despite evidence of sleep differences between the two groups [9, 11]. These studies suggested a lower unadjusted prevalence of habitual sleep duration of <7 hours among foreign-born compared to US-born NHWs [9] and that in the overall population of US adults, foreign-born individuals had higher odds of self-reported 7-8 hours of habitual sleep duration than US-born individuals after adjustment for sociodemographic characteristics, health behaviors, and clinical characteristics [11]. However, studies comparing other dimensions of sleep health by nativity among NHWs are sparse.

As illustrated by the socioecological framework, both an individual's characteristics and social context should be considered to better understand health behaviors and outcomes [12]. Therefore, in addition to individual characteristics like birthplace, ethnicity, and cultural background, consideration of the social environment related to culture (e.g., language spoken with friends) in studies of racial/ethnic disparities is important. For instance, language acculturation is a strong indicator of overall acculturation that is hypothesized to influence disparities in health behaviors [13, 14], and has been widely used as a proxy for overall acculturation [15]. However, results regarding acculturation are mixed and generally suggest negative associations for certain health outcomes (e.g., diet) but protective associations with other outcomes (e.g., sleep) [13, 14]. Relatedly, the lack of sleep disparities observed among Mexican Latinos compared to NHWs is hypothesized as due to lack of acculturation (e.g., being born in Mexico and speaking Spanish at home) among Mexican adults [14]. These findings relate to the "Hispanic Paradox" that was originally observed in the cardiovascular disease (CVD) literature in which adults of Mexican origin in the US were likely to have risk factors for CVD yet were less likely to have CVD compared to their NHW counterparts. It has been hypothesized that acculturative factors like use of the Spanish language, of which the linguistic intricacies promote emotional identification and connection may limit cumulative stress thus tempering the impact of risk factors on CVD outcomes [16]. This exemplifies the "Hispanic Paradox" which suggests that cultural characteristics shape perceptions and response to stressors, which may also be true in relation to sleep, and investigation is necessary.

Recent studies using nationally representative data have not yet simultaneously considered immigration status/birthplace, heterogeneity in heritage, and language preference as modifying factors of racial/ethnic disparities in multiple sleep health characteristics among Hispanics/Latinos compared to NHWs [4, 9, 11, 17-19]. Although a recent study used National Health Interview Survey (NHIS) data and reported variation in Hispanic/Latino-NHW differences in sleep duration by Hispanic/Latino heritage [20], the study lacked information regarding other

important sleep quality characteristics and did not compare the sleep of foreign-born and US-born NHWs [19]. Further, studies that compared sleep among foreign-born and US-born NHWs either combined NHWs with other racial/ethnic groups [11] or provided unadjusted prevalence of sleep duration [9]. Additional research inclusive of other sleep health dimensions and with adjustment for relevant confounders is warranted. To address important research gaps, we used the most recent data from a large, nationally representative sample of the US adult population of Hispanics/Latinos and NHWs to disentangle immigration status (birthplace) and heritage as contributors to sleep disparities. We sought to determine whether multiple sleep characteristics differed between (1) foreign-born and US-born NHWs and (2) both foreign-born and US-born Hispanic/Latino heritage groups compared to NHWs. We hypothesized better sleep among foreign-born vs. US-born NHWs and that Hispanic/Latino-NHW sleep disparities would vary by both nativity (i.e., US-born vs. foreign-born) and birthplace (e.g., Mexico, Puerto Rico). In a secondary aim, we investigated language preference, a marker of acculturation, as a modifier. We hypothesized that Hispanic/Latino-NHW sleep disparities would be greater if Hispanic/Latino adults completed surveys in English vs. Spanish.

## METHODS

### NHIS

The NHIS is the largest annually administered cross-sectional, in-person household survey in the US. NHIS survey protocols are described in detail elsewhere [21]. Briefly, NHIS uses a multistage probability sampling design to obtain a nationally representative sample of the non-institutionalized civilian population of children and adults in the US. After recruitment, trained interviewers used computer-assisted personal interviewing to obtain health-related data from participants. All provided informed consent. NHIS recruitment and data collection protocols were approved by the National Center for Health Statistics Review Board.

## Study Population

We pooled self-reported NHIS data collected from survey years 2004 to 2017, which were merged by the Integrated Health Interview Series [22]. The overall response rate was 80% for adults (range: 74.2% in 2008 - 83.8% in 2004). Eligible participants were aged ≥18 years and self-identified as either NHW alone or Hispanic/Latino of any race. In this analysis, we focused on NHW and Hispanic/Latino of any race participants because they represent the majority and largest ethnic minority populations in the US. Of 329,279 participants, ineligible participants were excluded, sequentially, if data were missing or implausible for sleep duration (≤2 or ≥23 hours; 2.2%) or birthplace (0.1%) or were currently pregnant (0.9%) (Supplemental Figure S1). Hispanic/Latino participants who reported "other" or multiple ethnicities (1.4%) were excluded because study objectives were to distinguish between Hispanic/Latino heritage groups. After excluding participants with missing data on potential confounders (18.1%), the final analytic sample comprised 254,699 participants.

## Patient and Public Involvement

Patients and the public were not involved in the development and design of this study.

## Measures

*Race/ethnicity*

Participants were asked, 'What race do you consider yourself to be?' with response options that met the Office of Management Budget Race and Ethnic Standards for Federal Statistics and Administrative Reporting [23]. Participants provided a 'yes' or 'no' response to 'Do you consider yourself to be Hispanic or Latino?'. Participants who self-identified as White race alone and non-Hispanic were categorized as NHW. Only region of birth (e.g., Europe) was available among NHW participants (Supplemental Table S1), which prevented measurement of

national heritage among NHWs. Participants of any race who self-identified as Hispanic/Latino were asked to provide Hispanic origin, ancestry, or heritage with response options of Puerto Rican, Cuban, Dominican, Mexican, and Central/South American.

*Multiple Sleep Characteristics*

We defined sleep characteristics categorically based on evidence so that results could serve as potential intervention targets. Participants responded to the following question: 'On average, how many hours of sleep do you get in a 24-hour period?". Reported values ≥30 minutes were rounded up to the nearest hour and values of <30 minutes were rounded down to the nearest hour; NHIS provided average sleep duration in whole numbers [21]. Using evidence-based recommendations [24], we defined two non-mutually exclusive levels of short sleep duration: very short (≤5-hours) and short (<7-hours). Long sleep duration may be associated with worse health or be an artifact of poor health; therefore, we defined long sleep as >9-hours and recommended sleep as 7-9-hours [25].

During survey years 2013 to 2017, participants reported the number of times/week they had trouble falling asleep, trouble staying asleep, nonrestorative sleep (awoke not feeling rested), and sleep medication during the week prior to the interview. We defined frequent trouble falling asleep, trouble staying asleep, nonrestorative sleep, and sleep medication use as reports of ≥3 nights (or days) per week versus <3 nights (or days) per week.

*Birthplace*

Participants were asked "Where were you born?". Birthplace included dichotomous categories of US-born (born in a US state or the District of Colombia [D.C.]) or foreign-born/island-born (not born in a US state or D.C., born in a US territory [including Puerto Rico], or born outside of the US and US territories).

*Language of Interview*

Language is an important dimension of acculturation associated with health behaviors (e.g., smoking) among Hispanics/Latinos [13]. Participants selected the language in which they wanted to complete the NHIS interview. Language of interview was the assumed language preference, and we derived a proxy three-level language acculturation variable: English (high acculturation), English and Spanish (medium acculturation), or Spanish (low acculturation).

*Potential Confounders*

Parameterizations of each potential confounder are listed in Table 1. Sociodemographic characteristics included age category, sex/gender, annual household income, educational attainment, unemployed/not in the labor force, 2000 Standard Occupational Classification categories for longest held occupation, marital/cohabitating status, time in the US, and Census region of residence. Health behaviors included smoking status, physical activity based on the Guidelines for Americans [26], and alcohol consumption. Clinical characteristics included body mass index (BMI) category calculated from self-reported height and weight [27], serious psychological distress [28], and self-report of physician-diagnosed dyslipidemia (available for survey years 2011-2017), hypertension, prediabetes or diabetes, and cancer. We additionally adjusted for "ideal" cardiovascular health (yes vs. no), a dichotomized version of the American Heart Association's metric that includes meeting all of the following criteria: never smoker/quit smoking in the prior 12 months, normal BMI, and no report of physician diagnosis of dyslipidemia, hypertension, or prediabetes/diabetes [29].

**Statistical Analysis**

All analyses accounted for the NHIS complex survey design using survey weights to account for non-response and oversampling of certain groups (e.g., racial/ethnic minorities,

older adults). We applied direct age standardization using the 2010 Census as the reference population to estimate descriptive statistics (Tables 1, 2, and 3). Poisson regressions with robust variance estimated prevalence ratios (PRs) and 95% confidence intervals (CIs) for each sleep characteristic among foreign-born NHWs and both US-born and foreign-born Hispanic/Latino heritage groups, separately, compared to US-born NHWs (Table 4). With the same approach, we estimated PRs and 95% CIs for each sleep characteristic among each US-born and foreign-born Hispanic/Latino heritage group, separately, compared to foreign-born NHWs (Table 5).

Models were adjusted for *a priori* potential confounders based on prior literature: age category, sex/gender, annual household income, educational attainment, employment status, occupational class, marital status, region of residence, alcohol consumption, serious psychological distress, "ideal" cardiovascular health, and cancer [2, 4, 9, 11, 19, 30-34]. Lastly, in a secondary analysis, we further stratified by language of interview (English, English and Spanish, and Spanish) as a proxy measure of language acculturation and compared sleep characteristics for each Hispanic/Latino heritage group to US-born NHWs (Figures 1 and 2). Five separate sensitivity analyses, including adjustment for multiple comparisons using the false discovery rate in all models are described in Table 6. We performed all analyses using Stata/SE 15. A two-sided p-value of 0.05 was used to determine statistical significance.

## RESULTS

### Study Population Characteristics

Among 254,669 participants, mean age ± standard error was 47±0.9 years (Table 1). Most participants self-identified as NHW (81%) and the remainder as Hispanic/Latino of the following heritage: Mexican (12%), Puerto Rican (2%), Cuban (1%), Dominican (1%), Central/South American (3%). Most (96%) NHW and approximately half of Mexican (47%) and

Puerto Rican (50%) participants were US-born. Most Cubans (78%), Dominicans (84%), and Central/South Americans (86%) were foreign-born. We present but do not interpret results for Central/South Americans because of within-group heritage heterogeneity.

The prevalence of health behavior and clinical characteristics are presented in Tables 2 and 3. The prevalence of short sleep was highest among adults of Puerto Rican descent (39%). Although similar to the prevalence of short sleep among NHWs (29%) who showed little variation by nativity (28%- US-born vs. 27% foreign-born), short sleep prevalence was lowest among adults of Mexican descent (28%). Each Hispanic/Latino heritage group except adults of Puerto Rican descent were less likely than NHWs to report poor sleep quality indicators (e.g., trouble falling asleep) except nonrestorative sleep. The prevalence of ideal cardiovascular health, although low overall, was higher among NHWs compared to other racial/ethnic/heritage groups, and prevalence varied by nativity status.

**Foreign-born NHWs Compared to US-born NHWs**

Compared to US-born NHWs, foreign-born NHWs were not more likely to report non-recommended sleep duration (Table 4), but were more likely to report trouble staying asleep (PR=1.27 [1.17-1.37]), nonrestorative sleep (PR=1.06 [1.00-1.12]), and sleep medication use (PR=1.34 [1.16-1.55]). Results were robust after applying the false discovery rate multiple comparison procedure (Table 6 and Supplemental Material).

**US-born and foreign-born Hispanic/Latino Heritage Groups Compared to US-born NHWs**

Compared to US-born NHWs, US-born Mexicans were as likely to report non-recommended sleep duration; however, foreign-born Mexicans were less likely to report non-recommended sleep duration ($PR_{very\ short}$=0.52 [0.47-0.57], $PR_{short}$=0.70 [0.67-0.73], $PR_{long}$=0.75 [0.66-0.85]). Overall, Mexicans were less likely to report trouble falling, trouble staying asleep, nonrestorative sleep, and sleep medication use compared to US-born NHWs; however,

racial/ethnic differences were larger across comparisons between foreign-born Mexicans and US-born NHWs. Results remained statistically significant after applying the false discovery rate multiple comparison procedure (Table 6 and Supplemental Material).

Overall, both US-born and foreign-born/island-born Puerto Ricans were more likely than US-born NHWs to report very short sleep (PR 1.39 [1.26-1.53]) and short sleep (PR= 1.20 [1.14-1.25]) with little variation by nativity/birthplace. Similarly, there was negligible variation by birthplace for sleep quality characteristics among US-born and foreign-born/island-born Puerto Ricans who were marginally less likely to report trouble staying asleep (PR=0.91 [0.83-1.00]) and no more likely to report other poor sleep quality characteristics compared to US-born NHWs. Statistical significance remained after applying the false discovery rate multiple comparison procedure (Table 6 and Supplemental Material).

Small sample sizes resulted in wide confidence intervals for US-born and foreign-born Cubans and Dominicans. Adults of Cuban heritage, overall, were less likely to report non-recommended sleep duration and poor sleep quality characteristics compared to US-born NHWs. However, only non-US born Cubans had lower prevalence of short sleep and poor sleep quality characteristics. Generally, Dominicans were less likely to report trouble falling asleep and no more likely to report non-restorative sleep or sleep medication use compared to US-born NHWs. However, only foreign-born Dominicans were less likely to report short sleep and trouble staying asleep.

**US-born and foreign-born Hispanic/Latino Heritage Groups Compared to foreign-born NHWs**

Compared to foreign-born NHWs, US-born Mexicans were more likely to report short sleep duration (PR=1.19 [1.12-1.26]) but foreign-born Mexicans were no more likely. US-born Mexicans were no more likely to report trouble staying asleep compared to foreign-born NHWs (PR=0.97 [0.86-1.10]); however, foreign-born Mexicans were less likely to report trouble staying

asleep (PR= 0.72 [0.62-0.84]; Table 5). Overall, Puerto Rican adults were more likely to report very short and short sleep duration, trouble falling asleep, trouble staying asleep, and sleep medication use compared to foreign-born NHWs with little evidence of variation by birthplace. Statistical significance for sleep duration results remained after false discovery rate correction for multiple comparisons. Small sample sizes of US-born Cubans and Dominicans resulted in wide, often overlapping confidence intervals limiting the ability to examine differences by birthplace.

**Hispanic/Latino-Heritage Groups Compared to US-born NHWs: Modification by Language of Interview**

Prevalence of non-recommended sleep duration among foreign-born Mexicans compared to US-born NHWs were lowest among subpopulations of foreign-born Mexicans with English/Spanish and Spanish versus English interviews (Figure 1). Additionally, among Mexicans, overall, those with Spanish interviews had the lowest prevalence of poor sleep quality compared to US-born NHWs (Figure 2). Among Puerto Ricans, overall, those with Spanish interviews had similar prevalence of shorter sleep durations and suggestively better sleep quality characteristics compared to US-born NHWs. Among Cubans and Dominicans, albeit imprecise, patterns of variation by language of interview were similar to those among Mexicans. Results of the remaining sensitivity analyses are provided in Table 6.

## DISCUSSION

In a nationally representative sample of NHW and Hispanic/Latino adults, we found sleep disparities between foreign-born and US-born NHWs, and differences in sleep characteristics varied by Hispanic/Latino heritage, birthplace/nativity, and language of interview among Hispanics/Latinos compared to NHWs. Although results among NHWs were counter to

our hypothesis, results for Latinos were congruent with our hypothesis. Compared to US-born NHWs, foreign-born NHWs had a higher prevalence of poor sleep quality indicators. Although habitual sleep duration was similar between US-born Mexicans and their NHW counterparts, foreign-born Mexican adults reported better sleep duration than US-born NHWs. Better sleep quality among foreign-born Mexican adults compared to US-born NHWs was of greater magnitude than the better sleep quality reported by US-born Mexicans compared to US-born NHWs. Puerto Rican adults generally reported worse sleep duration compared to NHWs. Acknowledging small sample sizes, foreign-born Cubans and Dominicans may generally had even better sleep duration and quality compared to US-born NHWs than US-born Cubans and Dominicans. Overall, Spanish language preference may be associated with increasingly better sleep among Hispanic/Latino heritage groups.

Our results are consistent with prior studies that suggest differences in sleep by birthplace and language preference. Most studies report better subjective sleep among foreign-born compared to US-born adults [10, 11, 17, 18], and our results were generally in agreement across each Hispanic/Latino heritage group except Puerto Ricans. Further, our results suggesting that birthplace is a modifier of sleep duration are congruent with findings of both an earlier study of NHIS data and the multisite Study of Women's Health Across the Nation (SWAN) where short sleep duration and sleep complaints were more often reported by US-born adults versus their foreign-born counterparts [10, 17]. Results of SWAN also suggested that language acculturation may mediate differences in sleep complaints, and similarly, completion of interviews in English versus Spanish were positively associated with probably clinically significant insomnia in a separate study of pregnant Latina women in San Diego [10, 35]. Like our study, a different nationally-representative sample found no differences in short sleep duration among US-born Mexicans compared to US-born NHWs but lower odds of short sleep duration among foreign-born Mexicans compared to NHWs [4]. Prior studies either comprised solely individuals of Mexican heritage or used a heterogenous Hispanic/Latino category [4, 10,

17, 18, 35]. Importantly, our study extended this literature by illustrating heterogeneity across Hispanic/Latino heritage groups [36].

Differences in study populations, the grouping of Hispanics/Latinos, and sleep assessments likely contribute differences between results of our and some prior studies. Among Mexican women aged 21-40 years in Northern California, birthplace and language preference were not associated with sleep disturbances [37]. In a prior study using 2012 NHIS data, short sleep was more prevalent among US-born Hispanics/Latinos compared to US-born NHWs, and there were no differences in sleep duration between foreign-born Hispanics/Latinos and NHWs [9]. However, all individuals of Hispanic/Latino heritage were combined. In a recent study using 2004-2017 NHIS data, investigators reported higher odds of short sleep among all Hispanic/Latino heritage groups except US-born Cubans compared to NHWs [19]. Our conflicting results are likely due to differences in categorization of sleep duration (e.g., ≤6 hours and ≥9 hours versus 7-8 hours), adjustment sets, and modeling approaches [19, 25, 38]. Unlike our study, a multidimensional language acculturation measure was not associated with self-reported sleep problems among middle-aged Puerto Rican, Cuban, and Dominican women in New Jersey [36].

Several environmental and cultural factors that influence sleep behaviors and sleep health likely explain our findings. The negative acculturation effect, which has been observed as associated with sleep, posits that adoption of Western lifestyles leads to unhealthy behavior practices and declines in health [39]. Negative acculturation coupled with stress related to immigration status likely drive the unexpected disparity in sleep quality among foreign-born NHWs compared to US-born NHWs . Replication and further investigation of this possibility is warranted. The “Hispanic Paradox” likely explains our observations among all Latino heritage groups except for Puerto Rican adults in which all remaining heritage groups tended to have better sleep than NHWs, and Spanish language preference, a proxy measure for low language acculturation, appeared as a protective factor related to sleep health [14, 16]. The likely

mechanism may be the greater ability to express emotions and reduce stress, which carries positive health impacts, when using the Spanish versus the English language [16]. Further, variation in sleep by birthplace and Hispanic/Latino heritage is likely due to differentially experienced environments and unique cultural backgrounds that influence health and coping behaviors. Risk factors for poor sleep including, for instance, low socioeconomic housing environments, color-related stigma and discrimination, social (including acculturation) stressors, structural barriers, and health behaviors like smoking vary by Hispanic/Latino heritage groups with individuals of Puerto Rican descent usually more negatively affected compared to other heritage groups, which may manifest as differences in sleep health [13, 40-46].

There are several study limitations. First, the cross-sectional study design precluded our ability to make causal assumptions about birthplace as a predictor of sleep health. Secondly, all data were self-reported; however, misclassification of individuals into categories of race/ethnicity, sleep duration and quality, birthplace/nativity, language preference/acculturation, and covariates is likely non-differential [47]. Third, sleep disorders such as insomnia and sleep apnea were not measured by the NHIS; however, these disorders may explain our results. Further study inclusive of sleep disorders is warranted. Fourth, our unidimensional, proxy measure of language acculturation did not capture the full breadth of acculturation [39], and data was not available for NHWs; however, psychometric analyses have shown language explains most of the variance in acculturation scales [13]. Nonetheless, future studies would benefit from using multidimensional measures of acculturation. Fifth, the observational nature of the study fosters potential for residual confounding. Sixth, small sample sizes upon stratification (e.g., Dominicans) and within group heterogeneity (e.g., birthplace for NHWs and Central/South Americans) limited interpretability of results for certain heritage groups. Lastly, we tested for many associations and did not adjust for multiple comparisons due to the novelty of our study and our interest in identifying potential associations that may warrant further investigation.

Study strengths included the use of the most recently available data collected from a nationally representative and large sample that allowed for robust stratification by birthplace, race/ethnicity, Hispanic/Latino heritage, and language preference/acculturation as well as adjustment for multiple confounders. Further, we used evidence-based categories of sleep duration, assessed multiple important sleep dimensions, and directly estimated prevalence ratios [20, 25, 38]. Our study extended prior literature as one of the few using national data to compare sleep health between US-born and foreign-born NHWs as well as between foreign-born Hispanic/Latinos and their NHW counterparts [9, 11].

In conclusion, consideration of variation in birthplace/nativity, heritage, language, and other cultural factors in future studies of racial/ethnic disparities in sleep health is important. Sleep disparities studies in the US often consider NHWs as the reference group despite heterogeneity in birthplace, which may lead to inaccurate conclusions about racial/ethnic disparities in sleep health. Studies also often combine Hispanic/Latino heritage groups despite cultural heterogeneity. Future studies should consider within group heterogeneity and disentangle cultural contributors in the social environment that influence sleep health and sleep health behaviors. Findings from such studies have the potential to inform culturally tailored public health interventions designed to improve sleep health among racial/ethnic subpopulations. Further, coupling culturally tailored interventions with structural changes related to environmental justice such as equitable social, economic, and housing policies may further improve sleep health while reducing sleep health disparities.

## AUTHOR CONTRIBUTIONS

**Authors: Symielle A. Gaston, Erline E. Martinez-Miller, John McGrath, W. Braxton Jackson II, Anna Nápoles, Eliseo J. Pérez-Stable, Chandra L. Jackson**

*Study concept and design:* CL. Jackson, SA. Gaston.

*Acquisition of data:* CL. Jackson.

*Statistical Analysis:* J. McGrath, WB. Jackson II.

*Interpretation of data:* SA. Gaston, EE. Martinez-Miller, J. McGrath, WB. Jackson II, A. Nápoles, EJ. Pérez-Stable, CL. Jackson.

*Drafting of the manuscript:* SA. Gaston, EE. Martinez-Miller.

*Critical revision of the manuscript for important intellectual content:* SA. Gaston, EE. Martinez-Miller, J. McGrath, WB. Jackson II, A. Nápoles, EJ. Pérez-Stable, CL. Jackson.

*Administrative, technical, and material support:* CL. Jackson.

*Obtaining funding and study supervision:* CL. Jackson.

*Final Approval:* SA. Gaston, EE. Martinez-Miller, J. McGrath, WB. Jackson II, A. Nápoles, EJ. Pérez-Stable, CL. Jackson.

## REFERENCES


1 Institute of Medicine Committee on Sleep Medicine Research. The National Academies Collection: Reports funded by National Institutes of Health. In: Colten HR, Altevogt BM, eds. *Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem*. Washington (DC): National Academies Press (US) National Academy of Sciences. 2006.

2 Liu Y, Wheaton AG, Chapman DP*, et al.* Prevalence of Healthy Sleep Duration among Adults--United States, 2014. *MMWR Morbidity and mortality weekly report* 2016;**65**:137-41.

3 Johnson DA, Jackson CL, Williams NJ*, et al.* Are sleep patterns influenced by race/ethnicity - a marker of relative advantage or disadvantage? Evidence to date. *Nature and science of sleep* 2019;**11**:79-95.

4 Whinnery J, Jackson N, Rattanaumpawan P*, et al.* Short and long sleep duration associated with race/ethnicity, sociodemographics, and socioeconomic position. *Sleep* 2014;**37**:601-11.

5 Jackson CL, Redline S, Emmons KM. Sleep as a potential fundamental contributor to disparities in cardiovascular health. *Annual review of public health* 2015;**36**:417-40.

6 Jackson CL. Determinants of racial/ethnic disparities in disordered sleep and obesity. *Sleep health* 2017;**3**:401-15.

7 Jackson CL, Walker JR, Brown MK*, et al.* A workshop report on the causes and consequences of sleep health disparities. *Sleep* 2020;**43**.

8 Berge JM, Fertig A, Tate A*, et al.* Who is meeting the Healthy People 2020 objectives?: Comparisons between racially/ethnically diverse and immigrant children and adults. *Families, systems & health : the journal of collaborative family healthcare* 2018;**36**:451-70.

9 Cunningham TJ, Wheaton AG, Ford ES*, et al.* Racial/ethnic disparities in self-reported short sleep duration among US-born and foreign-born adults. *Ethnicity & health* 2016;**21**:628-38.

10 Hale L, Troxel WM, Kravitz HM*, et al.* Acculturation and sleep among a multiethnic sample of women: the Study of Women's Health Across the Nation (SWAN). *Sleep* 2014;**37**:309-17.

11 Newsome V, Seixas A, Iwelunmor J*, et al.* Place of birth and sleep duration: Analysis of the national health interview survey (NHIS). *International journal of environmental research and public health* 2017;**14**.

12 *Principles of Community Engagement*. Atlanta, GA: Clinical and Translational Science Awards (CTSA) Community Engagement Key Function Committee Task Force on the Principles of Community Engagement. Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry. National Institutes of Health 2011.

13 Lara M, Gamboa C, Kahramanian MI, *et al.* Acculturation and Latino health in the United States: a review of the literature and its sociopolitical context. *Annual review of public health* 2005;**26**:367-97.

14 Grandner MA, Khader WS, Warlick CD, *et al.* Acculturation and sleep: implications for sleep and health disparities. *Sleep* 2019;**42**.

15 Thomson MD, Hoffman-Goetz L. Defining and measuring acculturation: a systematic review of public health studies with Hispanic populations in the United States. *Social science & medicine (1982)* 2009;**69**:983-91.

16 Llabre MM. Insight Into the Hispanic Paradox: The Language Hypothesis. *Perspect Psychol Sci* 2021:1745691620968765.

17 Hale L, Rivero-Fuentes E. Negative acculturation in sleep duration among Mexican immigrants and Mexican Americans. *Journal of immigrant and minority health* 2011;**13**:402-7.

18 Seicean S, Neuhauser D, Strohl K, *et al.* An exploration of differences in sleep characteristics between Mexico-born US immigrants and other Americans to address the Hispanic Paradox. *Sleep* 2011;**34**:1021-31.

19 Garcia C, Sheehan CM, Flores-Gonzalez N, *et al.* Sleep Patterns among US Latinos by Nativity and Country of Origin: Results from the National Health Interview Survey. *Ethnicity & disease* 2020;**30**:119-28.

20 Buysse DJ. Sleep health: can we define it? Does it matter? *Sleep* 2014;**37**:9-17.

21 Statistics NCfH. Survey Description, National Health Interview Survey, 2015. Hyattsville, Maryland 2016.

22 Blewett LA, Rivera-Drew JA, Griffin R, *et al.* IPUMS Health Surveys: National Health Interview Survey, Version 6.2. Minneapolis: University of Minnesota 2016.

23 OMB. Standards for Maintaining, Collecting, and Presenting Federal Data on Race and Ethnicity. A Notice by the Management and Budget Office on 09/30/2016. In: Budget OoMa, ed. *The Daily Journal of the United States Government* 2016.

24 Watson NF, Badr MS, Belenky G, *et al.* Recommended Amount of Sleep for a Healthy Adult: A Joint Consensus Statement of the American Academy of Sleep Medicine and Sleep Research Society. *Journal of clinical sleep medicine : JCSM : official publication of the American Academy of Sleep Medicine* 2015;**11**:591-2.

25 Hirshkowitz M, Whiton K, Albert SM, *et al.* National Sleep Foundation's updated sleep duration recommendations: final report. *Sleep health* 2015;**1**:233-43.

26 U.S. Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans. Washington, DC 2008.

27 U. S. Preventive Services Task Force. Screening for obesity in adults: recommendations and rationale. *American family physician* 2004;**69**:1973-6.

28 Kessler RC, Green JG, Gruber MJ*, et al.* Screening for serious mental illness in the general population with the K6 screening scale: results from the WHO World Mental Health (WMH) survey initiative. *International journal of methods in psychiatric research* 2010;**19 Suppl 1**:4-22.

29 Lloyd-Jones DM, Hong Y, Labarthe D*, et al.* Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. *Circulation* 2010;**121**:586-613.

30 Jackson CL, Hu FB, Redline S*, et al.* Racial/ethnic disparities in short sleep duration by occupation: the contribution of immigrant status. *Social science & medicine (1982)* 2014;**118**:71-9.

31 Jackson CL, Redline S, Emmons KM. Sleep as a Potential Fundamental Contributor to Disparities in Cardiovascular Health. In: Fielding JE, ed. *Annual Review of Public Health, Vol 36*. Palo Alto: Annual Reviews 2015:417-40.

32 Goldstein SJ, Gaston SA, McGrath JA*, et al.* Sleep Health and Serious Psychological Distress: A Nationally Representative Study of the United States among White, Black, and Hispanic/Latinx Adults. *Nature and science of sleep* 2020;**12**:1091-104.

33 Grandner MA, Patel NP, Gehrman PR*, et al.* Who gets the best sleep? Ethnic and socioeconomic factors related to sleep complaints. *Sleep medicine* 2010;**11**:470-8.

34 Mogavero MP, DelRosso LM, Fanfulla F*, et al.* Sleep disorders and cancer: State of the art and future perspectives. *Sleep medicine reviews* 2020;**56**:101409.

35 Manber R, Steidtmann D, Chambers AS*, et al.* Factors Associated with Clinically Significant Insomnia Among Pregnant Low-Income Latinas. *Journal of Womens Health* 2013;**22**:694-701.

36 Green R, Santoro NF, McGinn AP*, et al.* The relationship between psychosocial status, acculturation and country of origin in mid-life Hispanic women: data from the Study of Women's Health Across the Nation (SWAN). *Climacteric : the journal of the International Menopause Society* 2010;**13**:534-43.

37 Heilemann MV, Choudhury SM, Kury FS*, et al.* Factors associated with sleep disturbance in women of Mexican descent. *Journal of advanced nursing* 2012;**68**:2256-66.

38 Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Medical Research Methodology* 2003;**3**:21.

39 Martinez-Miller EE, Prather AA, Robinson WR*, et al.* US acculturation and poor sleep among an intergenerational cohort of adult Latinos in Sacramento, California. *Sleep* 2018.

40 Cuevas AG, Dawson BA, Williams DR. Race and Skin Color in Latino Health: An Analytic Review. *Am J Public Health* 2016;**106**:2131-6.

41 Garcia JA, Sanchez GR, Sanchez-Youngman S*, et al.* RACE AS LIVED EXPERIENCE: The Impact of Multi-Dimensional Measures of Race/Ethnicity on the Self-Reported Health Status of Latinos. *Du Bois Rev* 2015;**12**:349-73.

42 Alcántara C, Gallo LC, Wen J*, et al.* Employment status and the association of sociocultural stress with sleep in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). *Sleep* 2019;**42**.

43 Dominguez K, Penman-Aguilar A, Chang MH*, et al.* Vital signs: leading causes of death, prevalence of diseases and risk factors, and use of health services among Hispanics in the United States - 2009-2013. *MMWR Morbidity and mortality weekly report* 2015;**64**:469-78.

44 Loredo JS, Soler X, Bardwell W*, et al.* Sleep health in U.S. Hispanic population. *Sleep* 2010;**33**:962-7.

45 Alcantara C, Patel SR, Carnethon M*, et al.* Stress and Sleep: Results from the Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study. *SSM - population health* 2017;**3**:713-21.

46 Gaston SA, Nguyen-Rodriguez S, Aiello AE*, et al.* Hispanic/Latino heritage group disparities in sleep and the sleep-cardiovascular health relationship by housing tenure status in the United States. *Sleep health* 2020.

47 Jackson CL, Patel SR, Jackson WB, 2nd*, et al.* Agreement between self-reported and objectively measured sleep duration among white, black, Hispanic, and Chinese adults in the United States: Multi-Ethnic Study of Atherosclerosis. *Sleep* 2018;**41**.

**Table 1. Age-standardized Sociodemographic Characteristics among non-Hispanic White and Hispanic/Latino Adults, National Health Interview Survey, 2004-2017 (N=254,669) [a]**

| Race/Ethnicity and Heritage | Overall | White (n=207,154) | | | Mexican (n=30,100) | | | Puerto Rican (n=5,077) | | | Cuban (n=2,518) | | | Dominican (n=1,658) | | | Central/ South American (n=8,162) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nativity** | | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** |
| **n (%)** | 254,699 | 207,154 (81%) | 198,297 (96%) | 8,857 (4%) | 30,100 (12%) | 14,282 (47%) | 15,818 (53%) | 5,077 (2%) | 2,544 (50%) | 2,533 (50%) | 2,518 (1%) | 559 (22%) | 1,959 (78%) | 1,658 (1%) | 264 (16%) | 1,394 (84%) | 8,162 (3%) | 1,113 (14%) | 7,049 (86%) |
| **Sociodemographic Characteristics** | | | | | | | | | | | | | | | | | | | |
| **Age, mean ± SE (years)** | 46.8±0.9 | 48.0±0.1 | 47.9±0.1 | 48.7±0.2 | 39.4±0.2 | 38.1±0.2 | 40.5±0.2 | 43.0±0.3 | 37.6±0.3 | 49.2±0.5 | 47.8±0.4 | 35.8±0.8 | 51.9±0.5 | 41.8±0.5 | 30.8±0.9 | 44.6±0.5 | 40.4±0.2 | 30.1±0.4 | 42.2±0.2 |
| **Female (%)** | 49 | 50 | 50 | 49 | 45 | 49 | 40 | 48 | 47 | 48 | 44 | 42 | 44 | 56 | 53 | 57 | 49 | 55 | 48 |
| **Annual Household Income (%)** | | | | | | | | | | | | | | | | | | | |
| <$35,000 | 30 | 28 | 28 | 27 | 44 | 37 | 51 | 46 | 35 | 52 | 42 | 25 | 45 | 54 | 36 | 56 | 43 | 24 | 44 |
| $35,000-$74,999 | 33 | 32 | 32 | 29 | 34 | 35 | 34 | 30 | 31 | 31 | 32 | 29 | 34 | 30 | 38 | 30 | 34 | 39 | 34 |
| ≥$75,000 | 37 | 40 | 40 | 44 | 21 | 29 | 15 | 24 | 33 | 17 | 26 | 46 | 21 | 16 | 26 | 14 | 23 | 37 | 21 |
| **Educational Attainment** | | | | | | | | | | | | | | | | | | | |
| <High school | 11 | 8 | 8 | 7 | 40 | 19 | 60 | 25 | 13 | 30 | 14 | 4 | 15 | 36 | 10 | 38 | 27 | 7 | 29 |
| High school graduate | 29 | 28 | 29 | 22 | 28 | 34 | 22 | 30 | 31 | 29 | 32 | 18 | 36 | 25 | 16 | 27 | 27 | 18 | 27 |
| Some college | 30 | 31 | 31 | 26 | 22 | 33 | 12 | 27 | 35 | 23 | 26 | 39 | 22 | 23 | 55 | 20 | 23 | 36 | 22 |
| ≥ College | 30 | 33 | 32 | 45 | 10 | 14 | 6 | 18 | 22 | 18 | 29 | 39 | 26 | 16 | 20 | 14 | 23 | 39 | 22 |
| **Unemployed/Not in the Labor Force (%)** | 38 | 38 | 38 | 36 | 38 | 40 | 36 | 46 | 43 | 49 | 37 | 33 | 37 | 40 | 47 | 39 | 33 | 27 | 33 |
| **Occupational Class (%)** | | | | | | | | | | | | | | | | | | | |
| Professional/ management | 21 | 22 | 22 | 27 | 9 | 13 | 5 | 12 | 17 | 9 | 18 | 32 | 15 | 9 | 20 | 7 | 11 | 24 | 10 |
| Support Services | 35 | 46 | 46 | 45 | 31 | 44 | 19 | 41 | 45 | 39 | 40 | 49 | 37 | 39 | 52 | 37 | 34 | 54 | 32 |
| Laborers | 45 | 31 | 32 | 28 | 60 | 43 | 76 | 47 | 38 | 52 | 42 | 19 | 48 | 53 | 28 | 55 | 55 | 22 | 58 |
| **Marital/Co-habiting Status (%)** | | | | | | | | | | | | | | | | | | | |
| Married/living with partner or cohabitating | 65 | 65 | 65 | 68 | 64 | 58 | 70 | 55 | 56 | 56 | 65 | 69 | 67 | 51 | 43 | 52 | 60 | 51 | 62 |
| Divorced/widowed/no live-In partner | 21 | 20 | 20 | 20 | 21 | 23 | 20 | 26 | 23 | 28 | 22 | 12 | 23 | 32 | 37 | 33 | 24 | 25 | 24 |
| Single/no live-in partner | 14 | 14 | 14 | 12 | 14 | 18 | 11 | 19 | 21 | 16 | 14 | 19 | 10 | 17 | 20 | 14 | 16 | 24 | 14 |
| **Language of Interview (%)** | | | | | | | | | | | | | | | | | | | |
| English | 95 | 100 | 100 | 99 | 64 | 91 | 39 | 81 | 91 | 73 | 45 | 85 | 36 | 45 | 88 | 40 | 54 | 88 | 51 |
| English and Spanish | 2 | 0 | 0 | 0 | 15 | 6 | 23 | 9 | 6 | 11 | 10 | 8 | 11 | 14 | 9 | 14 | 16 | 7 | 16 |
| Spanish | 3 | 0 | 0 | 0 | 21 | 2 | 38 | 11 | 3 | 16 | 45 | 7 | 54 | 42 | 3 | 46 | 30 | 5 | 33 |
| **Time in the US (states) (%)** | | | | | | | | | | | | | | | | | | | |
| ≥15 years | 24 | 22 | 100 | 78 | 77 | 100 | 77 | 80 | 100 | 80 | 66 | 100 | 66 | 75 | 100 | 75 | 70 | 100 | 70 |
| <15 years | 76 | 78 | 0 | 22 | 23 | 0 | 23 | 20 | 0 | 20 | 34 | 0 | 34 | 25 | 0 | 25 | 30 | 0 | 30 |

| **Region of Residence (%)** | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Northeast | 18 | 19 | 19 | 29 | 2 | 1 | 3 | 50 | 46 | 49 | 9 | 12 | 8 | 75 | 54 | 77 | 23 | 13 | 23 |
| Midwest | 25 | 28 | 29 | 17 | 10 | 10 | 10 | 9 | 9 | 9 | 4 | 12 | 2 | 2 | 3 | 1 | 5 | 5 | 5 |
| South | 34 | 34 | 34 | 26 | 35 | 40 | 31 | 32 | 31 | 36 | 82 | 68 | 85 | 21 | 38 | 20 | 43 | 37 | 44 |
| West | 22 | 20 | 19 | 29 | 53 | 49 | 56 | 8 | 14 | 6 | 5 | 8 | 4 | 2 | 5 | 2 | 30 | 45 | 28 |

Note. Data is presented as percentages or means ± standard errors. All estimates are weighted for the survey's complex sampling design. All estimates except for age are age-standardized to the US 2010 population. SE=standard error

[a] Data are presented as unweighted n's and weighted percentages. Percentages may not sum to 100 due to missing values or rounding.

**Table 2. Age-standardized Health Behavior Characteristics among non-Hispanic White and Hispanic/Latino Adults, National Health Interview Survey, 2004-2017 (N=254,669) [a]**

| Race/Ethnicity and Heritage | Overall | White (n=207,154) | | | Mexican (n=30,100) | | | Puerto Rican (n=5,077) | | | Cuban (n=2,518) | | | Dominican (n=1,658) | | | Central/ South American (n=8,162) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nativity** | | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** |
| **n (%)** | 254,699 | 207,154 (81%) | 198,297 (96%) | 8,857 (4%) | 30,100 (12%) | 14,282 (47%) | 15,818 (53%) | 5,077 (2%) | 2,544 (50%) | 2,533 (50%) | 2,518 (1%) | 559 (22%) | 1,959 (78%) | 1,658 (1%) | 264 (16%) | 1,394 (84%) | 8,162 (3%) | 1,113 (14%) | 7,049 (86%) |
| **Health Behaviors** | | | | | | | | | | | | | | | | | | | |
| **Sleep duration (%) [b]** | | | | | | | | | | | | | | | | | | | |
| ≤5 hours | 8 | 8 | 8 | 7 | 8 | 9 | 7 | 15 | 14 | 15 | 8 | 11 | 8 | 13 | 12 | 13 | 8 | 8 | 8 |
| <7 hours | 29 | 29 | 28 | 27 | 28 | 31 | 25 | 39 | 39 | 39 | 29 | 30 | 28 | 34 | 31 | 34 | 31 | 30 | 31 |
| 7-9 hours | 67 | 67 | 67 | 69 | 67 | 64 | 70 | 56 | 57 | 57 | 68 | 69 | 69 | 63 | 67 | 64 | 67 | 68 | 67 |
| >9 hours | 4 | 4 | 4 | 3 | 4 | 5 | 5 | 4 | 4 | 5 | 3 | 1 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |
| **Sleep Characteristics (%)** | | | | | | | | | | | | | | | | | | | |
| **Trouble falling asleep** (≥3 nights) | 20 | 21 | 21 | 17 | 19 | 22 | 17 | 27 | 26 | 27 | 18 | 30 | 16 | 19 | 15 | 19 | 18 | 31 | 16 |
| **Trouble Staying Asleep** (≥3 nights) | 29 | 30 | 30 | 23 | 22 | 26 | 18 | 29 | 29 | 28 | 20 | 33 | 19 | 21 | 18 | 21 | 20 | 28 | 19 |
| **Sleep Medication Use** (≥3 nights) | 11 | 11 | 11 | 8 | 7 | 8 | 6 | 12 | 13 | 12 | 8 | 7 | 7 | 10 | 6 | 10 | 5 | 14 | 5 |
| **Nonrestorative Sleep: Did not wake feeling rested** (≥3 days) | 64 | 63 | 63 | 66 | 65 | 63 | 67 | 61 | 63 | 61 | 66 | 55 | 67 | 63 | 52 | 64 | 67 | 71 | 67 |
| **Smoking status (%)** | | | | | | | | | | | | | | | | | | | |
| Never/ quit >12 months prior * | 80 | 79 | 79 | 83 | 86 | 84 | 88 | 81 | 79 | 81 | 84 | 88 | 84 | 93 | 92 | 93 | 91 | 86 | 91 |
| Quit ≤12 months ago | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 1 |
| Current | 18 | 20 | 20 | 15 | 13 | 15 | 11 | 18 | 19 | 17 | 15 | 11 | 15 | 6 | 8 | 6 | 9 | 12 | 8 |
| **Leisure-time Physical Activity (%)** | | | | | | | | | | | | | | | | | | | |
| Never/unable | 33 | 32 | 32 | 31 | 44 | 39 | 48 | 47 | 39 | 52 | 52 | 35 | 56 | 59 | 57 | 60 | 43 | 30 | 45 |
| Does not meet PA guidelines | 19 | 19 | 19 | 18 | 18 | 18 | 18 | 17 | 18 | 16 | 12 | 9 | 12 | 14 | 12 | 14 | 18 | 20 | 17 |
| Meets PA guidelines [c] * | 47 | 49 | 49 | 51 | 38 | 43 | 34 | 37 | 43 | 32 | 36 | 56 | 31 | 27 | 30 | 26 | 39 | 50 | 38 |
| **Alcohol Consumption (%)** | | | | | | | | | | | | | | | | | | | |
| Lifetime abstainer | 16 | 14 | 14 | 18 | 25 | 19 | 30 | 26 | 20 | 30 | 30 | 18 | 32 | 35 | 21 | 36 | 29 | 15 | 30 |
| Former | 16 | 16 | 16 | 10 | 18 | 17 | 19 | 18 | 15 | 19 | 10 | 8 | 11 | 13 | 17 | 13 | 16 | 9 | 17 |
| Current | 68 | 70 | 70 | 72 | 57 | 64 | 51 | 56 | 65 | 51 | 60 | 74 | 57 | 52 | 62 | 50 | 55 | 75 | 53 |

Note. Data is presented as percentages or means ± standard errors. All estimates are weighted for the survey's complex sampling design. All estimates except for age are age-standardized to the US 2010 population. SE=standard error

[a] Data are presented as unweighted n's and weighted percentages. Percentages may not sum to 100 due to missing values or rounding.

[b] Short sleep duration categories of ≤5 hours and <7 hours are non-mutually exclusive.

[c] Meets PA guidelines defined as ≥150 minutes/week of moderate intensity or ≥75 minutes/week of vigorous intensity or ≥150 minutes/week of moderate + vigorous intensity physical activity.

* Indicator of "ideal" cardiovascular health

**Table 3. Age-standardized Clinical Characteristics among non-Hispanic White and Hispanic/Latino Adults, National Health Interview Survey, 2004-2017 (N=254,669) [a]**

| Race/Ethnicity and Heritage | Overall | White (n=207,154) | | | Mexican (n=30,100) | | | Puerto Rican (n=5,077) | | | Cuban (n=2,518) | | | Dominican (n=1,658) | | | Central/ South American (n=8,162) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nativity** | | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** | **All** | **US-born (yes)** | **US-born (no)** |
| **n (%)** | 254,699 | 207,154 (81%) | 198,297 (96%) | 8,857 (4%) | 30,100 (12%) | 14,282 (47%) | 15,818 (53%) | 5,077 (2%) | 2,544 (50%) | 2,533 (50%) | 2,518 (1%) | 559 (22%) | 1,959 (78%) | 1,658 (1%) | 264 (16%) | 1,394 (84%) | 8,162 (3%) | 1,113 (14%) | 7,049 (86%) |
| **Clinical Characteristics (%)** | | | | | | | | | | | | | | | | | | | |
| **Body Mass Index (BMI)** | | | | | | | | | | | | | | | | | | | |
| **Normal** (BMI 18.5 - <24.9 kg/m$^2$) * | 34 | 35 | 35 | 40 | 24 | 24 | 24 | 26 | 22 | 27 | 33 | 40 | 31 | 30 | 17 | 32 | 31 | 33 | 31 |
| **Overweight** (BMI 25.0-29.9 kg/m$^2$) | 37 | 36 | 36 | 39 | 41 | 37 | 44 | 39 | 40 | 39 | 41 | 29 | 44 | 44 | 49 | 43 | 45 | 38 | 45 |
| **Obese** (BMI ≥30.0 kg/m$^2$) | 29 | 29 | 29 | 21 | 35 | 38 | 32 | 36 | 38 | 34 | 26 | 31 | 25 | 26 | 34 | 25 | 25 | 30 | 24 |
| **Serious Psychological Distress** [b] (% yes) | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 3 | 4 | 6 | 2 | 6 | 3 | 3 | 3 |
| **Dyslipidemia** (% yes) [c] * | 52 | 52 | 52 | 52 | 51 | 49 | 53 | 56 | 60 | 52 | 52 | 58 | 53 | 54 | 45 | 54 | 51 | 49 | 52 |
| **Hypertension** (% yes) * | 34 | 34 | 35 | 30 | 34 | 37 | 32 | 37 | 35 | 39 | 33 | 23 | 35 | 37 | 41 | 37 | 28 | 27 | 29 |
| **Prediabetes/diabetes** (% yes) * | 15 | 14 | 14 | 12 | 24 | 25 | 23 | 23 | 21 | 24 | 14 | 19 | 15 | 20 | 29 | 20 | 15 | 12 | 16 |
| **"Ideal" Cardiovascular Health** [d] **(% yes)** | 12 | 12 | 12 | 15 | 7 | 8 | 6 | 6 | 7 | 5 | 7 | 13 | 6 | 6 | 8 | 5 | 9 | 13 | 9 |
| **Cancer (% yes)** | 12 | 12 | 12 | 10 | 5 | 7 | 4 | 8 | 11 | 7 | 6 | 7 | 6 | 3 | 7 | 3 | 5 | 8 | 5 |

Note. Data is presented as percentages or means ± standard errors. All estimates are weighted for the survey's complex sampling design. All estimates except for age are age-standardized to the US 2010 population. SE=standard error

[a] Data are presented as unweighted n's and weighted percentages. Percentages may not sum to 100 due to missing values or rounding.
[b] Kessler-6 psychological distress scale score ≥13
[c] Dyslipidemia defined as high cholesterol in the 12 months prior to interview. Available for survey years 2011-2017.
[d] "Ideal" cardiovascular health includes never smoking/quit >12 months prior to interview, BMI 18.5 - <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes.
* Indicator of "ideal" cardiovascular health

**Table 4. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Foreign-born non-Hispanic Whites and Hispanic/Latino Heritage Groups compared to U.S.-born non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality in the Past Week | | | |
| **Group *(n)*** | **Very Short (≤5-hours) (n=21,227)** | **Short (<7-hours) (n=75,139)** | **Long (>9-hours) (n=9,190)** | **Trouble Falling Asleep (≥3 nights) (n=22,038)** | **Trouble Staying Asleep (≥3 nights) (n=30,013)** | **Non-restorative Sleep (≥3 days) (n=46,103)** | **Sleep Medication Use (≥3 nights) (n=11,097)** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | 1.03 (0.93-1.13) | 1.03 (0.99-1.08) | 1.07 (0.92-1.24) | 1.09 (0.99-1.19) | **1.27 (1.17-1.37)** | **1.06 (1.00-1.12)** | **1.34 (1.16-1.55)** |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | **0.76 (0.71-0.81)** | **0.87 (0.85-0.90)** | **0.87 (0.79-0.96)** | **0.77 (0.72-0.82)** | **0.65 (0.62-0.69)** | **0.90 (0.87-0.94)** | **0.52 (0.46-0.58)** |
| **U.S.-born (yes)** *(n=14,282)* | 1.04 (0.97-1.12) | 1.04 (1.00-1.08) | 0.98 (0.87-1.11) | **0.92 (0.85-0.99)** | **0.80 (0.74-0.85)** | 0.97 (0.93-1.01) | **0.66 (0.58-0.76)** |
| **U.S.-born (no)** *(n=15,818)* | **0.52 (0.47-0.57)** | **0.70 (0.67-0.73)** | **0.75 (0.66-0.85)** | **0.59 (0.54-0.65)** | **0.50 (0.46-0.55)** | **0.81 (0.77-0.85)** | **0.36 (0.29-0.43)** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.39 (1.26-1.53)** | **1.20 (1.14-1.25)** | 1.00 (0.84-1.20) | 1.05 (0.95-1.17) | 0.91 (0.83-1.00) | 0.98 (0.92-1.05) | 0.99 (0.85-1.15) |
| **U.S.-born (yes)** *(n=2,544)* | **1.44 (1.27-1.64)** | **1.23 (1.16-1.31)** | 1.08 (0.84-1.37) | 1.05 (0.91-1.21) | 0.97 (0.85-1.12) | 1.00 (0.92-1.09) | 0.96 (0.77-1.21) |
| **U.S.-born (no)** *(n=2,533)* | **1.32 (1.16-1.51)** | **1.15 (1.08-1.24)** | 0.94 (0.74-1.19) | 1.06 (0.92-1.22) | **0.84 (0.73-0.97)** | 0.95 (0.86-1.05) | 1.02 (0.83-1.25) |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | **0.83 (0.70-0.99)** | **0.89 (0.81-0.98)** | **0.69 (0.55-0.87)** | **0.78 (0.62-0.97)** | **0.70 (0.58-0.83)** | 0.90 (0.82-1.00) | **0.68 (0.53-0.89)** |
| **U.S.-born (yes)** *(n=559)* | 0.93 (0.66-1.29) | 1.04 (0.89-1.21) | 0.71 (0.34-1.47) | 0.97 (0.72-1.31) | 0.94 (0.70-1.26) | 0.98 (0.82-1.17) | 0.98 (0.57-1.69) |
| **U.S.-born (no)** *(n=1,959)* | **0.81 (0.66-0.99)** | **0.85 (0.76-0.95)** | **0.69 (0.54-0.88)** | **0.71 (0.53-0.95)** | **0.63 (0.49-0.79)** | **0.87 (0.78-0.98)** | **0.61 (0.43-0.85)** |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 0.90 (0.76-1.08) | 0.92 (0.83-1.01) | 0.72 (0.49-1.05) | **0.76 (0.62-0.92)** | **0.67 (0.55-0.83)** | 0.93 (0.82-1.05) | 0.81 (0.54-1.20) |
| **U.S.-born (yes)** *(n=264)* | 1.09 (0.68-1.74) | 1.09 (0.85-1.40) | 1.15 (0.49-2.73) | 0.73 (0.47-1.13) | 0.97 (0.65-1.43) | 0.98 (0.77-1.26) | 0.64 (0.31-1.31) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **U.S.-born (no)** *(n=1,394)* | 0.87 (0.73-1.03) | **0.88 (0.79-0.98)** | **0.60 (0.38-0.93)** | **0.76 (0.62-0.95)** | **0.61 (0.48-0.78)** | 0.92 (0.79-1.07) | 0.84 (0.54-1.30) |
| **Central/South American** | | | | | | | |
| **Overall** *(n=8,162)* | **0.78 (0.71-0.87)** | **0.93 (0.89-0.98)** | **0.68 (0.56-0.83)** | **0.76 (0.67-0.87)** | **0.65 (0.58-0.73)** | **0.89 (0.83-0.94)** | **0.42 (0.34-0.53)** |
| **U.S.-born (yes)** *(n=1,113)* | **1.30 (1.03-1.65)** | **1.18 (1.04-1.33)** | 0.82 (0.51-1.30) | 1.21 (0.96-1.51) | 0.98 (0.73-1.30) | 1.05 (0.93-1.19) | 0.64 (0.38-1.10) |
| **U.S.-born (no)** *(n=7,049)* | **0.72 (0.64-0.80)** | **0.89 (0.85-0.94)** | **0.66 (0.54-0.82)** | **0.68 (0.59-0.77)** | **0.59 (0.53-0.67)** | **0.85 (0.80-0.90)** | **0.39 (0.30-0.50)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Very short and short sleep are non-mutually exclusive sleep duration categories. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Table 5. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to Foreign-born non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=56,372)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality in the Past Week | | | |
| **Group *(n)*** | **Very Short (≤5-hours) (n=4,115)** | **Short (<7-hours) (n=14,048)** | **Long (>9-hours) (n=1,586)** | **Trouble Falling Asleep (≥3 nights) (n=3,431)** | **Trouble Staying Asleep (≥3 nights) (n=3,520)** | **Non-restorative Sleep (≥3 days) (n=7,734)** | **Sleep Medication Use (≥3 nights) (n=1,073)** |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | 1.10 (0.96-1.26) | **1.12 (1.05-1.18)** | 1.06 (0.86-1.31) | 0.92 (0.81-1.05) | **0.87 (0.78-0.97)** | 1.06 (0.99-1.14) | 0.92 (0.73-1.14) |
| **U.S.-born (yes)** *(n=14,282)* | **1.17 (1.02-1.34)** | **1.19 (1.12-1.26)** | 1.04 (0.84-1.29) | 1.00 (0.87-1.14) | 0.97 (0.86-1.10) | 1.07 (0.99-1.15) | 0.98 (0.78-1.23) |
| **U.S.-born (no)** *(n=15,818)* | 0.89 (0.73-1.08) | 0.98 (0.90-1.06) | 1.05 (0.81-1.36) | **0.78 (0.66-0.94)** | **0.72 (0.62-0.84)** | 1.02 (0.93-1.12) | **0.68 (0.48-0.96)** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.75 (1.51-2.02)** | **1.34 (1.25-1.44)** | 1.13 (0.88-1.44) | **1.19 (1.03-1.39)** | 1.14 (0.99-1.31) | 1.06 (0.96-1.16) | **1.33 (1.07-1.64)** |
| **U.S.-born (yes)** *(n=2,544)* | **1.85 (1.54-2.22)** | **1.39 (1.27-1.51)** | 1.33 (0.95-1.85) | 1.20 (0.99-1.46) | **1.22 (1.02-1.46)** | 1.06 (0.95-1.18) | **1.32 (1.01-1.73)** |
| **U.S.-born (no)** *(n=2,533)* | **1.58 (1.32-1.90)** | **1.27 (1.16-1.39)** | 1.02 (0.77-1.35) | **1.22 (1.01-1.46)** | 1.09 (0.91-1.30) | 1.06 (0.94-1.20) | **1.41 (1.09-1.83)** |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | 0.97 (0.76-1.22) | 0.98 (0.88-1.10) | **0.69 (0.49-0.97)** | 0.92 (0.70-1.20) | 0.93 (0.76-1.15) | 1.03 (0.90-1.18) | 1.09 (0.77-1.55) |
| **U.S.-born (yes)** *(n=559)* | 1.03 (0.69-1.53) | 1.15 (0.96-1.37) | 0.83 (0.39-1.75) | 1.14 (0.79-1.65) | 1.17 (0.84-1.65) | 1.05 (0.85-1.29) | 1.63 (0.91-2.93) |
| **U.S.-born (no)** *(n=1,959)* | 0.94 (0.72-1.22) | 0.92 (0.81-1.05) | **0.66 (0.46-0.94)** | 0.82 (0.59-1.14) | 0.85 (0.65-1.10) | 1.04 (0.89-1.21) | 0.96 (0.63-1.45) |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 1.12 (0.89-1.43) | 1.02 (0.90-1.16) | 0.91 (0.57-1.45) | 0.88 (0.68-1.13) | 0.94 (0.72-1.23) | 1.00 (0.87-1.15) | 1.03 (0.67-1.59) |
| **U.S.-born (yes)** *(n=264)* | 1.40 (0.82-2.41) | 1.24 (0.97-1.60) | 1.80 (0.68-4.79) | 0.82 (0.51-1.31) | 1.25 (0.81-1.93) | 1.01 (0.78-1.32) | 0.97 (0.42-2.20) |
| **U.S.-born (no)** *(n=1,394)* | 1.06 (0.84-1.34) | 0.96 (0.84-1.10) | 0.73 (0.45-1.20) | 0.88 (0.68-1.16) | 0.87 (0.65-1.18) | 0.99 (0.84-1.18) | 1.02 (0.64-1.63) |

| Central/South American | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Overall** *(n=8,162)* | 1.00 (0.86-1.17) | **1.10 (1.02-1.17)** | 0.76 (0.57-1.02) | 0.94 (0.78-1.13) | 0.89 (0.76-1.04) | 1.02 (0.95-1.11) | **0.69 (0.51-0.91)** |
| **U.S.-born (yes)** *(n=1,113)* | **1.42 (1.06-1.92)** | **1.30 (1.13-1.49)** | 1.02 (0.59-1.75) | 1.27 (0.96-1.67) | 1.14 (0.86-1.52) | 1.08 (0.94-1.25) | 0.95 (0.56-1.62) |
| **U.S.-born (no)** *(n=7,049)* | 0.92 (0.78-1.08) | 1.05 (0.98-1.13) | 0.77 (0.56-1.05) | 0.84 (0.69-1.02) | **0.84 (0.72-0.99)** | 1.00 (0.92-1.09) | **0.64 (0.47-0.88)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Very short and short sleep are non-mutually exclusive sleep duration categories. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Table 6. Summary of Sensitivity Analyses**

| Sensitivity Analysis Number | Purpose of Sensitivity Analysis | Method Employed | Summary of Results of Sensitivity Analysis |
|---|---|---|---|
| 1 | To adjust for multiple comparisons | When re-estimating the models in Tables 4 and 5 and well as Figures 1 and 2, we employed false discovery rate procedures. | In total, there were 427 p-values in which 159 were significant in the original analysis. After the false discovery p-value correction 127 of the 159 significant p-values (80%) remained statistically significant (Supplemental Tables S2 & S3 and Supplemental Figure S2). Results were robust for comparisons between foreign-born and US-born NHWs and for most results for comparisons with adults of Mexican and Puerto Rican descent compared to NHWs. |
| 2 | To investigate how results would be affected if we did not consider nativity/birthplace as a modifier of racial/ethnic differences in sleep | We combined both US-born and foreign-born participants; we then compared sleep characteristics among Hispanic/Latino heritage groups versus NHWs. | Combining foreign-born and US-born participants across both Hispanic/Latino heritage groups and NHWs would have missed important differences by nativity status (Supplemental Table S2). For instance, the lower prevalence of non-recommended sleep duration observed among foreign-born Mexicans vs. US-born NHWs (Table 2) would either have been underestimated or not have been observed if participants were not stratified by birthplace. |
| 3 | To investigate how results would be affected if we considered sex/gender and age as potential modifiers [39] | We stratified the original models by sex/gender (men, women) and by age category (18-30 years, 31-49 years, ≥50 years), separately. In models that were also stratified by language acculturation, we combined low and medium acculturation to increase sample sizes and improve statistical stability. | After stratification by sex/gender (Supplemental Table S3), point estimates were slightly stronger among men vs. women for sleep quality across comparisons with foreign-born NHWs and for very short as well as short sleep across comparisons with non-US born Mexicans. Sex/gender did not modify the remaining associations among Mexicans or Puerto Ricans. |

| | | | |
|---|---|---|---|
| | | | The differences among both foreign-born NHWs and Mexicans compared to US-born NHWs that were observed in the main analysis were greater among younger and middle vs. older aged adults (Supplemental Table S4).<br><br>Across comparisons to non-US born NHWs, there was little variation by sex/gender for Mexicans and Puerto Ricans, but the differences were greater among younger vs. older aged adults (Supplemental Tables S5 and S6).<br><br>In analyses stratified by language acculturation, lower prevalence of shorter sleep duration among foreign-born Mexicans compared to NHWs was stronger for men vs. women and for younger vs. older adults (Supplemental Tables S7 and S8). |
| 4 | To investigate how results would be affected if we adjusted for time in the US in the comparisons between foreign-born Hispanic/Latino heritage groups to their NHW counterparts [9, 19, 37] | Across comparisons of foreign-born Hispanic/Latino heritage groups to their foreign-born NHW counterparts, we additionally adjusted for time in the US. | Results (Supplemental Table S9) were consistent with the main analysis (Table 3), which suggested that time spent in the US was not a strong confounder across comparisons between foreign-born Hispanic/Latino heritage groups and their NHW counterparts. |
| 5 | To investigate how results would be affected if we used a different measure of acculturation in models [9, 19] | We separated foreign-born NHWs and Hispanic/Latino heritage groups by a different metric of acculturation, time lived in the US (<15 years in the US, ≥15 years in the US) [9, 19, 37], when compared to US-born NHWs. | Results (Supplemental Table S10) were consistent with those of the language acculturation-stratified analyses (Figure 1). |

**Figure 1. Fully-Adjusted Prevalence Ratios of Sleep Duration and Characteristics for Hispanic/Latino Heritage Groups compared to non-Hispanic Whites by Language Acculturation Status**, National Health Interview Survey, 2004-2017**

** Language acculturation categories include high (English only interview), medium (English and Spanish interview), and low (Spanish only interview).

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

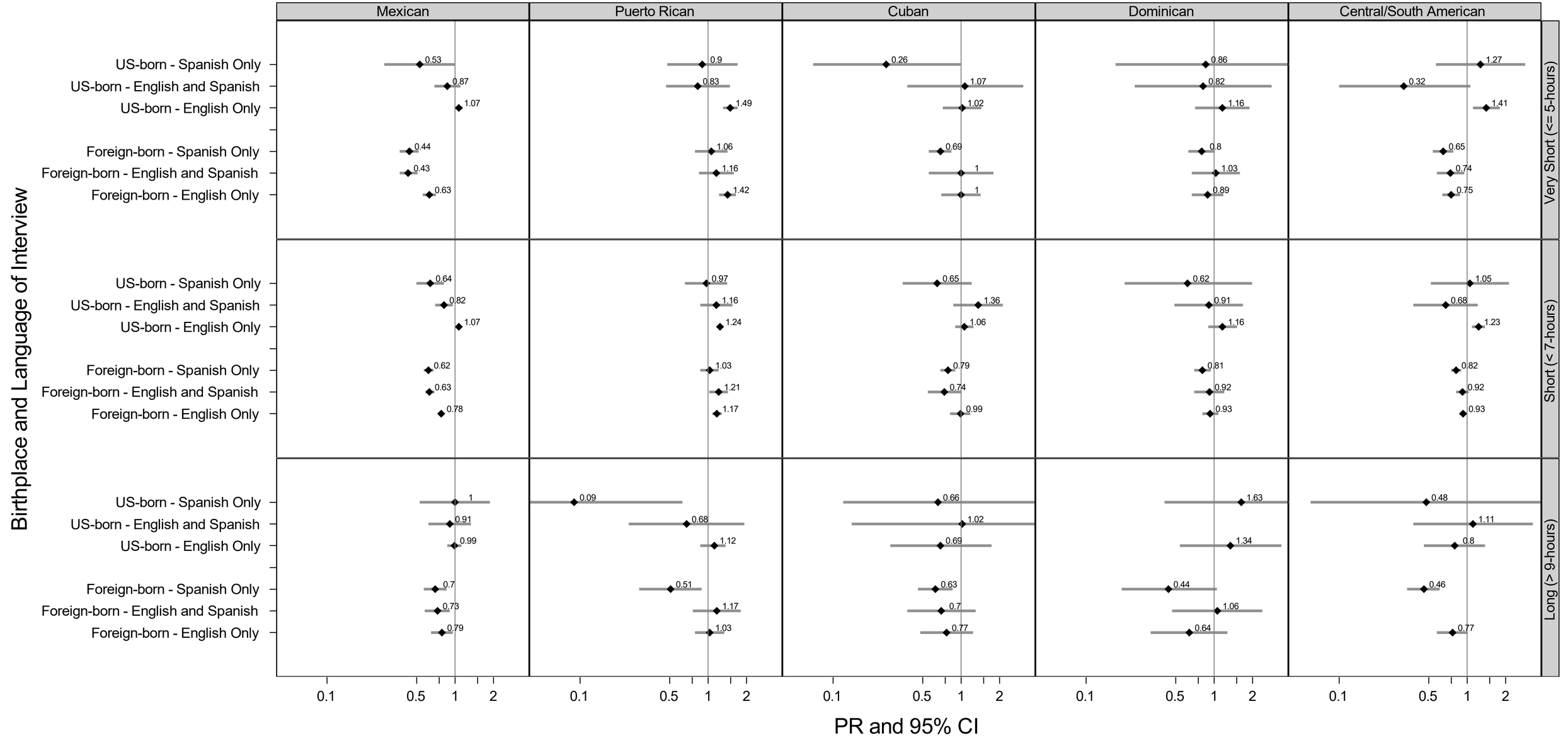
Note. All estimates are weighted for the survey's complex sampling design. Certain associations were not estimable due to small sample sizes and are, therefore, not provided (e.g., long sleep duration among Central/South Americans with medium acculturation compared to non-Hispanic Whites).

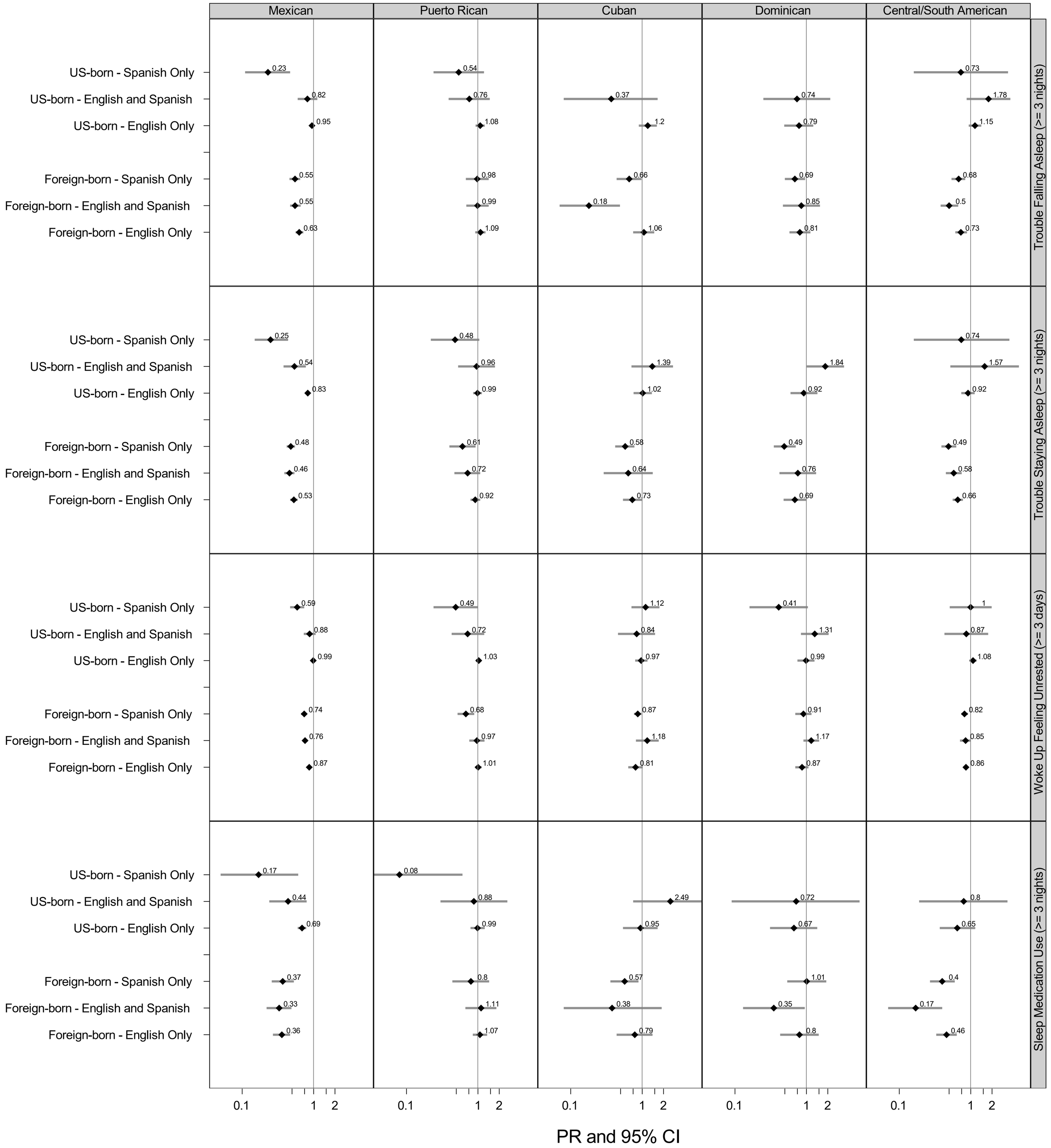
**Figure 2. Fully-Adjusted Prevalence Ratios of Sleep Quality* Characteristics for Hispanic/Latino Heritage Groups compared to non-Hispanic Whites by Language Acculturation Status**, National Health Interview Survey, 2004-2017**

* Trouble falling asleep, trouble staying asleep, sleep medication use, and non-restorative sleep were measured during the survey years 2013-2017.
** Language acculturation categories include high (English only interview), medium (English and Spanish interview), and low (Spanish only interview).

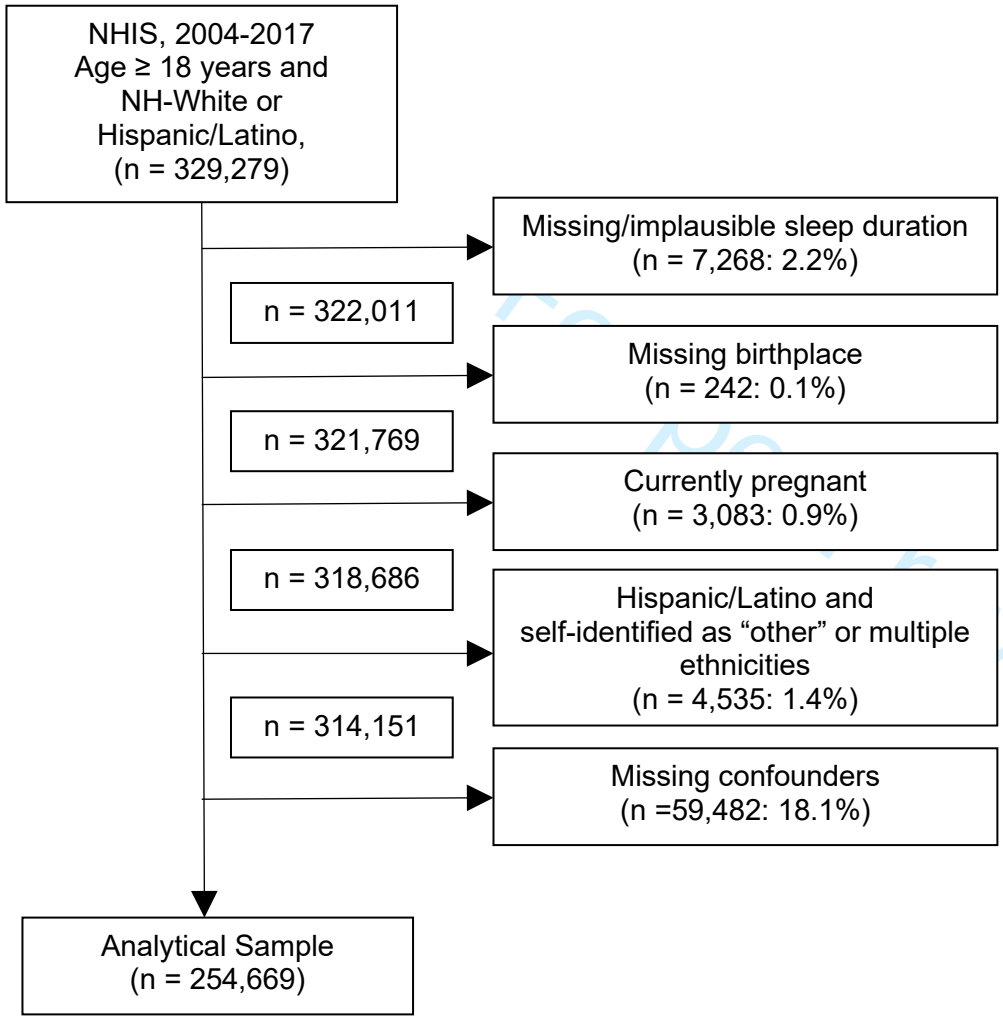
Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Certain associations were not estimable due to small sample sizes and are, therefore, not provided (e.g., long sleep duration among Central/South Americans with medium acculturation compared to non-Hispanic Whites).

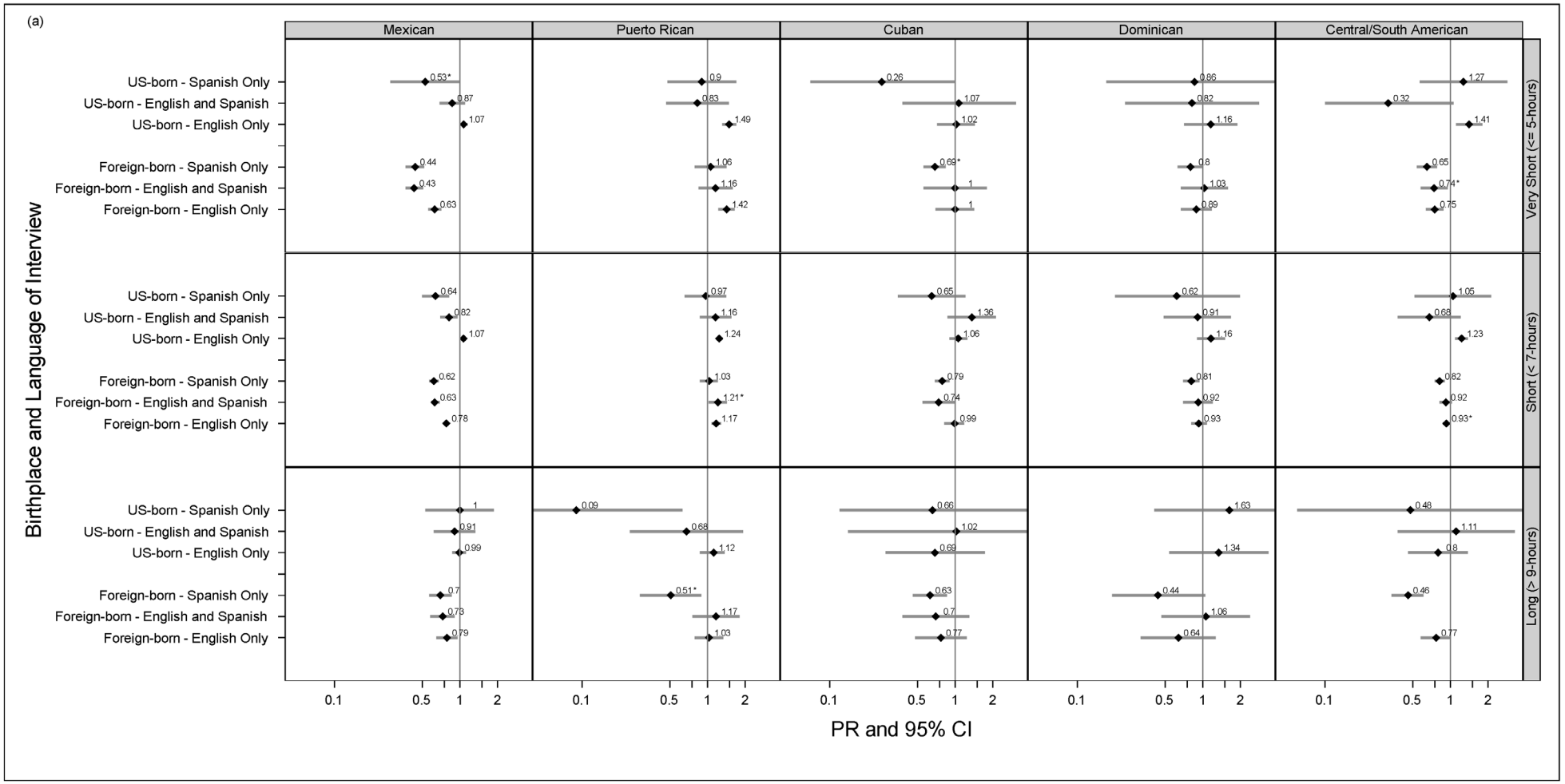

Mexican
Puerto Rican
Cuban
Dominican
Central/South American
Very Short (<= 5-hours)
Short (< 7-hours)
Long (> 9-hours)
Birthplace and Language of Interview
US-born - Spanish Only
US-born - English and Spanish
US-born - English Only
Foreign-born - Spanish Only
Foreign-born - English and Spanish
Foreign-born - English Only
0.53
0.87
1.07
0.44
0.43
0.63
0.9
0.83
1.49
1.06
1.16
1.42
0.26
1.07
1.02
0.69
1
1
0.86
0.82
1.16
0.8
1.03
0.89
1.27
0.32
1.41
0.65
0.74
0.75
0.64
0.82
1.07
0.62
0.63
0.78
0.97
1.16
1.24
1.03
1.21
1.17
0.65
1.36
1.06
0.79
0.74
0.99
0.62
0.91
1.16
0.81
0.92
0.93
1.05
0.68
1.23
0.82
0.92
0.93
1
0.91
0.99
0.7
0.73
0.79
0.09
0.68
1.12
0.51
1.17
1.03
0.66
1.02
0.69
0.63
0.7
0.77
1.63
1.34
0.44
1.06
0.64
0.48
1.11
0.8
0.46
0.77
0.1
0.5
1
2
PR and 95% CI

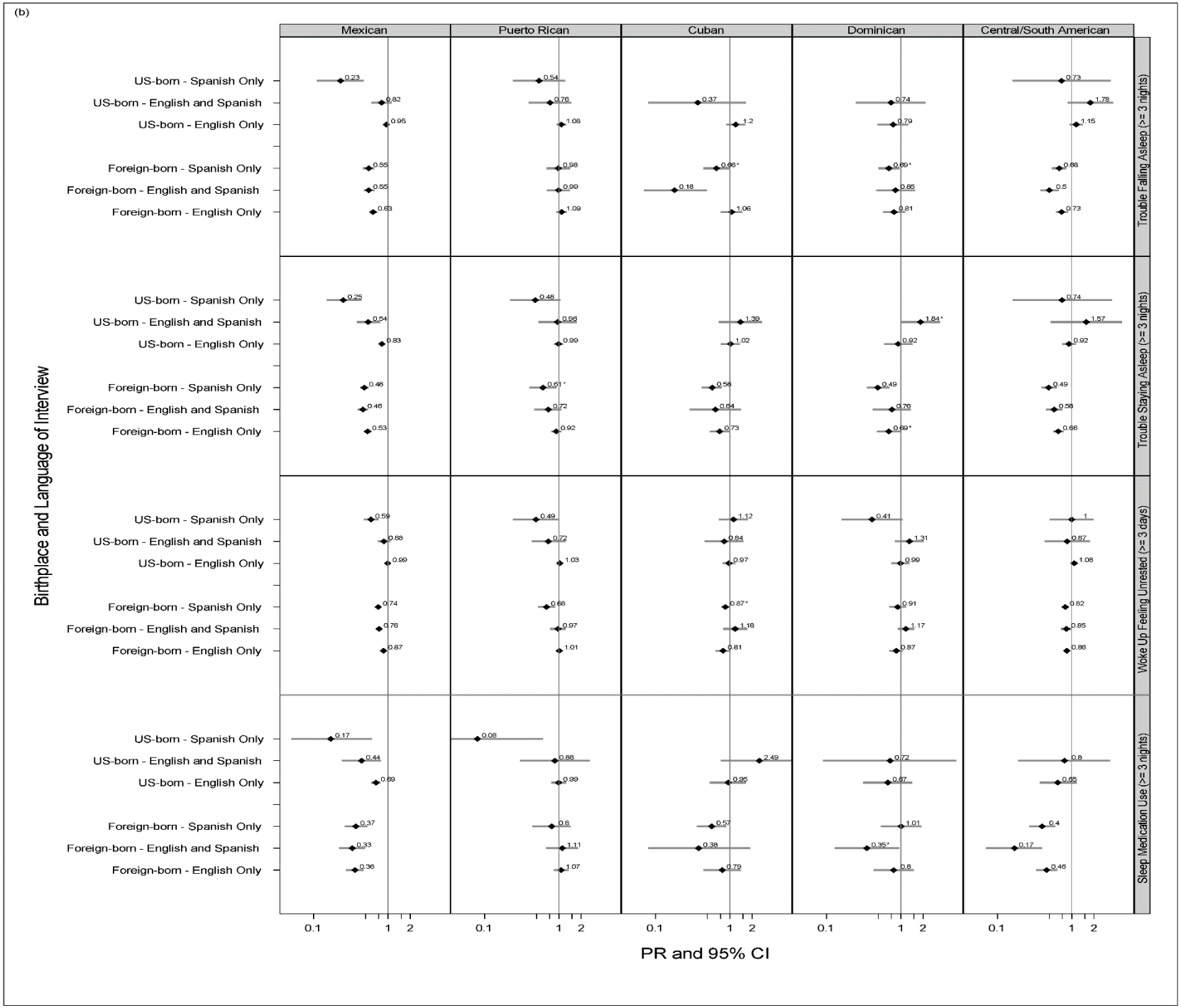

Mexican
Puerto Rican
Cuban
Dominican
Central/South American
Trouble Falling Asleep (>= 3 nights)
Trouble Staying Asleep (>= 3 nights)
Woke Up Feeling Unrested (>= 3 days)
Sleep Medication Use (>= 3 nights)
Birthplace and Language of Interview
US-born - Spanish Only
US-born - English and Spanish
US-born - English Only
Foreign-born - Spanish Only
Foreign-born - English and Spanish
Foreign-born - English Only
0.23 0.54 0.73
0.82 0.76 0.37 0.74 1.78
0.95 1.08 1.2 0.79 1.15
0.55 0.98 0.66 0.69 0.68
0.55 0.99 0.18 0.85 0.5
0.63 1.09 1.06 0.81 0.73
0.25 0.48 0.74
0.54 0.96 1.39 1.84 1.57
0.83 0.99 1.02 0.92 0.92
0.48 0.61 0.58 0.49 0.49
0.46 0.72 0.64 0.76 0.58
0.53 0.92 0.73 0.69 0.66
0.59 0.49 1.12 0.41 1
0.88 0.72 0.84 1.31 0.87
0.99 1.03 0.97 0.99 1.08
0.74 0.68 0.87 0.91 0.82
0.76 0.97 1.18 1.17 0.85
0.87 1.01 0.81 0.87 0.86
0.17 0.08 2.49 0.72 0.8
0.44 0.88 0.95 0.67 0.65
0.69 0.99 0.57 1.01 0.4
0.37 0.8 0.38 0.35 0.17
0.33 1.11 0.79 0.8 0.46
0.36 1.07
0.1 1 2
PR and 95% CI

**Supplemental Figure S1. Flow Chart Diagram of Final Analytic Sample**



**Supplemental Figure S2. Fully-Adjusted Prevalence Ratios of Sleep (a) Duration and (b) Quality[a] Characteristics for Hispanic/Latino Heritage Groups compared to non-Hispanic Whites by Language Acculturation Status[b]: Results after False Discovery Rate Correction, National Health Interview Survey, 2004-2017 (N=245,812)**




(b)
Mexican
Puerto Rican
Cuban
Dominican
Central/South American
Trouble Falling Asleep (>= 3 nights)
Trouble Staying Asleep (>= 3 nights)
Woke Up Feeling Unrested (>= 3 days)
Sleep Medication Use (>= 3 nights)
Birthplace and Language of Interview
US-born - Spanish Only
US-born - English and Spanish
US-born - English Only
Foreign-born - Spanish Only
Foreign-born - English and Spanish
Foreign-born - English Only
0.23
0.54
0.73
0.82
0.76
0.37
0.74
1.78
0.95
1.08
1.2
0.79
1.15
0.55
0.98
0.66*
0.69*
0.68
0.55
0.99
0.18
0.85
0.5
0.63
1.09
1.06
0.81
0.73
0.25
0.46
0.74
0.54
0.98
1.39
1.84*
1.57
0.83
0.99
1.02
0.92
0.92
0.48
0.61*
0.58
0.49
0.49
0.46
0.72
0.64
0.76
0.58
0.53
0.92
0.73
0.69*
0.66
0.59
0.49
1.12
0.41
1
0.88
0.72
0.84
1.31
0.87
0.99
1.03
0.97
0.99
1.08
0.74
0.68
0.87*
0.91
0.82
0.76
0.97
1.18
1.17
0.85
0.87
1.01
0.81
0.87
0.86
0.17
0.08
0.44
0.88
2.49
0.72
0.8
0.69
0.99
0.95
0.67
0.65
0.37
0.8
0.57
1.01
0.4
0.33
1.11
0.38
0.35*
0.17
0.36
1.07
0.79
0.8
0.46
0.1
1
2
PR and 95% CI

[a] Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.
[b] Language acculturation categories include high (English only interview), medium (English and Spanish interview), and low (Spanish only interview).

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/$m^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Certain associations were not estimable due to small sample sizes and are, therefore, not provided (e.g., long sleep duration among Central/South Americans with medium acculturation compared to non-Hispanic Whites).

* Results were statistically significant in original analyses but became statistically non-significant after applying false discovery rate p-values.

**Supplemental Table S1. Global Region of Birth among Foreign-born Non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=8,857)**

| Region of Birth | n (%) |
|---|---|
| Mexico, Central American, Caribbean Islands | 238 (2.7%) |
| South America | 236 (2.7%) |
| Europe | 4,670 (52.7%) |
| Russia | 838 (9.5%) |
| Africa | 368 (4.2%) |
| Middle East | 895 (10.1%) |
| Indian Subcontinent | 64 (0.7%) |
| Asia | 177 (2.0%) |
| Southeast Asia | 117 (1.3%) |
| Elsewhere | 1,254 (14.2%) |

Note: Data are presented as absolute counts and age-standardized, weighted percentages.

**Supplemental Table S2. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Foreign-born non-Hispanic Whites and Hispanic/Latino Heritage Groups compared to U.S.-born non-Hispanic Whites: Results after False Discovery Rate Correction, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality in the Past Week | | | |
| Group *(n)* | Very Short (≤5-hours) (n=21,227) | Short (<7-hours) (n=75,139) | Long (>9-hours) (n=9,190) | Trouble Falling Asleep (≥3 nights) (n=22,038) | Trouble Staying Asleep (≥3 nights) (n=30,013) | Non-restorative Sleep (≥3 days) (n=46,103) | Sleep Medication Use (≥3 nights) (n=11,097) |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | 1.03 (0.93-1.13) | 1.03 (0.99-1.08) | 1.07 (0.92-1.24) | 1.09 (0.99-1.19) | **1.27 (1.17-1.37)** | **1.06 (1.00-1.12)** | **1.34 (1.16-1.55)** |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | **0.76 (0.71-0.81)** | **0.87 (0.85-0.90)** | **0.87 (0.79-0.96)** | **0.77 (0.72-0.82)** | **0.65 (0.62-0.69)** | **0.90 (0.87-0.94)** | **0.52 (0.46-0.58)** |
| **U.S.-born (yes)** *(n=14,282)* | 1.04 (0.97-1.12) | 1.04 (1.00-1.08) | 0.98 (0.87-1.11) | **0.92 (0.85-0.99)** | **0.80 (0.74-0.85)** | 0.97 (0.93-1.01) | **0.66 (0.58-0.76)** |
| **U.S.-born (no)** *(n=15,818)* | **0.52 (0.47-0.57)** | **0.70 (0.67-0.73)** | **0.75 (0.66-0.85)** | **0.59 (0.54-0.65)** | **0.50 (0.46-0.55)** | **0.81 (0.77-0.85)** | **0.36 (0.29-0.43)** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.39 (1.26-1.53)** | **1.20 (1.14-1.25)** | 1.00 (0.84-1.20) | 1.05 (0.95-1.17) | 0.91 (0.83-1.00) | 0.98 (0.92-1.05) | 0.99 (0.85-1.15) |
| **U.S.-born (yes)** *(n=2,544)* | **1.44 (1.27-1.64)** | **1.23 (1.16-1.31)** | 1.08 (0.84-1.37) | 1.05 (0.91-1.21) | 0.97 (0.85-1.12) | 1.00 (0.92-1.09) | 0.96 (0.77-1.21) |
| **U.S.-born (no)** *(n=2,533)* | **1.32 (1.16-1.51)** | **1.15 (1.08-1.24)** | 0.94 (0.74-1.19) | 1.06 (0.92-1.22) | **0.84 (0.73-0.97)** | 0.95 (0.86-1.05) | 1.02 (0.83-1.25) |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | ***0.83 (0.70-0.99)*** | **0.89 (0.81-0.98)** | **0.69 (0.55-0.87)** | **0.78 (0.62-0.97)** | **0.70 (0.58-0.83)** | 0.90 (0.82-1.00) | **0.68 (0.53-0.89)** |
| **U.S.-born (yes)** *(n=559)* | 0.93 (0.66-1.29) | 1.04 (0.89-1.21) | 0.71 (0.34-1.47) | 0.97 (0.72-1.31) | 0.94 (0.70-1.26) | 0.98 (0.82-1.17) | 0.98 (0.57-1.69) |
| **U.S.-born (no)** *(n=1,959)* | ***0.81 (0.66-0.99)*** | **0.85 (0.76-0.95)** | **0.69 (0.54-0.88)** | **0.71 (0.53-0.95)** | **0.63 (0.49-0.79)** | **0.87 (0.78-0.98)** | **0.61 (0.43-0.85)** |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 0.90 (0.76-1.08) | 0.92 (0.83-1.01) | 0.72 (0.49-1.05) | **0.76 (0.62-0.92)** | **0.67 (0.55-0.83)** | 0.93 (0.82-1.05) | 0.81 (0.54-1.20) |
| **U.S.-born (yes)** | 1.09 | 1.09 | 1.15 | 0.73 | 0.97 | 0.98 | 0.64 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *(n=264)* | (0.68-1.74) | (0.85-1.40) | (0.49-2.73) | (0.47-1.13) | (0.65-1.43) | (0.77-1.26) | (0.31-1.31) |
| **U.S.-born (no)** *(n=1,394)* | 0.87 (0.73-1.03) | **0.88 (0.79-0.98)** | **0.60 (0.38-0.93)** | **0.76 (0.62-0.95)** | **0.61 (0.48-0.78)** | 0.92 (0.79-1.07) | 0.84 (0.54-1.30) |
| **Central/South American** | | | | | | | |
| **Overall** *(n=8,162)* | **0.78 (0.71-0.87)** | **0.93 (0.89-0.98)** | **0.68 (0.56-0.83)** | **0.76 (0.67-0.87)** | **0.65 (0.58-0.73)** | **0.89 (0.83-0.94)** | **0.42 (0.34-0.53)** |
| **U.S.-born (yes)** *(n=1,113)* | ***1.30 (1.03-1.65)*** | **1.18 (1.04-1.33)** | 0.82 (0.51-1.30) | 1.21 (0.96-1.51) | 0.98 (0.73-1.30) | 1.05 (0.93-1.19) | 0.64 (0.38-1.10) |
| **U.S.-born (no)** *(n=7,049)* | **0.72 (0.64-0.80)** | **0.89 (0.85-0.94)** | **0.66 (0.54-0.82)** | **0.68 (0.59-0.77)** | **0.59 (0.53-0.67)** | **0.85 (0.80-0.90)** | **0.39 (0.30-0.50)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Very short and short sleep are non-mutually exclusive sleep duration categories. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

Italicized results indicate results that were statistically significant in original analyses but became statistically non-significant after applying false discovery rate p-values.

**Supplemental Table S3. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to Foreign-born non-Hispanic Whites: Results after False Discovery Rate Correction, National Health Interview Survey, 2004-2017 (N=56,372)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality in the Past Week | | | |
| **Group *(n)*** | **Very Short (≤5-hours) (n=4,115)** | **Short (<7-hours) (n=14,048)** | **Long (>9-hours) (n=1,586)** | **Trouble Falling Asleep (≥3 nights) (n=3,431)** | **Trouble Staying Asleep (≥3 nights) (n=3,520)** | **Non-restorative Sleep (≥3 days) (n=7,734)** | **Sleep Medication Use (≥3 nights) (n=1,073)** |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | 1.10 (0.96-1.26) | **1.12 (1.05-1.18)** | 1.06 (0.86-1.31) | 0.92 (0.81-1.05) | ***0.87 (0.78-0.97)*** | 1.06 (0.99-1.14) | 0.92 (0.73-1.14) |
| **U.S.-born (yes)** *(n=14,282)* | ***1.17 (1.02-1.34)*** | **1.19 (1.12-1.26)** | 1.04 (0.84-1.29) | 1.00 (0.87-1.14) | 0.97 (0.86-1.10) | 1.07 (0.99-1.15) | 0.98 (0.78-1.23) |
| **U.S.-born (no)** *(n=15,818)* | 0.89 (0.73-1.08) | 0.98 (0.90-1.06) | 1.05 (0.81-1.36) | ***0.78 (0.66-0.94)*** | **0.72 (0.62-0.84)** | 1.02 (0.93-1.12) | ***0.68 (0.48-0.96)*** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.75 (1.51-2.02)** | **1.34 (1.25-1.44)** | 1.13 (0.88-1.44) | ***1.19 (1.03-1.39)*** | 1.14 (0.99-1.31) | 1.06 (0.96-1.16) | ***1.33 (1.07-1.64)*** |
| **U.S.-born (yes)** *(n=2,544)* | **1.85 (1.54-2.22)** | **1.39 (1.27-1.51)** | 1.33 (0.95-1.85) | 1.20 (0.99-1.46) | ***1.22 (1.02-1.46)*** | 1.06 (0.95-1.18) | ***1.32 (1.01-1.73)*** |
| **U.S.-born (no)** *(n=2,533)* | **1.58 (1.32-1.90)** | **1.27 (1.16-1.39)** | 1.02 (0.77-1.35) | ***1.22 (1.01-1.46)*** | 1.09 (0.91-1.30) | 1.06 (0.94-1.20) | ***1.41 (1.09-1.83)*** |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | 0.97 (0.76-1.22) | 0.98 (0.88-1.10) | ***0.69 (0.49-0.97)*** | 0.92 (0.70-1.20) | 0.93 (0.76-1.15) | 1.03 (0.90-1.18) | 1.09 (0.77-1.55) |
| **U.S.-born (yes)** *(n=559)* | 1.03 (0.69-1.53) | 1.15 (0.96-1.37) | 0.83 (0.39-1.75) | 1.14 (0.79-1.65) | 1.17 (0.84-1.65) | 1.05 (0.85-1.29) | 1.63 (0.91-2.93) |
| **U.S.-born (no)** *(n=1,959)* | 0.94 (0.72-1.22) | 0.92 (0.81-1.05) | ***0.66 (0.46-0.94)*** | 0.82 (0.59-1.14) | 0.85 (0.65-1.10) | 1.04 (0.89-1.21) | 0.96 (0.63-1.45) |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 1.12 (0.89-1.43) | 1.02 (0.90-1.16) | 0.91 (0.57-1.45) | 0.88 (0.68-1.13) | 0.94 (0.72-1.23) | 1.00 (0.87-1.15) | 1.03 (0.67-1.59) |
| **U.S.-born (yes)** *(n=264)* | 1.40 (0.82-2.41) | 1.24 (0.97-1.60) | 1.80 (0.68-4.79) | 0.82 (0.51-1.31) | 1.25 (0.81-1.93) | 1.01 (0.78-1.32) | 0.97 (0.42-2.20) |
| **U.S.-born (no)** *(n=1,394)* | 1.06 (0.84-1.34) | 0.96 (0.84-1.10) | 0.73 (0.45-1.20) | 0.88 (0.68-1.16) | 0.87 (0.65-1.18) | 0.99 (0.84-1.18) | 1.02 (0.64-1.63) |

| Central/South American | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Overall** *(n=8,162)* | 1.00 (0.86-1.17) | ***1.10*** ***(1.02-1.17)*** | 0.76 (0.57-1.02) | 0.94 (0.78-1.13) | 0.89 (0.76-1.04) | 1.02 (0.95-1.11) | ***0.69*** ***(0.51-0.91)*** |
| **U.S.-born (yes)** *(n=1,113)* | ***1.42*** ***(1.06-1.92)*** | **1.30** **(1.13-1.49)** | 1.02 (0.59-1.75) | 1.27 (0.96-1.67) | 1.14 (0.86-1.52) | 1.08 (0.94-1.25) | 0.95 (0.56-1.62) |
| **U.S.-born (no)** *(n=7,049)* | 0.92 (0.78-1.08) | 1.05 (0.98-1.13) | 0.77 (0.56-1.05) | 0.84 (0.69-1.02) | ***0.84*** ***(0.72-0.99)*** | 1.00 (0.92-1.09) | ***0.64*** ***(0.47-0.88)*** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex/gender (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Very short and short sleep are non-mutually exclusive sleep duration categories. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

Italicized results indicate results that were statistically significant in original analyses but became statistically non-significant after applying false discovery rate p-values.

**Supplemental Table S4. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality [a] | | | |
| **Heritage Group Compared to non-Hispanic Whites, Overall** (n=207,154) | **Very Short (≤5-hours) (n=21,227)** | **Short (<7-hours) (n=75,139)** | **Long (>9-hours) (n=9,190)** | **Trouble Falling Asleep (≥3 nights) (n=22,038)** | **Trouble Staying Asleep (≥3 nights) (n=30,013)** | **Non-restorative Sleep (≥3 days) (n=46,103)** | **Sleep Medication Use (≥3 nights) (n=11,097)** |
| **Mexican** (n=30,100 Mexican) | **0.89 (0.82-0.95)** | 0.95 (0.92-0.98) | 0.94 (0.84-1.04) | **0.85 (0.79-0.91)** | **0.75 (0.71-0.80)** | **0.95 (0.91-0.99)** | **0.62 (0.54-0.70)** |
| **Puerto Rican** (n=5,077) | **1.41 (1.27-1.57)** | **1.21 (1.16-1.27)** | 1.05 (0.87-1.27) | 1.10 (0.99-1.22) | 1.02 (0.92-1.12) | 1.01 (0.94-1.08) | 1.10 (0.94-1.30) |
| **Cuban** (n=2,518) | 0.90 (0.75-1.07) | 0.94 (0.86-1.04) | **0.75 (0.58-0.97)** | 0.88 (0.71-1.09) | 0.88 (0.74-1.05) | 0.96 (0.87-1.07) | 0.93 (0.70-1.23) |
| **Dominican** (n=1,658) | 0.95 (0.78-1.16) | 0.96 (0.86-1.06) | 0.79 (0.53-1.18) | 0.82 (0.66-1.02) | 0.84 (0.68-1.04) | 0.98 (0.87-1.11) | 1.04 (0.69-1.58) |
| **Central/South American** (n=8,162) | 0.89 (0.78-1.01) | 1.01 (0.95-1.07) | **0.75 (0.60-0.94)** | 0.88 (0.75-1.03) | **0.83 (0.73-0.95)** | 0.95 (0.88-1.02) | **0.57 (0.44-0.73)** |

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (lifetime abstainer, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), and "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), cancer, and US nativity status/years lived in the US (US-born, 15+ years in the US, <15 years in the US).

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, awakening feeling rested, and sleep medication were measured during the survey years 2013-2017.

**Supplemental Table S5. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for (1) foreign-born non-Hispanic Whites and (2) Hispanic/Latino Heritage Groups compared to US-born non-Hispanic Whites, Stratified by Sex/Gender, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | Sleep Quality in the Past Week | | | | | | | |
| | Very Short (≤5-hours) (n=21,227) | | Short (<7-hours) (n=75,139) | | Long (>9-hours) (n=9,190) | | Trouble Falling Asleep (≥3 nights) (n=22,038) | | Trouble Staying Asleep (≥3 nights) (n=30,013) | | Non-restorative Sleep (≥3 days) (n=46,103) | | Sleep Medication Use (≥3 nights) (n=11,097) | |
| **Group *(n)*** | | | | | | | | | | | | | | |
| **Sex/Gender** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | 1.12 (0.98-1.30) | 0.94 (0.83-1.06) | 1.07 (1.00-1.13) | 1.00 (0.95-1.06) | 1.18 (0.94-1.47) | 1.00 (0.82-1.21) | 1.08 (0.92-1.27) | 1.09 (0.97-1.21) | **1.31 (1.16-1.49)** | **1.22 (1.11-1.35)** | **1.11 (1.02-1.21)** | 1.01 (0.95-1.08) | **1.44 (1.12-1.85)** | **1.28 (1.07-1.52)** |
| **Mexican** | | | | | | | | | | | | | | |
| **Overall** *(n=30,100)* | **0.70 (0.63-0.77)** | **0.83 (0.76-0.91)** | **0.83 (0.79-0.86)** | **0.94 (0.90-0.97)** | 0.96 (0.84-1.10) | **0.77 (0.68-0.87)** | **0.77 (0.73-0.82)** | **0.80 (0.74-0.86)** | **0.66 (0.62-0.70)** | **0.68 (0.63-0.73)** | **0.91 (0.87-0.94)** | **0.91 (0.87-0.95)** | **0.52 (0.46-0.59)** | **0.48 (0.41-0.56)** |
| **U.S.-born (yes)** *(n=14,282)* | 1.02 (0.91-1.14) | 1.05 (0.96-1.15) | 1.01 (0.96-1.07) | **1.07 (1.03-1.12)** | 1.09 (0.91-1.31) | 0.88 (0.75-1.03) | **0.92 (0.85-0.99)** | 0.92 (0.84-1.00) | **0.80 (0.74-0.86)** | **0.77 (0.71-0.85)** | 0.97 (0.93-1.01) | 0.95 (0.90-1.00) | **0.66 (0.58-0.76)** | **0.59 (0.50-0.70)** |
| **U.S.-born (no)** *(n=15,818)* | **0.47 (0.40-0.54)** | **0.60 (0.52-0.69)** | **0.66 (0.62-0.70)** | **0.77 (0.71-0.82)** | **0.83 (0.70-0.99)** | **0.65 (0.54-0.78)** | **0.60 (0.55-0.66)** | **0.64 (0.58-0.71)** | **0.51 (0.46-0.55)** | **0.55 (0.49-0.62)** | **0.82 (0.77-0.86)** | **0.85 (0.80-0.90)** | **0.36 (0.30-0.44)** | **0.34 (0.27-0.42)** |
| **Puerto Rican** | | | | | | | | | | | | | | |
| **Overall** *(n=5,077)* | **1.31 (1.13-1.53)** | **1.45 (1.29-1.63)** | **1.19 (1.11-1.28)** | **1.21 (1.14-1.28)** | 1.05 (0.82-1.34) | 0.95 (0.74-1.21) | 1.05 (0.94-1.16) | 1.08 (0.96-1.22) | 0.91 (0.83-1.00) | **0.87 (0.78-0.97)** | 0.98 (0.91-1.05) | 1.04 (0.97-1.12) | 0.98 (0.84-1.15) | 1.02 (0.84-1.23) |
| **U.S.-born (yes)** *(n=2,544)* | **1.33 (1.08-1.63)** | **1.53 (1.30-1.81)** | **1.21 (1.11-1.33)** | **1.24 (1.15-1.35)** | 1.26 (0.89-1.77) | 0.94 (0.66-1.33) | 1.04 (0.90-1.21) | 1.14 (0.98-1.33) | 0.97 (0.85-1.11) | 0.91 (0.78-1.05) | 1.00 (0.92-1.09) | **1.10 (1.01-1.20)** | 0.96 (0.76-1.19) | 0.97 (0.73-1.30) |
| **U.S.-born (no)** *(n=2,533)* | **1.29 (1.03-1.61)** | **1.36 (1.17-1.58)** | **1.15 (1.04-1.27)** | **1.16 (1.06-1.26)** | 0.89 (0.63-1.26) | 0.96 (0.72-1.28) | 1.05 (0.91-1.21) | 1.01 (0.86-1.18) | 0.84 (0.73-0.97) | **0.82 (0.70-0.97)** | 0.95 (0.86-1.04) | 0.96 (0.85-1.08) | 1.01 (0.83-1.24) | 1.08 (0.86-1.35) |
| **Cuban** | | | | | | | | | | | | | | |
| **Overall** *(n=2,518)* | **0.75 (0.59-0.96)** | 0.94 (0.75-1.18) | **0.84 (0.74-0.95)** | 0.97 (0.87-1.09) | **0.73 (0.54-0.99)** | **0.63 (0.42-0.93)** | **0.76 (0.61-0.94)** | 0.78 (0.60-1.01) | **0.68 (0.57-0.81)** | **0.72 (0.57-0.91)** | **0.89 (0.81-0.99)** | 0.98 (0.85-1.14) | **0.66 (0.51-0.87)** | 0.77 (0.55-1.06) |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.78 (0.44-1.39) | 1.08 (0.74-1.58) | 1.01 (0.81-1.25) | 1.08 (0.89-1.31) | 0.49 (0.18-1.29) | 0.95 (0.39-2.31) | 0.95 (0.70-1.28) | 0.96 (0.66-1.39) | 0.92 (0.69-1.23) | 0.83 (0.53-1.31) | 0.96 (0.80-1.16) | 1.07 (0.86-1.34) | 0.95 (0.54-1.66) | 1.37 (0.78-2.42) |
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.75 (0.56-1.00) | 0.90 (0.69-1.18) | **0.78 (0.67-0.91)** | 0.94 (0.82-1.07) | 0.78 (0.57-1.05) | **0.55 (0.35-0.87)** | **0.69 (0.52-0.92)** | **0.71 (0.52-0.98)** | **0.61 (0.48-0.78)** | **0.68 (0.50-0.94)** | **0.87 (0.77-0.97)** | 0.95 (0.80-1.13) | **0.59 (0.42-0.83)** | **0.60 (0.40-0.89)** |
| **Dominican** | | | | | | | | | | | | | | |
| **Overall** *(n=1,658)* | 0.82 (0.60-1.11) | 0.96 (0.79-1.16) | 0.83 (0.71-0.97) | 0.98 (0.88-1.10) | 1.05 (0.68-1.61) | 0.49 (0.24-1.00) | **0.77 (0.63-0.94)** | 0.83 (0.66-1.03) | **0.68 (0.56-0.84)** | **0.77 (0.61-0.97)** | 0.94 (0.83-1.06) | 0.96 (0.84-1.09) | 0.83 (0.55-1.23) | 0.93 (0.60-1.45) |
| **U.S.-born (yes)** | 1.13 (0.60-2.11) | 1.02 (0.58-1.79) | 0.86 (0.60-1.23) | 1.32 (0.98-1.77) | 0.96 (0.30-3.07) | 1.35 (0.48-3.80) | 0.73 (0.48-1.12) | 0.62 (0.36-1.07) | 0.97 (0.65-1.44) | 0.91 (0.53-1.57) | 0.99 (0.78-1.26) | 0.93 (0.68-1.29) | 0.64 (0.31-1.30) | 0.57 (0.23-1.43) |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *(n=264)* | | | | | | | | | | | | | | |
| **U.S.-born (no)** *(n=1,394)* | 0.74 (0.52-1.04) | 0.95 (0.78-1.15) | 0.82 (0.69-0.97) | 0.92 (0.81-1.04) | 1.08 (0.63-1.85) | **0.29 (0.15-0.53)** | **0.78 (0.63-0.97)** | 0.88 (0.69-1.12) | **0.62 (0.49-0.80)** | **0.74 (0.57-0.97)** | 0.92 (0.79-1.08) | 0.96 (0.83-1.13) | 0.86 (0.55-1.34) | 1.00 (0.61-1.63) |
| **Central/South American** | | | | | | | | | | | | | | |
| **Overall** *(n=8,162)* | **0.71 (0.61-0.83)** | **0.87 (0.76-0.99)** | **0.93 (0.87-0.99)** | 0.94 (0.88-1.01) | **0.66 (0.48-0.91)** | **0.70 (0.56-0.89)** | **0.78 (0.68-0.88)** | **0.83 (0.71-0.97)** | **0.65 (0.58-0.73)** | **0.73 (0.63-0.86)** | **0.89 (0.84-0.95)** | 0.96 (0.89-1.04) | **0.43 (0.34-0.54)** | **0.46 (0.35-0.61)** |
| **U.S.-born (yes)** *(n=1,113)* | 1.31 (0.92-1.87) | 1.31 (0.96-1.77) | 1.25 (1.08-1.45) | 1.10 (0.92-1.30) | 0.64 (0.35-1.16) | 0.95 (0.52-1.74) | 1.21 (0.96-1.53) | **1.40 (1.06-1.86)** | 0.97 (0.73-1.30) | 1.13 (0.80-1.61) | 1.05 (0.92-1.20) | 1.13 (0.97-1.32) | 0.64 (0.38-1.10) | **0.47 (0.24-0.94)** |
| **U.S.-born (no)** *(n=7,049)* | **0.64 (0.54-0.76)** | **0.80 (0.70-0.93)** | **0.88 (0.82-0.94)** | **0.92 (0.85-0.98)** | **0.66 (0.47-0.94)** | **0.67 (0.52-0.87)** | **0.69 (0.60-0.78)** | **0.71 (0.61-0.83)** | **0.60 (0.53-0.68)** | **0.66 (0.57-0.77)** | **0.85 (0.80-0.91)** | **0.92 (0.85-0.99)** | **0.40 (0.31-0.51)** | **0.46 (0.34-0.62)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S6. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for (1) foreign-born non-Hispanic Whites and (2) Hispanic/Latino Heritage Groups compared to US-born non-Hispanic Whites, Stratified by Age Group, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | | | | Sleep Quality in the Past Week | | | | | | | | | | | |
| | Very Short (≤5-hours) (n=21,227) | | | Short (≤7-hours) (n=75,139) | | | Long (>9-hours) (n=9,190) | | | Trouble Falling Asleep (≥3 nights) (n=22,038) | | | Trouble Staying Asleep (≥3 nights) (n=30,013) | | | Non-restorative Sleep (≥3 days) (n=46,103) | | | Sleep Medication Use (≥3 nights) (n=11,097) | | |
| **Group *(n)*** | | | | | | | | | | | | | | | | | | | | | |
| **Age (years) Group** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | 0.93 (0.71-1.23) | **1.33 (1.13-1.56)** | 0.89 (0.80-1.00) | 1.08 (0.95-1.22) | **1.13 (1.05-1.21)** | 0.96 (0.91-1.01) | 1.24 (0.80-1.92) | 1.12 (0.79-1.59) | 0.96 (0.82-1.13) | 0.98 (0.74-1.31) | **1.24 (1.06-1.44)** | 1.04 (0.92-1.17) | 1.11 (0.79-1.56) | **1.44 (1.24-1.68)** | **1.20 (1.10-1.31)** | 1.02 (0.89-1.16) | **1.15 (1.07-1.25)** | 1.00 (0.92-1.08) | 1.64 (0.95-2.85) | **1.64 (1.21-2.22)** | **1.22 (1.03-1.44)** |
| **Mexican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=30,100)* | **0.78 (0.69-0.89)** | **0.69 (0.62-0.76)** | 0.98 (0.87-1.10) | **0.88 (0.83-0.93)** | **0.87 (0.83-0.90)** | 0.96 (0.91-1.02) | 0.96 (0.80-1.15) | **0.72 (0.61-0.87)** | **0.86 (0.75-0.98)** | **0.81 (0.76-0.86)** | **0.66 (0.60-0.73)** | 0.92 (0.83-1.01) | **0.65 (0.61-0.69)** | **0.58 (0.53-0.64)** | **0.71 (0.64-0.78)** | **0.95 (0.92-0.99)** | **0.88 (0.84-0.92)** | 0.93 (0.87-1.00) | **0.50 (0.44-0.56)** | **0.41 (0.33-0.51)** | **0.61 (0.52-0.72)** |
| **U.S.-born (yes)** *(n=14,282)* | 1.03 (0.90-1.18) | 1.03 (0.91-1.15) | **1.14 (1.01-1.27)** | 1.00 (0.93-1.06) | **1.09 (1.03-1.15)** | 1.06 (0.99-1.13) | 1.04 (0.85-1.26) | 0.85 (0.67-1.09) | 0.96 (0.81-1.13) | 0.96 (0.89-1.03) | **0.81 (0.73-0.91)** | 1.01 (0.90-1.15) | **0.77 (0.71-0.82)** | **0.73 (0.65-0.82)** | **0.84 (0.75-0.95)** | 1.02 (0.98-1.06) | 0.96 (0.91-1.03) | 1.00 (0.92-1.09) | **0.61 (0.53-0.70)** | **0.64 (0.51-0.80)** | **0.64 (0.54-0.76)** |
| **U.S.-born (no)** *(n=15,818)* | **0.43 (0.34-0.54)** | **0.48 (0.41-0.55)** | **0.82 (0.68-0.98)** | **0.67 (0.61-0.74)** | **0.69 (0.65-0.74)** | **0.86 (0.79-0.93)** | 0.81 (0.62-1.06) | **0.65 (0.51-0.82)** | **0.76 (0.63-0.92)** | **0.63 (0.58-0.69)** | **0.54 (0.46-0.62)** | **0.80 (0.69-0.93)** | **0.51 (0.47-0.56)** | **0.46 (0.40-0.52)** | **0.57 (0.50-0.65)** | **0.86 (0.82-0.91)** | **0.79 (0.74-0.85)** | **0.85 (0.77-0.94)** | **0.36 (0.29-0.43)** | **0.22 (0.15-0.32)** | **0.57 (0.44-0.75)** |
| **Puerto Rican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=5,077)* | **1.47 (1.17-1.83)** | **1.30 (1.12-1.51)** | **1.56 (1.36-1.78)** | **1.26 (1.13-1.39)** | **1.15 (1.07-1.24)** | **1.27 (1.18-1.36)** | 1.28 (0.94-1.75) | 0.88 (0.64-1.20) | 0.88 (0.69-1.14) | **1.12 (1.01-1.23)** | 0.93 (0.78-1.11) | **1.35 (1.18-1.56)** | 0.92 (0.84-1.02) | 0.92 (0.77-1.09) | 0.92 (0.80-1.07) | 1.04 (0.97-1.10) | 0.97 (0.87-1.07) | 1.04 (0.93-1.17) | 0.98 (0.84-1.15) | 0.83 (0.62-1.12) | 1.15 (0.93-1.40) |
| **U.S.-born (yes)** *(n=2,544)* | **1.53 (1.19-1.96)** | **1.47 (1.24-1.74)** | **1.55 (1.17-2.06)** | **1.26 (1.12-1.42)** | **1.25 (1.15-1.36)** | **1.28 (1.11-1.48)** | 1.36 (0.97-1.91) | 1.00 (0.66-1.54) | 0.64 (0.35-1.19) | 1.14 (0.99-1.31) | 0.93 (0.75-1.14) | **1.49 (1.20-1.86)** | 0.98 (0.85-1.12) | 1.02 (0.82-1.25) | 1.01 (0.79-1.28) | 1.08 (0.99-1.18) | 0.99 (0.87-1.12) | 1.11 (0.94-1.31) | 0.93 (0.74-1.17) | 0.79 (0.52-1.19) | 1.25 (0.92-1.69) |
| **U.S.-born (no)** *(n=2,533)* | 1.27 (0.86-1.87) | 1.08 (0.85-1.38) | **1.56 (1.34-1.81)** | **1.23 (1.01-1.51)** | 1.01 (0.90-1.14) | **1.26 (1.16-1.37)** | 1.03 (0.53-2.02) | 0.75 (0.47-1.18) | 0.96 (0.74-1.25) | 1.09 (0.94-1.25) | 0.95 (0.73-1.22) | **1.27 (1.06-1.51)** | **0.86 (0.75-0.99)** | 0.77 (0.58-1.02) | 0.87 (0.73-1.03) | 0.98 (0.88-1.08) | 0.94 (0.80-1.10) | 1.00 (0.87-1.14) | 1.04 (0.85-1.27) | 0.90 (0.60-1.35) | 1.08 (0.85-1.37) |
| **Cuban** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=2,518)* | 0.69 (0.40-1.17) | **0.66 (0.50-0.86)** | 1.08 (0.87-1.34) | **0.75 (0.59-0.95)** | **0.79 (0.67-0.93)** | 1.06 (0.96-1.18) | 0.64 (0.32-1.26) | 0.69 (0.42-1.14) | **0.71 (0.55-0.93)** | **0.78 (0.63-0.97)** | 0.72 (0.52-1.00) | 1.00 (0.79-1.26) | **0.70 (0.59-0.84)** | **0.73 (0.56-0.94)** | **0.73 (0.58-0.91)** | 0.91 (0.83-1.01) | **0.81 (0.70-0.94)** | 0.98 (0.84-1.14) | **0.69 (0.53-0.90)** | 0.66 (0.43-1.04) | 0.76 (0.56-1.04) |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **U.S.-born Cuban (yes)** *(n=559)* | 0.81 (0.47-1.42) | 0.83 (0.49-1.41) | 1.65 (0.93-2.94) | 0.98 (0.76-1.26) | 1.11 (0.91-1.35) | 1.04 (0.69-1.57) | 0.93 (0.39-2.23) | 0.45 (0.14-1.41) | 0.21 (0.03-1.53) | 1.05 (0.78-1.41) | 1.11 (0.72-1.71) | 1.54 (0.85-2.78) | 0.91 (0.68-1.22) | 1.02 (0.68-1.53) | 1.04 (0.62-1.75) | 1.05 (0.87-1.26) | 0.94 (0.72-1.24) | 0.99 (0.61-1.63) | 0.91 (0.52-1.60) | 1.53 (0.83-2.80) | 0.63 (0.26-1.49) |
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.59 (0.24-1.43) | **0.61 (0.44-0.84)** | 1.03 (0.81-1.31) | **0.48 (0.31-0.75)** | **0.67 (0.53-0.83)** | 1.06 (0.95-1.18) | 0.32 (0.08-1.34) | 0.75 (0.42-1.34) | **0.74 (0.56-0.96)** | **0.70 (0.53-0.93)** | **0.57 (0.35-0.95)** | 0.94 (0.74-1.20) | **0.64 (0.50-0.81)** | **0.61 (0.41-0.90)** | **0.69 (0.54-0.89)** | **0.87 (0.78-0.97)** | **0.76 (0.64-0.89)** | 0.98 (0.83-1.16) | **0.62 (0.44-0.88)** | **0.30 (0.13-0.66)** | 0.77 (0.56-1.07) |
| **Dominican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=1,658)* | **0.64 (0.41-0.99)** | 0.90 (0.68-1.19) | 1.18 (0.95-1.46) | 0.81 (0.62-1.05) | 0.94 (0.82-1.08) | 1.02 (0.89-1.17) | 1.32 (0.73-2.36) | 0.48 (0.22-1.03) | **0.42 (0.21-0.84)** | **0.80 (0.66-0.97)** | 0.69 (0.47-1.01) | 0.90 (0.68-1.18) | **0.68 (0.55-0.83)** | **0.51 (0.33-0.77)** | **0.71 (0.53-0.96)** | 0.98 (0.86-1.11) | **0.79 (0.65-0.97)** | 1.12 (0.94-1.34) | 0.79 (0.53-1.18) | **0.37 (0.20-0.69)** | 1.31 (0.82-2.07) |
| **U.S.-born (yes)** *(n=264)* | 0.63 (0.31-1.30) | **2.17 (1.33-3.55)** | 1.65 (0.41-6.68) | 0.87 (0.58-1.31) | **1.62 (1.30-2.02)** | 0.98 (0.43-2.20) | 1.32 (0.52-3.33) | 2.50 (0.76-8.25) | NE | 0.78 (0.50-1.21) | 0.88 (0.44-1.76) | 0.82 (0.12-5.75) | 0.85 (0.56-1.28) | 1.05 (0.55-2.02) | 0.46 (0.07-3.02) | 1.06 (0.82-1.36) | 1.05 (0.77-1.42) | 1.60 (0.70-3.67) | 0.50 (0.24-1.02) | 1.26 (0.52-3.02) | 0.69 (0.08-5.75) |
| **U.S.-born (no)** *(n=1,394)* | 0.63 (0.37-1.08) | 0.76 (0.55-1.04) | 1.16 (0.94-1.44) | 0.75 (0.55-1.03) | **0.84 (0.72-0.99)** | 1.02 (0.89-1.17) | 1.31 (0.64-2.68) | 0.33 (0.12-0.87) | **0.44 (0.22-0.87)** | **0.80 (0.65-0.99)** | **0.66 (0.44-0.97)** | 0.90 (0.69-1.18) | **0.63 (0.50-0.81)** | **0.41 (0.26-0.64)** | **0.72 (0.54-0.96)** | 0.96 (0.82-1.12) | **0.75 (0.59-0.94)** | 1.11 (0.91-1.35) | 0.87 (0.56-1.35) | **0.20 (0.09-0.47)** | 1.33 (0.84-2.12) |
| **Central/South American** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=8,162)* | 0.90 (0.72-1.12) | **0.72 (0.62-0.84)** | 0.92 (0.78-1.09) | 0.97 (0.87-1.08) | **0.92 (0.86-0.99)** | 0.99 (0.91-1.07) | 0.90 (0.63-1.27) | **0.63 (0.45-0.87)** | **0.51 (0.36-0.72)** | **0.81 (0.71-0.92)** | **0.70 (0.58-0.85)** | 0.85 (0.71-1.02) | **0.65 (0.58-0.73)** | **0.55 (0.46-0.66)** | **0.66 (0.55-0.79)** | **0.93 (0.88-0.99)** | **0.85 (0.79-0.93)** | 0.91 (0.81-1.02) | **0.41 (0.33-0.52)** | **0.33 (0.21-0.51)** | **0.50 (0.38-0.67)** |
| **U.S.-born Central/South American (yes)** *(n=1,113)* | 1.31 (0.94-1.82) | **1.52 (1.07-2.16)** | 0.98 (0.43-2.25) | **1.19 (1.02-1.40)** | **1.23 (1.04-1.45)** | 1.02 (0.65-1.58) | 0.82 (0.48-1.40) | 0.96 (0.34-2.74) | 0.36 (0.08-1.54) | 1.26 (1.01-1.55) | 1.28 (0.90-1.83) | **1.66 (1.01-2.73)** | 0.87 (0.65-1.15) | 0.73 (0.53-1.03) | 0.93 (0.53-1.63) | 1.10 (0.97-1.25) | 1.02 (0.84-1.23) | 0.80 (0.46-1.41) | **0.52 (0.30-0.89)** | **0.23 (0.11-0.49)** | 1.41 (0.67-2.95) |
| **U.S.-born Central/South American (no)** *(n=7,049)* | **0.73 (0.56-0.96)** | **0.65 (0.55-0.77)** | 0.92 (0.77-1.09) | **0.86 (0.76-0.98)** | **0.89 (0.83-0.96)** | 0.99 (0.91-1.07) | 0.93 (0.61-1.41) | **0.61 (0.44-0.85)** | **0.51 (0.36-0.73)** | **0.72 (0.63-0.82)** | **0.63 (0.51-0.78)** | **0.83 (0.69-0.99)** | **0.61 (0.54-0.69)** | **0.53 (0.43-0.65)** | **0.65 (0.54-0.78)** | **0.90 (0.84-0.96)** | **0.83 (0.76-0.91)** | 0.91 (0.81-1.03) | **0.40 (0.31-0.51)** | **0.34 (0.22-0.55)** | **0.47 (0.35-0.64)** |

Abbreviations: ref (reference)

Adjusted for sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S7. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to foreign-born non-Hispanic Whites, Stratified by Sex/Gender, National Health Interview Survey, 2004-2017 (N=56,372)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | Sleep Quality in the Past Week | | | | | | | |
| | Very Short (≤5-hours) (n=4,115) | | Short (<7-hours) (n=14,048) | | Long (>9-hours) (n=1,586) | | Trouble Falling Asleep (≥3 nights) (n=3,431) | | Trouble Staying Asleep (≥3 nights) (n=3,520) | | Non-restorative Sleep (≥3 days) (n=7,734) | | Sleep Medication Use (≥3 nights) (n=1,073) | |
| **Group *(n)*** | | | | | | | | | | | | | | |
| **Sex/Gender** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Mexican** | | | | | | | | | | | | | | |
| **Overall** *(n=30,100)* | 1.23 (1.00-1.51) | 1.00 (0.84-1.19) | **1.14 (1.05-1.24)** | **1.09 (1.02-1.18)** | 1.26 (0.92-1.73) | 0.90 (0.68-1.19) | 0.87 (0.69-1.09) | 0.97 (0.84-1.12) | 0.85 (0.70-1.02) | 0.87 (0.76-1.01) | **1.15 (1.03-1.29)** | 0.99 (0.91-1.08) | 1.03 (0.72-1.47) | 0.85 (0.65-1.13) |
| **U.S.-born (yes)** *(n=14,282)* | **1.31 (1.06-1.61)** | 1.06 (0.88-1.26) | **1.23 (1.12-1.35)** | **1.15 (1.06-1.24)** | 1.20 (0.86-1.68) | 0.91 (0.69-1.20) | 1.00 (0.79-1.27) | 1.00 (0.85-1.17) | 1.03 (0.84-1.27) | 0.92 (0.78-1.08) | **1.17 (1.04-1.31)** | 0.99 (0.90-1.09) | 1.06 (0.75-1.50) | 0.91 (0.69-1.22) |
| **U.S.-born (no)** *(n=15,818)* | 0.99 (0.73-1.34) | 0.80 (0.62-1.02) | 1.00 (0.89-1.12) | 0.96 (0.87-1.07) | 1.20 (0.82-1.76) | 0.92 (0.63-1.34) | **0.71 (0.52-0.96)** | 0.86 (0.71-1.05) | **0.62 (0.48-0.79)** | **0.80 (0.66-0.98)** | 1.07 (0.92-1.24) | 0.97 (0.87-1.08) | 0.80 (0.45-1.40) | **0.64 (0.42-0.99)** |
| **Puerto Rican** | | | | | | | | | | | | | | |
| **Overall** *(n=5,077)* | **1.84 (1.46-2.30)** | **1.64 (1.36-1.99)** | **1.39 (1.26-1.54)** | **1.29 (1.17-1.42)** | 1.27 (0.90-1.81) | 0.97 (0.71-1.33) | 1.13 (0.88-1.47) | **1.24 (1.05-1.47)** | 1.26 (0.99-1.60) | 1.04 (0.88-1.22) | 1.02 (0.88-1.18) | 1.08 (0.97-1.20) | **1.62 (1.11-2.37)** | 1.19 (0.92-1.56) |
| **U.S.-born (yes)** *(n=2,544)* | **1.83 (1.37-2.45)** | **1.79 (1.39-2.29)** | **1.43 (1.26-1.62)** | **1.32 (1.19-1.49)** | 1.63 (0.99-2.70) | 1.11 (0.74-1.66) | 1.05 (0.75-1.47) | **1.32 (1.07-1.62)** | 1.36 (1.00-1.85) | 1.08 (0.88-1.33) | 0.96 (0.80-1.16) | 1.12 (0.99-1.26) | **1.68 (1.08-2.63)** | 1.12 (0.81-1.55) |
| **U.S.-born (no)** *(n=2,533)* | **1.77 (1.31-2.37)** | **1.44 (1.15-1.81)** | **1.33 (1.17-1.51)** | **1.20 (1.07-1.35)** | 1.07 (0.70-1.65) | 0.92 (0.64-1.34) | 1.24 (0.91-1.68) | 1.20 (0.97-1.48) | 1.15 (0.85-1.55) | 1.02 (0.83-1.26) | 1.10 (0.91-1.33) | 1.02 (0.89-1.18) | **1.74 (1.06-2.83)** | 1.31 (0.95-1.81) |
| **Cuban** | | | | | | | | | | | | | | |
| **Overall** *(n=2,518)* | 1.01 (0.71-1.45) | 0.92 (0.68-1.26) | 0.95 (0.81-1.12) | 1.02 (0.88-1.17) | 0.81 (0.47-1.39) | **056 (0.35-0.91)** | 0.91 (0.65-1.36) | 0.96 (0.72-1.30) | 0.90 (0.66-1.22) | 0.97 (0.74-1.28) | 1.02 (0.83-1.24) | 1.07 (0.88-1.28) | 0.98 (0.57-1.70) | 1.13 (0.75-1.69) |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.93 (0.48-1.80) | 1.11 (0.71-1.74) | 1.12 (0.88-1.43) | 1.16 (0.93-1.44) | 0.59 (0.19-1.85) | 1.05 (0.43-2.52) | 1.14 (0.64-2.02) | 1.18 (0.76-1.83) | 1.28 (0.79-2.09) | 1.04 (0.63-1.73) | 0.98 (0.72-1.35) | 1.13 (0.86-1.49) | 0.85 (0.24-2.99) | **2.09 (1.08-4.01)** |
| **U.S.-born Cuban (no)** *(n=1,959)* | 1.04 (0.70-1.57) | 0.85 (0.59-1.22) | 0.89 (0.74-1.08) | 0.96 (0.81-1.13) | 0.85 (0.49-1.49) | **0.47 (0.27-0.80)** | 0.83 (0.52-1.32) | 0.86 (0.60-1.23) | 0.76 (0.54-1.07) | 0.94 (0.66-1.35) | 1.02 (0.81-1.29) | 1.05 (0.85-1.31) | 1.01 (0.55-1.85) | 0.87 (0.55-1.38) |
| **Dominican** | | | | | | | | | | | | | | |
| **Overall** *(n=1,658)* | 1.21 (0.81-1.78) | 1.07 (0.79-1.43) | 1.00 (0.83-1.21) | 1.03 (0.87-1.21) | 1.39 (0.81-2.40) | 0.61 (0.27-1.38) | 0.76 (0.47-1.23) | 0.97 (0.73-1.29) | 0.77 (0.47-1.27) | 0.99 (0.72-1.36) | 1.01 (0.80-1.26) | 0.98 (0.82-1.17) | 1.11 (0.54-2.29) | 0.94 (0.59-1.51) |
| **U.S.-born (yes)** *(n=264)* | 1.61 (0.78-3.30) | 1.15 (0.58-2.26) | 1.05 (0.73-1.52) | **1.42 (1.04-1.95)** | 1.40 (0.32-6.12) | 2.40 (0.83-6.95) | 1.06 (0.52-2.17) | 0.72 (0.40-1.31) | 1.30 (0.51-3.34) | 1.18 (0.64-2.18) | 1.10 (0.72-1.67) | 0.97 (0.68-1.37) | 1.88 (0.57-6.19) | 0.68 (0.23-1.98) |
| **U.S.-born (no)** *(n=1,394)* | 1.09 (0.72-1.64) | 1.04 (0.77-1.39) | 0.99 (0.81-1.21) | 0.92 (0.78-1.09) | 1.42 (0.79-2.54) | **0.34 (0.16-0.72)** | 0.67 (0.39-1.15) | 1.03 (0.76-1.40) | 0.65 (0.36-1.17) | 0.96 (0.68-1.35) | 0.99 (0.74-1.32) | 0.98 (0.81-1.19) | 0.96 (0.43-2.14) | 0.98 (0.58-1.65) |
| **Central/South American** | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overall** *(n=8,162)* | 1.12 (0.87-1.45) | 0.91 (0.76-1.10) | **1.17 (1.06-1.30)** | 1.02 (0.93-1.12) | 0.92 (0.56-1.51) | **0.68 (0.48-0.94)** | 0.86 (0.63-1.16) | 1.01 (0.83-1.24) | 0.77 (0.59-1.01) | 0.99 (0.81-1.21) | 1.02 (0.89-1.16) | 1.03 (0.93-1.14) | **0.62 (0.39-0.99)** | 0.73 (0.51-1.06) |
| **U.S.-born Central/South American (yes)** *(n=1,113)* | **1.62 (1.03-2.54)** | 1.26 (0.86-1.84) | **1.45 (1.21-1.74)** | 1.15 (0.95-1.38) | 0.76 (0.34-1.70) | 1.22 (0.64-2.30) | 1.01 (0.61-1.67) | **1.47 (1.09-1.99)** | 0.83 (0.51-1.36) | **1.43 (1.03-1.99)** | 1.05 (0.83-1.33) | 1.11 (0.93-1.31) | 1.56 (0.72-3.38) | 0.67 (0.31-1.45) |
| **U.S.-born Central/South American (no)** *(n=7,049)* | 1.02 (0.78-1.35) | 0.84 (0.69-1.04) | **1.13 (1.02-1.25)** | 0.99 (0.89-1.09) | 0.98 (0.58-1.67) | **0.65 (0.45-0.93)** | 0.79 (0.57-1.09) | 0.90 (0.72-1.11) | 0.77 (0.58-1.02) | 0.90 (0.74-1.11) | 1.00 (0.86-1.15) | 1.01 (0.91-1.12) | **0.48 (0.29-0.79)** | 0.74 (0.50-1.10) |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S8. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to foreign-born non-Hispanic Whites, Stratified by Age Group, National Health Interview Survey, 2004-2017 (N=56,372)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | | | | Sleep Quality in the Past Week | | | | | | | | | | | |
| | Very Short (≤5-hours) (n=4,115) | | | Short (<7-hours) (n=14,048) | | | Long (>9-hours) (n=1,586) | | | Trouble Falling Asleep (≥3 nights) (n=3,431) | | | Trouble Staying Asleep (≥3 nights) (n=3,520) | | | Non-restorative Sleep (≥3 days) (n=7,734) | | | Sleep Medication Use (≥3 nights) (n=1,073) | | |
| **Group *(n)*** | | | | | | | | | | | | | | | | | | | | | |
| **Age (years) Group** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Mexican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=30,100)* | 1.04 (0.76-1.44) | 1.26 (1.00-1.58) | 0.99 (0.83-1.19) | 1.15 (0.99-1.33) | **1.17 (1.08-1.28)** | 1.03 (0.94-1.13) | 1.51 (0.96-2.38) | 1.02 (0.65-1.61) | 0.79 (0.60-1.04) | 0.97 (0.71-1.32) | **0.81 (0.67-0.98)** | 1.01 (0.84-1.21) | 0.97 (0.67-1.40) | 0.82 (0.67-1.01) | 0.90 (0.78-1.04) | 1.09 (0.93-1.27) | 1.10 (0.99-1.21) | 1.04 (0.93-1.17) | 1.17 (0.59-2.32) | 0.81 (0.51-1.28) | 0.89 (0.70-1.15) |
| **U.S.-born (yes)** *(n=14,282)* | 1.12 (0.80-1.58) | **1.43 (1.14-1.81)** | 1.02 (0.86-1.21) | 1.19 (1.02-1.39) | **1.31 (1.20-1.43)** | 1.07 (0.97-1.17) | 1.45 (0.93-2.26) | 1.06 (0.64-1.75) | 0.81 (0.61-1.07) | 1.07 (0.77-1.48) | 0.93 (0.75-1.15) | 1.02 (0.84-1.25) | 1.08 (0.73-1.60) | 0.94 (0.75-1.17) | 0.98 (0.84-1.16) | 1.06 (0.90-1.24) | 1.13 (1.01-1.26) | 1.04 (0.92-1.18) | 1.44 (0.70-2.95) | 1.02 (0.63-1.63) | 0.85 (0.66-1.11) |
| **U.S.-born (no)** *(n=15,818)* | 0.84 (0.54-1.29) | 0.97 (0.72-1.30) | 0.87 (0.64-1.17) | 0.96 (0.77-1.20) | 1.03 (0.92-1.16) | 0.94 (0.83-1.07) | 1.67 (0.99-2.82) | 1.04 (0.62-1.74) | **0.67 (0.47-0.94)** | 0.76 (0.53-1.10) | **0.71 (0.54-0.92)** | 0.91 (0.72-1.15) | 0.85 (0.54-1.32) | **0.65 (0.50-0.85)** | **0.76 (0.62-0.93)** | 1.12 (0.92-1.37) | 1.01 (0.89-1.15) | 1.01 (0.87-1.19) | NE | **0.41 (0.22-0.76)** | 0.91 (0.60-1.39) |
| **Puerto Rican** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=5,077)* | **1.87 (1.24-2.81)** | **1.92 (1.49-2.47)** | **1.58 (1.32-1.90)** | **1.44 (1.20-1.73)** | **1.37 (1.22-1.53)** | **1.27 (1.15-1.40)** | 1.67 (0.92-3.02) | 1.30 (0.78-2.14) | 0.80 (0.59-1.09) | 1.01 (0.71-1.45) | 1.07 (0.82-1.39) | **1.45 (1.18-1.78)** | 1.05 (0.67-1.64) | 1.21 (0.92-1.58) | 1.14 (0.95-1.37) | 1.03 (0.85-1.25) | 1.07 (0.92-1.25) | 1.13 (0.98-1.32) | 1.61 (0.87-2.96) | 1.20 (0.78-1.86) | 1.30 (1.00-1.68) |
| **U.S.-born (yes)** *(n=2,544)* | **1.88 (1.22-2.90)** | **2.08 (1.59-2.72)** | **1.56 (1.14-2.13)** | **1.40 (1.15-1.70)** | **1.43 (1.27-1.62)** | **1.27 (1.08-1.49)** | 1.71 (0.91-3.19) | 1.51 (0.85-2.68) | 0.58 (0.31-1.07) | 1.11 (0.76-1.63) | 1.01 (0.75-1.35) | **1.61 (1.23-2.11)** | 1.02 (0.62-1.67) | 1.28 (0.94-1.75) | 1.25 (0.95-1.65) | 1.06 (0.87-1.29) | 1.07 (0.90-1.27) | 1.17 (0.97-1.42) | 1.33 (0.66-2.69) | 0.99 (0.65-1.51) | 1.34 (0.95-1.91) |
| **U.S.-born (no)** *(n=2,533)* | 1.69 (0.99-2.88) | **1.51 (1.04-2.20)** | **1.61 (1.31-1.97)** | **1.38 (1.05-1.79)** | **1.20 (1.02-1.42)** | **1.27 (1.14-1.42)** | 0.77 (0.37-1.58) | 1.25 (0.68-2.32) | 0.87 (0.63-1.21) | 0.87 (0.49-1.53) | 1.22 (0.87-1.71) | **1.40 (1.11-1.78)** | 1.17 (0.62-2.22) | 1.08 (0.76-1.53) | 1.09 (0.88-1.33) | 1.01 (0.75-1.37) | 1.08 (0.89-1.32) | 1.12 (0.94-1.33) | NE | 1.59 (0.90-2.84) | 1.27 (0.93-1.73) |
| **Cuban** | | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=2,518)* | 0.77 (0.37-1.58) | 0.99 (0.67-1.47) | 1.02 (0.74-1.40) | 0.77 (0.56-1.04) | 1.01 (0.84-1.21) | 1.03 (0.90-1.19) | NE | 0.92 (0.42-2.03) | **0.55 (0.37-0.81)** | **0.42 (0.21-0.85)** | 1.00 (0.67-1.51) | 1.10 (0.81-1.50) | 0.58 (0.26-1.31) | 1.05 (0.75-1.47) | 0.98 (0.76-1.27) | 0.99 (0.73-1.34) | 0.97 (0.80-1.18) | 1.11 (0.91-1.34) | NE | 1.58 (0.77-3.23) | 1.06 (0.71-1.58) |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.70 (0.34-1.44) | 1.11 (0.61-2.00) | 1.45 (0.81-2.59) | 0.97 (0.71-1.33) | 1.28 (1.03-1.58) | 0.97 (0.64-1.48) | NE | 0.59 (0.14-2.51) | 0.16 (0.02-1.23) | 0.73 (0.38-1.40) | 1.39 (0.85-2.27) | 1.64 (0.88-3.08) | 0.90 (0.42-1.91) | 1.37 (0.84-2.22) | 1.27 (0.76-2.11) | 1.08 (0.78-1.50) | 1.05 (0.79-1.38) | 0.98 (0.57-1.68) | NE | 2.92 (1.39-6.12) | 0.75 (0.31-1.83) |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.80 (0.28-2.27) | 0.94 (0.60-1.49) | 0.97 (0.69-1.37) | **0.49 (0.29-0.82)** | 0.88 (0.68-1.13) | 1.04 (0.90-1.20) | NE | 1.06 (0.43-2.64) | **0.57 (0.39-0.84)** | **0.08 (0.01-0.61)** | 0.79 (0.44-1.39) | 1.04 (0.76-1.43) | **0.15 (0.03-0.72)** | 0.89 (0.55-1.44) | 0.95 (0.71-1.27) | 0.87 (0.55-1.36) | 0.93 (0.74-1.18) | 1.14 (0.93-1.40) | NE | 0.75 (0.25-2.23) | 1.10 (0.72-1.69) |
| **Dominican** | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=1,658)* | 0.81 (0.44-1.48) | 1.18 (0.77-1.79) | 1.29 (0.98-1.70) | 0.96 (0.69-1.34) | 1.08 (0.89-1.32) | 1.02 (0.87-1.21) | NE | 0.92 (0.36-2.39) | **0.41 (0.19-0.85)** | 0.80 (0.46-1.39) | 0.92 (0.58-1.44) | 1.00 (0.72-1.39) | 1.22 (0.63-2.35) | 0.74 (0.44-1.24) | 1.00 (0.72-1.39) | 0.96 (0.72-1.29) | 0.86 (0.68-1.08) | 1.25 (1.01-1.56) | NE | 0.58 (0.28-1.23) | 1.33 (0.79-2.23) |
| **U.S.-born (yes)** *(n=264)* | 0.80 (0.35-1.84) | **2.84 (1.64-4.93)** | 1.80 (0.42-7.78) | 0.98 (0.65-1.49) | 1.70 (1.34-2.16) | 0.97 (0.43-2.17) | NE | 4.28 (1.23-14.91) | NE | 0.81 (0.41-1.63) | 1.09 (0.52-2.33) | 0.91 (0.14-6.03) | 1.22 (0.62-2.39) | 1.53 (0.77-3.03) | 0.60 (0.84-4.34) | 0.93 (0.64-1.37) | 1.11 (0.79-1.57) | 1.74 (0.73-4.13) | NE | 2.01 (0.76-5.34) | 0.69 (0.08-6.05) |
| **U.S.-born (no)** *(n=1,394)* | 0.78 (0.40-1.54) | 0.95 (0.59-1.51) | 1.28 (0.97-1.68) | 0.86 (0.57-1.29) | 0.96 (0.76-1.21) | 1.03 (0.87-1.21) | NE | 0.59 (0.20-1.76) | **0.43 (0.20-0.90)** | 0.77 (0.37-1.63) | 0.86 (0.53-1.39) | 1.00 (0.72-1.39) | 1.16 (0.41-3.31) | 0.60 (0.34-1.06) | 1.01 (0.73-1.41) | 1.04 (0.70-1.54) | 0.80 (0.62-1.04) | 1.24 (0.98-1.57) | NE | **0.31 (0.13-0.73)** | 1.36 (0.80-2.30) |
| **Central/South American** | | | | | | | | | | | | | | | | | | | | |
| **Overall** *(n=8,162)* | 1.02 (0.69-1.51) | 1.12 (0.87-1.46) | 0.88 (0.71-1.10) | 1.13 (0.94-1.36) | **1.17 (1.06-1.29)** | 0.98 (0.89-1.10) | 1.44 (0.84-2.46) | 0.91 (0.54-1.54) | **0.42 (0.26-0.67)** | 0.83 (0.59-1.17) | 1.04 (0.78-1.39) | 0.94 (0.75-1.17) | 1.07 (0.72-1.59) | 0.84 (0.65-1.09) | 0.83 (0.67-1.02) | 1.06 (0.89-1.25) | 1.03 (0.92-1.15) | 1.02 (0.88-1.18) | NE | 0.65 (0.38-1.12) | **0.65 (0.46-0.90)** |
| **U.S.-born Central/South American (yes)** *(n=1,113)* | 1.25 (0.79-1.98) | **1.80 (1.22-2.65)** | 0.86 (0.37-1.97) | **1.28 (1.03-1.59)** | **1.33 (1.11-1.58)** | 0.96 (0.62-1.49) | 1.22 (0.67-2.23) | 1.14 (0.38-3.41) | 0.28 (0.06-1.27) | 1.04 (0.71-1.52) | 1.40 (0.97-2.04) | 1.65 (1.03-2.64) | 1.21 (0.77-1.90) | 0.99 (0.68-1.44) | 1.10 (0.65-1.87) | 1.08 (0.90-1.31) | 1.10 (0.90-1.33) | 0.81 (0.47-1.40) | NE | **0.31 (0.13-0.69)** | 1.79 (0.86-3.70) |
| **U.S.-born Central/South American (no)** *(n=7,049)* | 0.89 (0.57-1.40) | 1.00 (0.75-1.33) | 0.88 (0.71-1.10) | 1.02 (0.82-1.26) | **1.14 (1.02-1.27)** | 0.98 (0.88-1.09) | NE | 0.92 (0.53-1.61) | **0.42 (0.26-0.68)** | 0.67 (0.44-1.03) | 0.94 (0.68-1.32) | 0.90 (0.71-1.13) | 0.95 (0.59-1.52) | 0.83 (0.62-1.11) | 0.81 (0.65-1.01) | 1.00 (0.81-1.24) | 1.01 (0.90-1.13) | 1.03 (0.89-1.19) | NE | 0.75 (0.41-1.38) | **0.60 (0.42-0.84)** |

Abbreviations: ref (reference)

Adjusted for sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S9. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to US-born non-Hispanic Whites by Language Acculturation Status*, Stratified by Sex/Gender, National Health Interview Survey, 2004-2017 (N=245,812)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | Sleep Quality in the Past Week | | | | | | | |
| | Very Short (≤5-hours) (n=17,112) | | Short (<7-hours) (n=61,091) | | Long (>9-hours) (n=7,604) | | Trouble Falling Asleep (≥3 nights) (n=18,607) | | Trouble Staying Asleep (≥3 nights) (n=26,493) | | Non-restorative Sleep (≥3 days) (n=38,369) | | Sleep Medication Use (≥3 nights) (n=10,024) | |
| **Group *(n)*** | | | | | | | | | | | | | | |
| **Sex/Gender** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** | **Men** | **Women** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref | ref |
| **Mexican** | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=14,282)* | 1.02 (0.91-1.14) | 1.05 (0.96-1.15) | 1.01 (0.96-1.07) | **1.07 (1.03-1.12)** | 1.09 (0.91-1.31) | 0.88 (0.75-1.03) | **0.92 (0.85-0.99)** | 0.92 (0.84-1.00) | **0.80 (0.74-0.86)** | **0.77 (0.71-0.85)** | 0.97 (0.93-1.01) | 0.95 (0.90-1.00) | **0.66 (0.58-0.76)** | **0.59 (0.50-0.70)** |
| **High Acculturation** (n=13,075) | 1.05 (0.93-1.19) | 1.08 (0.98-1.19) | 1.04 (0.98-1.10) | **1.09 (1.05-1.14)** | 1.12 (0.93-1.36) | 0.86 (0.74-1.01) | 0.94 (0.84-1.06) | 0.95 (0.87-1.03) | **0.86 (0.76-0.97)** | **0.80 (0.73-0.88)** | 1.01 (0.95-1.08) | 0.97 (0.92-1.02) | **0.78 (0.62-0.99)** | **0.63 (0.53-0.75)** |
| **Medium/Low Acculturation** (n=1,188) | 0.75 (0.56-1.01) | 0.79 (0.58-1.09) | **0.71 (0.60-0.85)** | 0.84 (0.70-1.00) | 0.89 (0.58-1.38) | 0.97 (0.60-1.59) | 0.63 (0.40-1.00) | **0.59 (0.43-0.83)** | **0.46 (0.28-0.74)** | **0.43 (0.29-0.64)** | 0.82 (0.64-1.04) | **0.75 (0.61-0.92)** | 0.56 (0.29-1.08) | **0.15 (0.06-0.40)** |
| **U.S.-born (no)** *(n=15,818)* | **0.47 (0.40-0.54)** | **0.60 (0.52-0.69)** | **0.66 (0.62-0.70)** | **0.77 (0.71-0.82)** | **0.83 (0.70-0.99)** | **0.65 (0.54-0.78)** | **0.60 (0.55-0.66)** | **0.64 (0.58-0.71)** | **0.51 (0.46-0.55)** | **0.55 (0.49-0.62)** | **0.82 (0.77-0.86)** | **0.85 (0.80-0.90)** | **0.36 (0.30-0.44)** | **0.34 (0.27-0.42)** |
| **High Acculturation** (n=6,141) | **0.59 (0.50-0.70)** | **0.69 (0.58-0.83)** | **0.76 (0.71-0.82)** | **0.81 (0.74-0.88)** | 0.88 (0.68-1.14) | **0.69 (0.52-0.91)** | **0.57 (0.46-0.69)** | **0.70 (0.61-0.81)** | **0.47 (0.39-0.58)** | **0.59 (0.50-0.69)** | **0.83 (0.75-0.92)** | **0.90 (0.83-0.98)** | **0.30 (0.19-0.47)** | **0.40 (0.29-0.57)** |
| **Medium/Low Acculturation** (n=9,666) | **0.38 (0.31-0.46)** | **0.54 (0.45-0.64)** | **0.57 (0.53-0.62)** | **0.73 (0.66-0.80)** | 0.81 (0.66-1.00) | **0.61 (0.49-0.75)** | **0.53 (0.43-0.66)** | **0.58 (0.50-0.67)** | **0.44 (0.36-0.53)** | **0.52 (0.44-0.60)** | **0.71 (0.64-0.79)** | **0.78 (0.72-0.85)** | **0.45 (0.31-0.67)** | **0.29 (0.21-0.39)** |
| **Puerto Rican** | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=2,544)* | **1.33 (1.08-1.63)** | **1.53 (1.30-1.81)** | **1.21 (1.11-1.33)** | **1.24 (1.15-1.35)** | 1.26 (0.89-1.77) | 0.94 (0.66-1.33) | 1.04 (0.90-1.21) | 1.14 (0.98-1.33) | 0.97 (0.85-1.11) | 0.91 (0.78-1.05) | 1.00 (0.92-1.09) | **1.10 (1.01-1.20)** | 0.96 (0.76-1.19) | 0.97 (0.73-1.30) |
| **High Acculturation** (n=2,359) | **1.36 (1.11-1.68)** | **1.59 (1.34-1.89)** | **1.22 (1.11-1.34)** | **1.26 (1.16-1.37)** | 1.32 (0.93-1.86) | 0.98 (0.68-1.40) | 0.93 (0.72-1.21) | 1.17 (1.00-1.38) | 1.08 (0.84-1.39) | 0.92 (0.79-1.07) | 0.92 (0.79-1.06) | **1.11 (1.02-1.22)** | 1.00 (0.69-1.44) | 1.00 (0.74-1.35) |
| **Medium/Low Acculturation** (n=184) | 0.79 (0.36-1.74) | 0.89 (0.56-1.42) | 1.17 (0.83-1.65) | 1.01 (0.73-1.40) | 0.48 (0.10-2.30) | 0.51 (0.19-1.31) | 0.72 (0.32-1.66) | 0.61 (0.32-1.16) | 0.74 (0.35-1.54) | 0.75 (0.39-1.44) | **0.36 (0.16-0.81)** | 0.87 (0.55-1.39) | 0.52 (0.10-2.77) | 0.60 (0.17-2.10) |
| **U.S.-born (no)** *(n=2,533)* | **1.29 (1.03-1.61)** | **1.36 (1.17-1.58)** | **1.15 (1.04-1.27)** | **1.16 (1.06-1.26)** | 0.89 (0.63-1.26) | 0.96 (0.72-1.28) | 1.05 (0.91-1.21) | 1.01 (0.86-1.18) | 0.84 (0.73-0.97) | **0.82 (0.70-0.97)** | 0.95 (0.86-1.04) | 0.96 (0.85-1.08) | 1.01 (0.83-1.24) | 1.08 (0.86-1.35) |
| **High Acculturation** (n=1,773) | **1.48 (1.16-1.90)** | **1.37 (1.14-1.64)** | 1.14 (1.00-1.30) | **1.20 (1.09-1.33)** | 1.06 (0.72-1.57) | 0.97 (0.69-1.37) | 1.14 (0.85-1.52) | 1.06 (0.88-1.28) | 0.98 (0.76-1.26) | 0.87 (0.72-1.05) | 1.02 (0.88-1.20) | 1.00 (0.87-1.14) | 0.97 (0.62-1.52) | 1.14 (0.88-1.48) |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Medium/Low Acculturation** (n=755) | 0.81 (0.48-1.37) | **1.32 (1.07-1.64)** | 1.15 (0.95-1.40) | 1.05 (0.91-1.22) | 0.57 (0.30-1.07) | 0.96 (0.60-1.53) | 1.16 (0.76-1.77) | 0.86 (0.64-1.16) | **0.60 (0.38-0.95)** | **0.69 (0.50-0.95)** | 0.73 (0.53-1.01) | 0.84 (0.69-1.02) | 0.87 (0.41-1.86) | 0.92 (0.63-1.36) |
| **Cuban** | | | | | | | | | | | | | | |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.78 (0.44-1.39) | 1.08 (0.74-1.58) | 1.01 (0.81-1.25) | 1.08 (0.89-1.31) | 0.49 (0.18-1.29) | 0.95 (0.39-2.31) | 0.95 (0.70-1.28) | 0.96 (0.66-1.39) | 0.92 (0.69-1.23) | 0.83 (0.53-1.31) | 0.96 (0.80-1.16) | 1.07 (0.86-1.34) | 0.95 (0.54-1.66) | 1.37 (0.78-2.42) |
| **High Acculturation** (n=440) | 0.89 (0.49-1.62) | 1.16 (0.79-1.71) | 1.08 (0.86-1.35) | 1.05 (0.85-1.30) | **0.29 (0.09-0.96)** | 1.06 (0.38-2.97) | 1.34 (0.85-2.10) | 1.17 (0.82-1.67) | 1.24 (0.82-1.88) | 0.84 (0.54-1.29) | 0.93 (0.68-1.28) | 1.03 (0.78-1.36) | 0.53 (0.17-1.64) | 1.30 (0.71-2.38) |
| **Medium/Low Acculturation** (n=119) | 0.37 (0.11-1.22) | 0.72 (0.21-2.46) | 0.69 (0.40-1.20) | 1.21 (0.71-2.06) | 0.88 (0.20-3.91) | 0.63 (0.16-2.51) | NE | 0.27 (0.06-1.23) | 0.28 (0.06-1.40) | 0.82 (0.29-2.28) | 0.76 (0.38-1.51) | 1.21 (0.90-1.62) | 0.25 (0.03-1.90) | 1.65 (0.39-6.94) |
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.75 (0.56-1.00) | 0.90 (0.69-1.18) | **0.78 (0.67-0.91)** | 0.94 (0.82-1.07) | 0.78 (0.57-1.05) | **0.55 (0.35-0.87)** | **0.69 (0.52-0.92)** | **0.71 (0.52-0.98)** | **0.61 (0.48-0.78)** | **0.68 (0.50-0.94)** | **0.87 (0.77-0.97)** | 0.95 (0.80-1.13) | **0.59 (0.42-0.83)** | **0.60 (0.40-0.89)** |
| **High Acculturation** (n=571) | 0.90 (0.54-1.51) | 1.13 (0.70-1.82) | 0.91 (0.68-1.22) | 1.09 (0.89-1.34) | 0.87 (0.48-1.58) | 0.63 (0.30-1.34) | 1.08 (0.64-1.82) | 1.04 (0.68-1.59) | **0.58 (0.36-0.91)** | 0.95 (0.62-1.46) | 0.75 (0.53-1.04) | 0.89 (0.65-1.23) | 0.93 (0.43-2.01) | 0.61 (0.30-1.25) |
| **Medium/Low Acculturation** (n=1,386) | **0.68 (0.50-0.93)** | 0.82 (0.58-1.16) | **0.71 (0.61-0.84)** | 0.87 (0.74-1.03) | 0.71 (0.49-1.01) | **0.53 (0.30-0.94)** | **0.52 (0.31-0.89)** | **0.64 (0.42-0.95)** | **0.56 (0.39-0.80)** | **0.61 (0.40-0.92)** | 0.84 (0.68-1.04) | 1.00 (0.84-1.21) | **0.46 (0.26-0.80)** | **0.60 (0.37-0.98)** |
| **Dominican** | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=264)* | 1.13 (0.60-2.11) | 1.02 (0.58-1.79) | 0.86 (0.60-1.23) | 1.32 (0.98-1.77) | 0.96 (0.30-3.07) | 1.35 (0.48-3.80) | 0.73 (0.48-1.12) | 0.62 (0.36-1.07) | 0.97 (0.65-1.44) | 0.91 (0.53-1.57) | 0.99 (0.78-1.26) | 0.93 (0.68-1.29) | 0.64 (0.31-1.30) | 0.57 (0.23-1.43) |
| **High Acculturation** (n=208) | 1.30 (0.67-2.55) | 1.00 (0.54-1.08) | 0.94 (0.64-1.38) | 1.38 (1.00-1.90) | 1.32 (0.40-4.36) | 1.36 (0.42-4.40) | 1.01 (0.58-1.76) | 0.62 (0.34-1.15) | 1.12 (0.47-2.67) | 0.79 (0.41-1.50) | 1.10 (0.76-1.60) | 0.90 (0.63-1.30) | 0.80 (0.26-2.47) | 0.56 (0.20-1.56) |
| **Medium/Low Acculturation** (n=56) | 0.63 (0.12-3.25) | 1.11 (0.34-3.57) | 0.58 (0.23-1.47) | 1.05 (0.56-1.97) | 0.23 (0.03-1.74) | 1.30 (0.19-8.81) | NE | 0.62 (0.22-1.79) | NE | 1.42 (0.69-2.94) | 0.47 (0.11-1.96) | 1.06 (0.61-1.84) | NE | 0.62 (0.08-4.72) |
| **U.S.-born (no)** *(n=1,394)* | 0.74 (0.52-1.04) | 0.95 (0.78-1.15) | 0.82 (0.69-0.97) | 0.92 (0.81-1.04) | 1.08 (0.63-1.85) | **0.29 (0.15-0.53)** | **0.78 (0.63-0.97)** | 0.88 (0.69-1.12) | **0.62 (0.49-0.80)** | **0.74 (0.57-0.97)** | 0.92 (0.79-1.08) | 0.96 (0.83-1.13) | 0.86 (0.55-1.34) | 1.00 (0.61-1.63) |
| **High Acculturation** (n=594) | 0.89 (0.56-1.39) | 0.88 (0.63-1.24) | 0.94 (0.75-1.18) | 0.92 (0.76-1.11) | 1.51 (0.67-3.40) | **0.15 (0.06-0.35)** | 0.79 (0.44-1.40) | 0.81 (0.54-1.22) | 0.62 (0.31-1.21) | 0.73 (0.48-1.11) | 0.72 (0.51-1.00) | 0.96 (0.75-1.23) | 0.67 (0.21-2.10) | 0.85 (0.43-1.70) |
| **Medium/Low Acculturation** (n=800) | 0.63 (0.38-1.03) | 0.98 (0.76-1.26) | **0.72 (0.55-0.93)** | 0.91 (0.79-1.06) | 0.90 (0.41-1.94) | **0.36 (0.17-0.74)** | **0.34 (0.18-0.65)** | 0.94 (0.71-1.25) | **0.22 (0.11-0.44)** | 0.76 (0.56-1.03) | 0.96 (0.67-1.37) | 0.97 (0.78-1.21) | 0.38 (0.12-1.13) | 1.13 (0.60-2.11) |
| **Central/South American** | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=1,113)* | 1.31 (0.92-1.87) | 1.31 (0.96-1.77) | 1.25 (1.08-1.45) | 1.10 (0.92-1.30) | 0.64 (0.35-1.16) | 0.95 (0.52-1.74) | 1.21 (0.96-1.53) | **1.40 (1.06-1.86)** | 0.97 (0.73-1.30) | 1.13 (0.80-1.61) | 1.05 (0.92-1.20) | 1.13 (0.97-1.32) | 0.64 (0.38-1.10) | **0.47 (0.24-0.94)** |
| **High Acculturation** (n=994) | 1.40 (0.97-2.04) | **1.42 (1.04-1.94)** | **1.30 (1.11-1.51)** | 1.15 (0.97-1.36) | 0.48 (0.22-1.07) | 1.03 (0.53-2.00) | 0.97 (0.64-1.47) | **1.30 (1.04-1.63)** | 0.71 (0.46-1.10) | 1.06 (0.82-1.37) | 0.99 (0.80-1.23) | 1.14 (1.00-1.30) | 1.01 (0.45-2.27) | 0.44 (0.21-0.90) |
| **Medium/Low Acculturation** | 0.73 (0.29-1.83) | 0.61 (0.22-1.69) | 0.92 (0.51-1.64) | 0.74 (0.36-1.52) | 1.26 (0.51-3.12) | 0.52 (0.11-2.62) | 0.86 (0.27-2.75) | 1.90 (0.87-4.12) | 0.89 (0.24-3.25) | 1.50 (0.48-4.75) | 0.60 (0.28-1.32) | 1.07 (0.61-1.87) | 0.43 (0.06-3.19) | 0.66 (0.11-3.91) |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (n=119) | | | | | | | | | | | | | | |
| **U.S.-born (no)** *(n=7,049)* | **0.64 (0.54-0.76)** | **0.80 (0.70-0.93)** | **0.88 (0.82-0.94)** | **0.92 (0.85-0.98)** | **0.66 (0.47-0.94)** | **0.67 (0.52-0.87)** | **0.69 (0.60-0.78)** | **0.71 (0.61-0.83)** | **0.60 (0.53-0.68)** | **0.66 (0.57-0.77)** | **0.85 (0.80-0.91)** | **0.92 (0.85-0.99)** | **0.40 (0.31-0.51)** | **0.46 (0.34-0.62)** |
| **High Acculturation** (n=3,366) | **0.72 (0.57-0.91)** | **0.79 (0.63-0.98)** | 0.94 (0.85-1.04) | 0.91 (0.82-1.02) | 0.77 (0.50-1.17) | 0.76 (0.53-1.11) | **0.66 (0.50-0.88)** | **0.80 (0.64-0.98** | **0.57 (0.42-0.76)** | **0.74 (0.61-0.89)** | **0.75 (0.65-0.86)** | 0.96 (0.87-1.06) | **0.38 (0.22-0.67)** | **0.52 (0.36-0.76)** |
| **Medium/Low Acculturation** (n=3,664) | **0.56 (0.45-0.72)** | **0.82 (0.68-0.98)** | **0.80 (0.72-0.89)** | 0.92 (0.84-1.00) | **0.58 (0.34-0.98)** | **0.59 (0.42-0.84)** | **0.60 (0.43-0.84)** | **0.63 (0.51-0.79)** | **0.44 (0.32-0.61)** | **0.59 (0.47-0.74)** | **0.80 (0.67-0.94)** | **0.87 (0.77-0.97)** | **0.19 (0.09-0.38)** | **0.40 (0.26-0.63)** |

Abbreviations: ref (reference); NE (non-estimable)

* Language acculturation categories include high (English only interview) and medium/low (English and Spanish interview or Spanish only interview).

Adjusted for age (18-30, 31-49, 50-64, 65+ years), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S10. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for Hispanic/Latino Heritage Groups compared to non-Hispanic Whites by Language Acculturation Status*, Stratified by Age Group, National Health Interview Survey, 2004-2017 (N=245,812)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | | | | | | | Sleep Quality in the Past Week | | | | | | | | | | | |
| | Very Short (≤5-hours) (n=17,112) | | | Short (<7-hours) (n=61,091) | | | Long (>9-hours) (n=7,604) | | | Trouble Falling Asleep (≥3 nights) (n=18,607) | | | Trouble Staying Asleep (≥3 nights) (n=26,493) | | | Non-restorative Sleep (≥3 days) (n=38,369) | | | Sleep Medication Use (≥3 nights) (n=10,024) | | |
| **Group *(n)*** | | | | | | | | | | | | | | | | | | | | | |
| **Age (years) Group** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** | **18-30** | **31-49** | **50+** |
| **U.S.-born Non-Hispanic White** *(n=198,297)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Mexican** | | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=14,282)* | 1.03 (0.90-1.18) | 1.03 (0.91-1.15) | **1.14 (1.01-1.27)** | 1.00 (0.93-1.06) | **1.09 (1.03-1.15)** | 1.06 (0.99-1.13) | 1.04 (0.85-1.26) | 0.85 (0.67-1.09) | 0.96 (0.81-1.13) | 0.96 (0.89-1.03) | **0.81 (0.73-0.91)** | 1.01 (0.90-1.15) | **0.77 (0.71-0.82)** | **0.73 (0.65-0.82)** | **0.84 (0.75-0.95)** | 1.02 (0.98-1.06) | 0.96 (0.91-1.03) | 1.00 (0.92-1.09) | **0.61 (0.53-0.70)** | **0.64 (0.51-0.80)** | **0.64 (0.54-0.76)** |
| **High Acculturation** (n=13,075) | 1.07 (0.93-1.23) | 1.03 (0.92-1.16) | **1.18 (1.05-1.33)** | 1.04 (0.97-1.11) | **1.09 (1.04-1.15)** | **1.09 (1.02-1.17)** | 1.03 (0.84-1.27) | 0.86 (0.67-1.10) | 0.98 (0.82-1.17) | 1.02 (0.89-1.17) | **0.83 (0.74-0.94)** | 1.03 (0.91-1.17) | 0.89 (0.76-1.04) | **0.76 (0.67-0.85)** | **0.87 (0.77-0.97)** | 1.02 (0.94-1.09) | 0.97 (0.91-1.03) | 1.03 (0.94-1.13) | 0.87 (0.60-1.25) | **0.65 (0.52-0.83)** | **0.65 (0.54-0.77)** |
| **Medium/Low Acculturation** (n=1,188) | 0.77 (0.54-1.10) | 0.95 (0.67-1.35) | 0.69 (0.42-1.14) | **0.72 (0.59-0.88)** | 1.00 (0.83-1.21) | **0.64 (0.49-0.86)** | 1.00 (0.62-1.60) | 0.79 (0.30-2.11) | 0.83 (0.59-1.15) | **0.64 (0.41-0.99)** | **0.49 (0.28-0.88)** | 0.78 (0.51-1.18) | **0.47 (0.27-0.81)** | **0.31 (0.16-0.59)** | **0.57 (0.38-0.84)** | 0.82 (0.67-1.01) | 0.88 (0.71-1.09) | **0.61 (0.41-0.89)** | **0.08 (0.01-0.60)** | 0.38 (0.12-1.19) | 0.58 (0.30-1.10) |
| **U.S.-born (no)** *(n=15,818)* | **0.43 (0.34-0.54)** | **0.48 (0.41-0.55)** | **0.82 (0.68-0.98)** | **0.67 (0.61-0.74)** | **0.69 (0.65-0.74)** | **0.86 (0.79-0.93)** | 0.81 (0.62-1.06) | **0.65 (0.51-0.82)** | **0.76 (0.63-0.92)** | **0.63 (0.58-0.69)** | **0.54 (0.46-0.62)** | **0.80 (0.69-0.93)** | **0.51 (0.47-0.56)** | **0.46 (0.40-0.52)** | **0.57 (0.50-0.65)** | **0.86 (0.82-0.91)** | **0.79 (0.74-0.85)** | **0.85 (0.77-0.94)** | **0.36 (0.29-0.43)** | **0.22 (0.15-0.32)** | **0.57 (0.44-0.75)** |
| **High Acculturation** (n=6,141) | **0.62 (0.48-0.81)** | **0.55 (0.46-0.65)** | 0.98 (0.76-1.25) | **0.79 (0.70-0.90)** | **0.76 (0.70-0.81)** | 0.92 (0.82-1.03) | 0.80 (0.57-1.13) | **0.65 (0.46-0.92)** | 0.91 (0.66-1.25) | **0.63 (0.50-0.80)** | **0.57 (0.47-0.69)** | 0.86 (0.69-1.08) | **0.68 (0.52-0.90)** | **0.48 (0.40-0.57)** | **0.57 (0.46-0.69)** | 1.06 (0.94-1.20) | **0.83 (0.76-0.90)** | 0.86 (0.74-1.00) | **0.22 (0.08-0.60)** | **0.26 (0.17-0.41)** | **0.58 (0.40-0.84)** |
| **Medium/Low Acculturation** (n=9,666) | **0.29 (0.20-0.41)** | **0.41 (0.34-0.49)** | **0.74 (0.58-0.94)** | **0.56 (0.48-0.65)** | **0.62 (0.56-0.68)** | **0.82 (0.74-0.91)** | 0.80 (0.58-1.10) | **0.64 (0.49-0.83)** | **0.69 (0.55-0.87)** | **0.45 (0.32-0.64)** | **0.50 (0.41-0.60)** | **0.77 (0.64-0.93)** | **0.46 (0.32-0.68)** | **0.44 (0.37-0.52)** | **0.57 (0.48-0.67)** | **0.79 (0.66-0.96)** | **0.75 (0.68-0.82)** | **0.84 (0.74-0.95)** | 0.27 (0.07-1.02) | **0.19 (0.12-0.31)** | **0.56 (0.40-0.80)** |
| **Puerto Rican** | | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=2,544)* | **1.53 (1.19-1.96)** | **1.47 (1.24-1.74)** | **1.55 (1.17-2.06)** | **1.26 (1.12-1.42)** | **1.25 (1.15-1.36)** | **1.28 (1.11-1.48)** | 1.36 (0.97-1.91) | 1.00 (0.66-1.54) | 0.64 (0.35-1.19) | 1.14 (0.99-1.31) | 0.93 (0.75-1.14) | **1.49 (1.20-1.86)** | 0.98 (0.85-1.12) | 1.02 (0.82-1.25) | 1.01 (0.79-1.28) | 1.08 (0.99-1.18) | 0.99 (0.87-1.12) | 1.11 (0.94-1.31) | 0.93 (0.74-1.17) | 0.79 (0.52-1.19) | 1.25 (0.92-1.69) |
| **High Acculturation** (n=2,359) | **1.50 (1.17-1.94)** | **1.52 (1.28-1.81)** | **1.71 (1.28-2.30)** | **1.25 (1.10-1.42)** | **1.25 (1.14-1.36)** | **1.35 (1.17-1.55)** | 1.40 (0.99-1.97) | 1.03 (0.66-1.61) | 0.73 (0.40-1.34) | 1.02 (0.78-1.33) | 0.94 (0.75-1.17) | **1.58 (1.27-1.97)** | 0.89 (0.62-1.28) | 1.01 (0.81-1.26) | 1.07 (0.84-1.36) | 1.04 (0.91-1.20) | 1.01 (0.89-1.14) | 1.17 (0.99-1.38) | 0.81 (0.41-1.60) | 0.81 (0.53-1.23) | 1.32 (0.97-1.78) |
| **Medium/Low Acculturation** (n=184) | **1.88 (1.07-3.31)** | 0.64 (0.27-1.51) | 0.55 (0.25-1.18) | 1.38 (0.93-2.05) | 1.25 (0.93-1.68) | 0.71 (0.34-1.47) | 0.78 (0.24-2.52) | 0.75 (0.25-2.24) | NE | NE | 0.73 (0.36-1.49) | 0.80 (0.35-1.84) | 0.44 (0.06-3.38) | 1.08 (0.58-2.01) | 0.54 (0.23-1.23) | 0.36 (0.07-1.79) | 0.68 (0.38-1.23) | 0.67 (0.33-1.38) | NE | 0.45 (0.09-2.24) | 0.67 (0.18-2.52) |
| **U.S.-born (no)** | 1.27 | 1.08 | **1.56** | **1.23** | 1.01 | **1.26** | 1.03 | 0.75 | 0.96 | 1.09 | 0.95 | **1.27** | **0.86** | 0.77 | 0.87 | 0.98 | 0.94 | 1.00 | 1.04 | 0.90 | 1.08 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *(n=2,533)* | (0.86-1.87) | (0.85-1.38) | **(1.34-1.81)** | **(1.01-1.51)** | (0.90-1.14) | **(1.16-1.37)** | (0.53-2.02) | (0.47-1.18) | (0.74-1.25) | (0.94-1.25) | (0.73-1.22) | **(1.06-1.51)** | **(0.75-0.99)** | (0.58-1.02) | (0.73-1.03) | (0.88-1.08) | (0.80-1.10) | (0.87-1.14) | (0.85-1.27) | (0.60-1.35) | (0.85-1.37) |
| **High Acculturation** (n=1,773) | 1.25 (0.82-1.91) | 1.05 (0.78-1.42) | 1.85 (1.56-2.19) | 1.20 (0.94-1.53) | 0.99 (0.86-1.14) | **1.35 (1.23-1.48)** | 0.87 (0.35-2.21) | 0.91 (0.57-1.43) | 1.09 (0.79-1.52) | **0.51 (0.28-0.93)** | 0.95 (0.72-1.24) | **1.41 (1.14-1.74)** | 0.99 (0.63-1.56) | 0.82 (0.60-1.12) | 0.98 (0.81-1.18) | 0.98 (0.71-1.35) | 1.05 (0.91-1.22) | 1.01 (0.86-1.20) | 0.73 (0.21-2.53) | 1.06 (0.69-1.64) | 1.09 (0.82-1.46) |
| **Medium/Low Acculturation** (n=755) | 1.31 (0.62-2.79) | 1.16 (0.78-1.72) | 1.04 (0.84-1.29) | 1.33 (0.99-1.78) | 1.08 (0.87-1.32) | 1.08 (0.92-1.27) | 1.48 (0.66-3.36) | **0.28 (0.08-0.94)** | 0.76 (0.48-1.20) | 1.25 (0.60-2.60) | 0.93 (0.51-1.68) | 0.97 (0.70-1.36) | 1.19 (0.46-3.13) | 0.62 (0.35-1.12) | **0.61 (0.43-0.86)** | 0.74 (0.35-1.60) | **0.62 (0.42-0.91)** | 0.95 (0.76-1.19) | 2.05 (0.61-6.90) | **0.41 (0.19-0.86)** | 1.05 (0.66-1.67) |
| **Cuban** | | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born Cuban (yes)** *(n=559)* | 0.81 (0.47-1.42) | 0.83 (0.49-1.41) | 1.65 (0.93-2.94) | 0.98 (0.76-1.26) | 1.11 (0.91-1.35) | 1.04 (0.69-1.57) | 0.93 (0.39-2.23) | 0.45 (0.14-1.41) | 0.21 (0.03-1.53) | 1.05 (0.78-1.41) | 1.11 (0.72-1.71) | 1.54 (0.85-2.78) | 0.91 (0.68-1.22) | 1.02 (0.68-1.53) | 1.04 (0.62-1.75) | 1.05 (0.87-1.26) | 0.94 (0.72-1.24) | 0.99 (0.61-1.63) | 0.91 (0.52-1.60) | 1.53 (0.83-2.80) | 0.63 (0.26-1.49) |
| **High Acculturation** (n=440) | 1.00 (0.56-1.77) | 0.84 (0.47-1.50) | 1.69 (0.92-3.10) | 1.01 (0.78-1.32) | 1.12 (0.90-1.39) | 1.06 (0.68-1.63) | 1.06 (0.37-3.04) | 0.30 (0.07-1.21) | 0.25 (0.04-1.82) | 0.92 (0.55-1.53) | 1.32 (0.86-2.03) | 1.66 (0.90-3.06) | 1.04 (0.57-1.90) | 0.97 (0.62-1.54) | 1.11 (0.64-1.90) | 1.05 (0.80-1.40) | 0.92 (0.67-1.26) | 1.00 (0.59-1.70) | **0.10 (0.01-0.76)** | 1.45 (0.78-2.69) | 0.63 (0.24-1.64) |
| **Medium/Low Acculturation** (n=119) | 0.22 (0.03-1.53) | 0.81 (0.30-2.19) | 1.13 (0.26-4.86) | 0.87 (0.42-1.82) | 1.06 (0.69-1.61) | 0.85 (0.25-2.91) | 0.73 (0.17-3.17) | 1.02 (0.23-4.51) | NE | NE | 0.30 (0.05-1.92) | 0.50 (0.11-2.21) | NE | 1.18 (0.51-2.74) | 0.36 (0.07-2.00) | 1.10 (0.63-1.93) | 1.03 (0.66-1.63) | 0.88 (0.27-2.90) | NE | 1.84 (0.48-7.11) | 0.64 (0.14-2.89) |
| **U.S.-born Cuban (no)** *(n=1,959)* | 0.59 (0.24-1.43) | **0.61 (0.44-0.84)** | 1.03 (0.81-1.31) | **0.48 (0.31-0.75)** | **0.67 (0.53-0.83)** | 1.06 (0.95-1.18) | 0.32 (0.08-1.34) | 0.75 (0.42-1.34) | **0.74 (0.56-0.96)** | **0.70 (0.53-0.93)** | **0.57 (0.35-0.95)** | 0.94 (0.74-1.20) | **0.64 (0.50-0.81)** | **0.61 (0.41-0.90)** | **0.69 (0.54-0.89)** | **0.87 (0.78-0.97)** | **0.76 (0.64-0.89)** | 0.98 (0.83-1.16) | **0.62 (0.44-0.88)** | **0.30 (0.13-0.66)** | 0.77 (0.56-1.07) |
| **High Acculturation** (n=571) | 0.55 (0.16-1.91) | 0.75 (0.44-1.28) | 1.31 (0.82-2.09) | 0.55 (0.27-1.12) | 0.87 (0.67-1.11) | 1.18 (0.95-1.47) | 0.91 (0.21-4.01) | 0.76 (0.21-2.83) | 0.75 (0.45-1.26) | NE | **0.38 (0.14-0.98)** | 1.66 (1.20-2.30) | 0.20 (0.03-1.47) | 0.58 (0.25-1.37) | 0.85 (0.61-1.19) | 0.66 (0.31-1.40) | 0.65 (0.41-1.04) | 0.95 (0.70-1.28) | NE | 0.16 (0.02-1.11) | 1.03 (0.58-1.85) |
| **Medium/Low Acculturation** (n=1,386) | 0.62 (0.20-1.92) | **0.55 (0.37-0.82)** | 0.92 (0.71-1.19) | **0.47 (0.27-0.83)** | **0.57 (0.41-0.78)** | 1.00 (0.90-1.12) | 0.13 (0.01-1.08) | 0.75 (0.40-1.41) | **0.69 (0.49-0.99)** | **0.11 (0.02-0.74)** | 0.64 (0.36-1.12)) | **0.62 (0.45-0.86)** | **0.12 (0.02-0.85)** | **0.62 (0.40-0.96)** | **0.62 (0.43-0.89)** | 1.01 (0.63-1.64) | **0.79 (0.68-0.92)** | 1.00 (0.83-1.20) | NE | **0.33 (0.14-0.82)** | **0.66 (0.47-0.94)** |
| **Dominican** | | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=264)* | 0.63 (0.31-1.30) | 2.17 (1.33-3.55) | 1.65 (0.41-6.68) | 0.87 (0.58-1.31) | **1.62 (1.30-2.02)** | 0.98 (0.43-2.20) | 1.32 (0.52-3.33) | 2.50 (0.76-8.25) | NE | 0.78 (0.50-1.21) | 0.88 (0.44-1.76) | 0.82 (0.12-5.75) | 0.85 (0.56-1.28) | 1.05 (0.55-2.02) | 0.46 (0.07-3.02) | 1.06 (0.82-1.36) | 1.05 (0.77-1.42) | 1.60 (0.70-3.67) | 0.50 (0.24-1.02) | 1.26 (0.52-3.02) | 0.69 (0.08-5.75) |
| **High Acculturation** (n=208) | 0.68 (0.31-1.51) | 2.15 (1.25-3.69) | 1.85 (0.46-7.43) | 0.99 (0.64-1.51) | **1.60 (1.27-2.02)** | 1.05 (0.46-2.44) | 1.45 (0.52-4.00) | **3.32 (1.11-9.93)** | NE | 0.77 (0.41-1.45) | 1.04 (0.54-2.02) | 0.82 (0.12-5.75) | 1.15 (0.59-2.27) | 0.83 (0.35-1.99) | 0.46 (0.07-3.02) | 0.97 (0.66-1.43) | 1.06 (0.77-1.46) | 1.60 (0.70-3.67) | 0.23 (0.03-1.62) | 1.45 (0.57-3.66) | 0.69 (0.08-5.75) |
| **Medium/Low Acculturation** (n=56) | 0.49 (0.11-2.16) | 2.28 (0.86-6.06) | NE | 0.44 (0.18-1.09) | **1.72 (1.11-2.67)** | 0.38 (0.05-2.93) | 0.97 (0.22-4.36) | NE | NE | 0.44 (0.20-1.01) | 0.52 (0.10-2.59) | NE | 0.62 (0.25-1.50) | 1.63 (0.74-3.57) | NE | 0.99 (0.45-2.17) | 1.00 (0.48-2.10) | NE | NE | 0.78 (0.10-6.23) | NE |
| **U.S.-born (no)** *(n=1,394)* | 0.63 (0.37-1.08) | 0.76 (0.55-1.04) | 1.16 (0.94-1.44) | 0.75 (0.55-1.03) | **0.84 (0.72-0.99)** | 1.02 (0.89-1.17) | 1.31 (0.64-2.68) | 0.33 (0.12-0.87) | **0.44 (0.22-0.87)** | **0.80 (0.65-0.99)** | **0.66 (0.44-0.97)** | 0.90 (0.69-1.18) | **0.63 (0.50-0.81)** | **0.41 (0.26-0.64)** | **0.72 (0.54-0.96)** | 0.96 (0.82-1.12) | **0.75 (0.59-0.94)** | 1.11 (0.91-1.35) | 0.87 (0.56-1.35) | **0.20 (0.09-0.47)** | 1.33 (0.84-2.12) |
| **High Acculturation** (n=594) | 1.08 (0.61-1.92) | 0.72 (0.45-1.14) | 1.23 (0.81-1.88) | 1.04 (0.75-1.46) | 0.90 (0.74-1.09) | 1.00 (0.78-1.27) | 1.12 (0.41-3.04) | 0.26 (0.05-1.41) | 0.72 (0.22-2.40) | 0.99 (0.47-2.10) | 0.77 (0.47-1.27) | 0.87 (0.48-1.56) | 1.41 (0.64-3.10) | **0.37 (0.21-0.67)** | 0.93 (0.57-1.54) | 1.11 (0.80-1.55) | **0.65 (0.48-0.89)** | 1.18 (0.84-1.65) | **0.06 (0.01-0.54)** | **0.10 (0.03-0.32)** | 1.65 (0.91-2.99) |
| **Medium/Low Acculturation** (n=800) | **0.21 (0.08-0.56)** | 0.79 (0.54-1.15) | 1.14 (0.85-1.51) | **0.43 (0.25-0.75)** | **0.78 (0.63-0.97)** | 1.03 (0.87-1.21) | 1.42 (0.56-3.61) | 0.38 (0.12-1.25) | **0.34 (0.15-0.76)** | 0.43 (0.16-1.11) | **0.51 (0.27-0.95)** | 0.92 (0.67-1.25) | 0.53 (0.18-1.56) | **0.46 (0.25-0.83)** | **0.60 (0.41-0.90)** | 0.92 (0.41-2.04) | 0.87 (0.62-1.23) | 1.07 (0.85-1.33) | 0.28 (0.04-1.91) | **0.34 (0.13-0.93)** | 1.16 (0.60-2.26) |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Central/South American** | | | | | | | | | | | | | | | | | | | | |
| **U.S.-born (yes)** *(n=1,113)* | 1.31 (0.94-1.82) | **1.52 (1.07-2.16)** | 0.98 (0.43-2.25) | **1.19 (1.02-1.40)** | **1.23 (1.04-1.45)** | 1.02 (0.65-1.58) | 0.82 (0.48-1.40) | 0.96 (0.34-2.74) | 0.36 (0.08-1.54) | 1.26 (1.01-1.55) | 1.28 (0.90-1.83) | **1.66 (1.01-2.73)** | 0.87 (0.65-1.15) | 0.73 (0.53-1.03) | 0.93 (0.53-1.63) | 1.10 (0.97-1.25) | 1.02 (0.84-1.23) | 0.80 (0.46-1.41) | **0.52 (0.30-0.89)** | **0.23 (0.11-0.49)** | 1.41 (0.67-2.95) |
| **High Acculturation** (n=994) | **1.43 (1.02-2.02)** | **1.59 (1.10-2.30)** | 1.08 (0.47-2.45) | **1.28 (1.09-1.49)** | **1.24 (1.05-1.45)** | 1.04 (0.66-1.64) | 0.81 (0.42-1.57) | 1.04 (0.36-2.98) | 0.45 (0.11-1.86) | 1.08 (0.81-1.46) | 1.30 (0.91-1.84) | 1.47 (0.85-2.55) | 1.01 (0.72-1.42) | 0.80 (0.57-1.12) | 1.08 (0.64-1.81) | 1.10 (0.94-1.29) | 1.07 (0.89-1.29) | 0.91 (0.53-1.56) | 0.96 (0.43-2.13) | **0.24 (0.11-0.53)** | 1.00 (0.43-2.34) |
| **Medium/Low Acculturation** (n=119) | 0.74 (0.32-1.72) | 0.67 (0.16-2.90) | NE | 0.74 (0.45-1.22) | 1.15 (0.46-2.85) | 0.77 (0.16-3.66) | 0.85 (0.36-1.99) | NE | NE | 1.52 (0.69-3.34) | 1.12 (0.18-7.07) | **2.78 (1.47-5.24)** | 1.87 (0.86-4.05) | NE | NE | 1.06 (0.66-1.70) | 0.46 (0.11-1.83) | NE | 0.19 (0.02-1.49) | NE | 3.59 (2.21-5.82) |
| **U.S.-born (no)** *(n=7,049)* | **0.73 (0.56-0.96)** | **0.65 (0.55-0.77)** | 0.92 (0.77-1.09) | **0.86 (0.76-0.98)** | **0.89 (0.83-0.96)** | 0.99 (0.91-1.07) | 0.93 (0.61-1.41) | **0.61 (0.44-0.85)** | **0.51 (0.36-0.73)** | **0.72 (0.63-0.82)** | **0.63 (0.51-0.78)** | **0.83 (0.69-0.99)** | **0.61 (0.54-0.69)** | **0.53 (0.43-0.65)** | **0.65 (0.54-0.78)** | **0.90 (0.84-0.96)** | **0.83 (0.76-0.91)** | 0.91 (0.81-1.03) | **0.40 (0.31-0.51)** | **0.34 (0.22-0.55)** | **0.47 (0.35-0.64)** |
| **High Acculturation** (n=3,366) | 0.75 (0.50-1.12) | **0.70 (0.55-0.88)** | 0.92 (0.70-1.20) | 1.00 (0.85-1.18) | 0.92 (0.84-1.01) | 0.94 (0.82-1.07) | 1.11 (0.72-1.70) | 0.74 (0.49-1.11) | **0.56 (0.33-0.94)** | 0.75 (0.51-1.11) | **0.68 (0.51-0.90)** | 0.87 (0.64-1.18) | 1.12 (0.80-1.56) | **0.59 (0.46-0.76)** | **0.62 (0.46-0.83)** | 0.96 (0.80-1.16) | **0.82 (0.74-0.92)** | 0.91 (0.76-1.09) | 0.44 (0.16-1.21) | **0.39 (0.22-0.68)** | **0.56 (0.37-0.85)** |
| **Medium/Low Acculturation** (n=3,664) | 0.71 (0.49-1.03) | **0.60 (0.48-0.75)** | 0.91 (0.73-1.12) | **0.70 (0.57-0.87)** | **0.84 (0.76-0.93)** | 1.04 (0.94-1.15) | 0.79 (0.41-1.52) | **0.51 (0.32-0.81)** | **0.47 (0.30-0.75)** | **0.47 (0.28-0.79)** | **0.57 (0.42-0.79)** | 0.80 (0.63-1.02) | **0.40 (0.21-0.74)** | **0.44 (0.31-0.61)** | **0.68 (0.55-0.86)** | 0.86 (0.67-1.11) | **0.84 (0.73-0.95)** | 0.91 (0.77-1.07) | **0.09 (0.02-0.46)** | **0.29 (0.14-0.60)** | **0.39 (0.25-0.60)** |

Abbreviations: ref (reference); NE (not estimable)

* Language acculturation categories include high (English only interview) and medium/low (English and Spanish interview or Spanish only interview).

Adjusted for sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), heavy alcohol consumption (≥2 drinks/day for women and ≥3 drinks/day for men), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m2, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, sleep medication use, and restorative sleep were measured during the survey years 2013-2017.

**Supplemental Table S11. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for (a) US-Born Hispanic/Latino Heritage Groups and (b) Foreign-born Hispanic/Latino Heritage Groups With and Without Adjustment for Time in the US Compared Foreign-born non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=56,372)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality | | | |
| **Group *(n)*<br>Compared to Foreign-born Non-Hispanic Whites (n=8,857)** | **Very Short (≤5-hours) (n=4,115)** | **Short (<7-hours) (n=14,048)** | **Long (>9-hours) (n=1,586)** | **Trouble Falling Asleep (≥3 nights) (n=3,431)** | **Trouble Staying Asleep (≥3 nights) (n=3,520)** | **Non-restorative Sleep (≥3 days) (n=7,734)** | **Sleep Medication Use (≥3 nights) (n=1,073)** |
| **Foreign-born Non-Hispanic Whites** *(n=8,857)* | ref | ref | ref | ref | ref | ref | ref |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | 1.09 (0.96-1.25) | **1.14 (1.06-1.22)** | 1.00 (0.88-1.13) | 0.92 (0.81-1.05) | **0.87 (0.78-0.97)** | 0.97 (0.92-1.01) | 0.92 (0.73-1.14) |
| **US-born (yes)** *(n=14,282)* | **1.17 (1.02-1.33)** | **1.23 (1.14-1.33)** | 1.01 (0.88-1.15) | 1.00 (0.87-1.14) | 0.97 (0.86-1.10) | 0.96 (0.91-1.01) | 0.98 (0.78-1.23) |
| **US-born (no)** *(n=15,818)* | | | | | | | |
| **Not Adjusted for Time in the US** | 0.88 (0.73-1.07) | 1.00 (0.91-1.10) | 1.00 (0.86-1.17) | **0.78 (0.66-0.94)** | **0.72 (0.62-0.84)** | 0.98 (0.93-1.04) | **0.68 (0.48-0.96)** |
| **Adjusted for Time in the US** | 0.88 (0.73-1.06) | 0.97 (0.90-1.06) | 1.05 (0.81-1.36) | **0.79 (0.66-0.94)** | **0.72 (0.62-0.84)** | 1.03 (0.94-1.13) | **0.69 (0.49-0.97)** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.73 (1.49-2.00)** | **1.30 (1.19-1.41)** | 1.06 (0.89-1.25) | **1.19 (1.03-1.39)** | 1.14 (0.99-1.31) | 0.95 (0.90-1.01) | **1.33 (1.07-1.64)** |
| **US-born (yes)** *(n=2,544)* | **1.81 (1.51-2.17)** | **1.33 (1.19-1.48)** | 1.04 (0.82-1.33) | 1.20 (0.99-1.46) | **1.22 (1.02-1.46)** | 0.94 (0.87-1.02) | **1.32 (1.01-1.73)** |
| **US-born (no)** *(n=2,533)* | | | | | | | |
| **Not Adjusted for Time in the US** | **1.58 (1.32-1.89)** | **1.23 (1.10-1.38)** | 1.11 (0.92-1.33) | **1.22 (1.01-1.46)** | 1.09 (0.91-1.30) | 0.95 (0.88-1.02) | **1.41 (1.09-1.83)** |
| **Adjusted for Time in the US** | **1.56 (1.20-1.88)** | **1.26 (1.15-1.38)** | 1.02 (0.77-1.36) | **1.24 (1.04-1.50)** | 1.11 (0.93-1.33) | 1.07 (0.95-1.21) | **1.40 (1.08-1.82)** |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | 0.95 (0.75-1.20) | 0.99 (0.86-1.14) | **0.76 (0.60-0.98)** | 0.92 (0.70-1.20) | 0.93 (0.76-1.15) | 0.97 (0.90-1.04) | 1.09 (0.77-1.55) |
| **US-born Cuban (yes)** *(n=559)* | 1.01 (0.67-1.51) | 1.20 (0.98-1.47) | 0.79 (0.47-1.33) | 1.14 (0.79-1.65) | 1.17 (0.84-1.65) | 0.91 (0.78-1.06) | 1.63 (0.91-2.93) |
| **US-born Cuban (no)** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *(n=1,959)* | | | | | | | |
| **Not Adjusted for Time in the US** | 0.92 (0.71-1.20) | 0.90 (0.77-1.06) | 0.76 (0.58-1.00) | 0.82 (0.59-1.14) | 0.85 (0.65-1.10) | 0.99 (0.91-1.06) | 0.96 (0.63-1.45) |
| **Adjusted for Time in the US** | 0.99 (0.76-1.28) | 0.95 (0.84-1.08) | **0.69 (0.48-0.99)** | 0.88 (0.64-1.22) | 0.90 (0.69-1.17) | 1.05 (0.90-1.23) | 1.03 (0.68-1.57) |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 1.11 (0.88-1.41) | 0.98 (0.83-1.16) | 0.91 (0.64-1.28) | 0.88 (0.68-1.13) | 0.94 (0.72-1.23) | 1.02 (0.94-1.12) | 1.03 (0.67-1.59) |
| **US-born (yes)** *(n=264)* | 1.38 (0.80-2.38) | 1.21 (0.88-1.67) | 0.98 (0.49-1.99) | 0.82 (0.51-1.31) | 1.25 (0.81-1.93) | 0.92 (0.75-1.13) | 0.97 (0.42-2.20) |
| **US-born (no)** *(n=1,394)* | | | | | | | |
| **Not Adjusted for Time in the US** | 1.05 (0.84-1.33) | 0.92 (0.76-1.10) | 0.89 (0.60-1.32) | 0.88 (0.68-1.16) | 0.87 (0.65-1.18) | 1.05 (0.95-1.17) | 1.02 (0.64-1.63) |
| **Adjusted for Time in the US** | 1.07 (0.85-1.34) | 0.96 (0.84-1.10) | 0.74 (0.45-1.20) | 0.90 (0.69-1.19) | 0.89 (0.66-1.21) | 1.00 (0.84-1.19) | 1.05 (0.65-1.68) |
| **Central/South American** | | | | | | | |
| **Overall** *(n=8,162)* | 0.99 (0.85-1.15) | **1.13 (1.04-1.23)** | **0.81 (0.69-0.96)** | 0.94 (0.78-1.13) | 0.89 (0.76-1.04) | 0.98 (0.94-1.03) | **0.69 (0.51-0.91)** |
| **US-born (yes)** *(n=1,113)* | **1.41 (1.05-1.90)** | **1.30 (1.10-1.53)** | 0.85 (0.60-1.20) | 1.27 (0.96-1.67) | 1.14 (0.86-1.52) | 0.95 (0.85-1.06) | 0.95 (0.56-1.62) |
| **US-born (no)** *(n=7,049)* | | | | | | | |
| **Not Adjusted for Time in the US** | 0.91 (0.77-1.07) | **1.10 (1.01-1.20)** | **0.83 (0.70-1.00)** | 0.84 (0.69-1.02) | **0.84 (0.72-0.99)** | 0.99 (0.94-1.04) | **0.64 (0.47-0.88)** |
| **Adjusted for Time in the US** | 0.94 (0.80-1.11) | 1.07 (1.00-1.15) | 0.78 (0.57-1.06) | 0.86 (0.71-1.05) | 0.87 (0.74-1.02) | 1.01 (0.93-1.10) | **0.66 (0.48-0.90)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale score ≥13), "ideal" cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey's complex sampling design. Trouble falling asleep, trouble staying asleep, nonrestorative sleep, and sleep medication were measured during the survey years 2013-2017. Time in the US was defined as 15 years, 15+ years.

**Supplemental Table S12. Fully-Adjusted Prevalence Ratios of Sleep Characteristics for (a) Foreign-born Whites Stratified by Time in the US, (b) US-Born Hispanic/Latino Heritage Groups, and (c) Foreign-born Hispanic/Latino Heritage Groups Stratified by Time in the US Compared to US-born non-Hispanic Whites, National Health Interview Survey, 2004-2017 (N=254,669)**

| | Prevalence Ratio (95% Confidence Interval) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sleep Duration (reference: recommended (7-9 hours)) | | | Sleep Quality | | | |
| **Group (*n*)** | **Very Short (≤5-hours) (n=21,227)** | **Short (<7-hours) (n=75,139)** | **Long (>9-hours) (n=9,190)** | **Trouble Falling Asleep (≥3 nights) (n=22,038)** | **Trouble Staying Asleep (≥3 nights) (n=30,013)** | **Non-restorative Sleep (≥3 days) (n=46,103)** | **Sleep Medication Use (≥3 nights) (n=11,097)** |
| **US-born Non-Hispanic Whites** *(n=198,297)* | Ref | Ref | Ref | Ref | Ref | Ref | Ref |
| **Foreign-born Non-Hispanic White** *(n=8,857)* | 1.03 (0.94-1.14) | 1.05 (1.00-1.11) | **1.11 (1.01-1.21)** | 1.09 (0.99-1.19) | **1.27 (1.17-1.37)** | **0.96 (0.93-0.99)** | **1.34 (1.16-1.55)** |
| **Time in the US (<15 years)** *(n=2,169)* | **0.70 (0.54-0.91)** | **0.80 (0.71-0.90)** | 0.69 (0.43-1.12) | **0.76 (0.58-0.98)** | **0.76 (0.59-0.98)** | 0.92 (0.81-1.06) | 0.72 (0.46-1.13) |
| **Time in the US (15+ years)** *(n=6,657)* | **1.42 (1.09-1.85)** | **1.25 (1.11-1.40)** | 1.44 (0.90-2.33) | **1.32 (1.02-1.71)** | **1.31 (1.02-1.68)** | 1.08 (0.94-1.24) | 1.38 (0.88-2.16) |
| **Mexican** | | | | | | | |
| **Overall** *(n=30,100)* | **0.75 (0.71-0.80)** | **0.88 (0.85-0.92)** | **0.87 (0.81-0.93)** | **0.77 (0.72-0.82)** | **0.65 (0.62-0.69)** | **1.08 (1.05-1.11)** | **0.52 (0.46-0.58)** |
| **US-born (yes)** *(n=14,282)* | 1.04 (0.97-1.12) | 1.04 (0.99-1.09) | 0.95 (0.87-1.03) | **0.92 (0.85-0.99)** | **0.80 (0.74-0.85)** | 1.02 (0.98-1.05) | **0.66 (0.58-0.76)** |
| **US-born (no)** *(n=15,818)* | **0.52 (0.47-0.57)** | **0.72 (0.68-0.76)** | **0.79 (0.72-0.86)** | **0.59 (0.54-0.65)** | **0.50 (0.46-0.55)** | **1.17 (1.13-1.21)** | **0.36 (0.29-0.43)** |
| **Time in the US (<15 years)** *(n=5,739)* | **0.31 (0.27-0.37)** | **0.56 (0.52-0.60)** | **0.81 (0.68-0.98)** | **0.42 (0.36-0.50)** | **0.39 (0.32-0.47)** | **0.80 (0.74-0.87)** | **0.25 (0.15-0.42)** |
| **Time in the US (15+ years)** *(n=9,919)* | **0.63 (0.56-0.70)** | **0.77 (0.73-0.81)** | **0.70 (0.60-0.81)** | **0.65 (0.59-0.72)** | **0.53 (0.49-0.59)** | **0.81 (0.76-0.86)** | **0.39 (0.32-0.48)** |
| **Puerto Rican** | | | | | | | |
| **Overall** *(n=5,077)* | **1.37 (1.24-1.51)** | **1.15 (1.08-1.22)** | 0.92 (0.81-1.03) | 1.05 (0.95-1.17) | 0.91 (0.83-1.00) | 1.01 (0.96-1.07) | 0.99 (0.85-1.15) |
| **US-born (yes)** *(n=2,544)* | **1.41 (1.24-1.60)** | **1.19 (1.09-1.29)** | 0.87 (0.73-1.04) | 1.05 (0.91-1.21) | 0.97 (0.85-1.12) | 1.00 (0.93-1.07) | 0.96 (0.77-1.21) |
| **US-born (no)** *(n=2,533)* | **1.31 (1.15-1.49)** | **1.11 (1.01-1.21)** | 0.97 (0.83-1.12) | 1.06 (0.92-1.22) | **0.84 (0.73-0.97)** | 1.03 (0.96-1.10) | 1.02 (0.83-1.25) |
| **Time in the US (<15 years)** *(n=550)* | 1.26 (0.91-1.76) | **1.17 (1.01-1.35)** | 1.16 (0.73-1.83) | 0.77 (0.54-1.08) | **0.61 (0.40-0.94)** | 0.82 (0.66-1.02) | 0.98 (0.64-1.52) |
| **Time in the US (15+ years)** *(n=1,969)* | **1.33** | **1.15** | 0.89 | **1.17** | 0.92 | 1.01 | 1.01 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **(1.16-1.52)** | **(1.06-1.23)** | (0.69-1.14) | **(1.02-1.36)** | (0.80-1.06) | (0.91-1.12) | (0.80-1.26) |
| **Cuban** | | | | | | | |
| **Overall** *(n=2,518)* | **0.81 (0.68-0.96)** | **0.88 (0.78-1.00)** | **0.68 (0.56-0.82)** | **0.78 (0.62-0.97)** | **0.70 (0.58-0.83)** | 1.06 (1.00-1.12) | **0.68 (0.53-0.89)** |
| **US-born Cuban (yes)** *(n=559)* | 0.90 (0.64-1.27) | 1.07 (0.89-1.29) | 0.66 (0.40-1.09) | 0.97 (0.72-1.31) | 0.94 (0.70-1.26) | 0.97 (0.84-1.12) | 0.98 (0.57-1.69) |
| **US-born Cuban (no)** *(n=1,959)* | **0.79 (0.65-0.96)** | **0.82 (0.71-0.94)** | **0.68 (0.55-0.85)** | **0.71 (0.53-0.95)** | **0.63 (0.49-0.79)** | **1.09 (1.03-1.15)** | **0.61 (0.43-0.85)** |
| **Time in the US (<15 years)** *(n=634)* | **0.56 (0.37-0.83)** | **0.61 (0.51-0.74)** | **0.57 (0.36-0.92)** | **0.46 (0.26-0.81)** | **0.45 (0.29-0.69)** | **0.75 (0.61-0.93)** | **0.17 (0.08-0.38)** |
| **Time in the US (15+ years)** *(n=1,319)* | 1.00 (0.80-1.26) | 1.00 (0.89-1.12) | 0.74 (0.55-1.00) | 0.92 (0.72-1.19) | **0.75 (0.59-0.95)** | 0.97 (0.85-1.10) | 0.85 (0.59-1.21) |
| **Dominican** | | | | | | | |
| **Overall** *(n=1,658)* | 0.89 (0.75-1.06) | 0.88 (0.77-1.01) | **0.73 (0.54-0.98)** | **0.76 (0.62-0.92)** | **0.67 (0.55-0.83)** | **1.09 (1.00-1.20)** | 0.81 (0.54-1.20) |
| **US-born (yes)** *(n=264)* | 1.08 (0.68-1.73) | 1.06 (0.78-1.46) | 0.77 (0.40-1.48) | 0.73 (0.47-1.13) | 0.97 (0.65-1.43) | 0.97 (0.79-1.20) | 0.64 (0.31-1.31) |
| **US-born (no)** *(n=1,394)* | 0.85 (0.72-1.01) | **0.84 (0.72-0.97)** | 0.72 (0.50-1.03) | **0.76 (0.62-0.95)** | **0.61 (0.48-0.78)** | **1.13 (1.01-1.25)** | 0.84 (0.54-1.30) |
| **Time in the US (<15 years) (n=426)** | **0.59 (0.40-0.88)** | **0.65 (0.51-0.82)** | 0.60 (0.29-1.24) | 0.71 (0.50-1.01) | **0.54 (0.34-0.85)** | 0.79 (0.57-1.11) | 0.49 (0.18-1.29) |
| **Time in the US (15+ years) (n=962)** | 1.00 (0.84-1.20) | 0.99 (0.89-1.10) | 0.60 (0.35-1.04) | 0.79 (0.59-1.04) | **0.64 (0.49-0.84)** | **0.98 (0.84-1.15)** | 0.97 (0.62-1.51) |
| **Central/South American** | | | | | | | |
| **Overall** *(n=8,162)* | **0.78 (0.70-0.86)** | 0.96 (0.90-1.02) | **0.73 (0.64-0.82)** | **0.76 (0.67-0.87)** | **0.65 (0.58-0.73)** | **1.09 (1.05-1.13)** | **0.42 (0.34-0.53)** |
| **US-born (yes)** *(n=1,113)* | **1.29 (1.02-1.63)** | 1.15 (1.00-1.33) | **0.74 (0.55-0.99)** | 1.21 (0.96-1.51) | 0.98 (0.73-1.30) | 0.99 (0.89-1.11) | 0.64 (0.38-1.10) |
| **US-born (no)** *(n=7,049)* | **0.71 (0.64-0.79)** | **0.93 (0.87-0.98)** | **0.72 (0.64-0.82)** | **0.68 (0.59-0.77)** | **0.59 (0.53-0.67)** | **1.11 (1.07-1.16)** | **0.39 (0.30-0.50)** |
| **Time in the US (<15 years)** *(n=3,032)* | **0.55 (0.46-0.67)** | **0.80 (0.73-0.87)** | 0.74 (0.53-1.03) | **0.54 (0.42-0.69)** | **0.43 (0.34-0.55)** | **0.79 (0.70-0.89** | **0.30 (0.16-0.58)** |
| **Time in the US (15+ years)** *(n=3,989)* | **0.85 (0.74-0.96)** | 0.96 (0.91-1.02) | **0.60 (0.47-0.78)** | **0.75 (0.64-0.87)** | **0.67 (0.58-0.77)** | **0.87 (0.80-0.95)** | **0.43 (0.33-0.55)** |

Abbreviations: ref (reference)

Adjusted for age (18-30, 31-49, 50-64, 65+ years), sex (male, female), annual household income (<$35,000, $35,000-$74,999, $75,000+), educational attainment (<high school, high school graduate, some college, ≥college), unemployed/not in the labor force (yes, no), occupational class (professional/management, support services, laborers), marital/cohabitating status (married/cohabitating, divorced/widowed, single), region of residence (Northeast, Midwest, South, West), alcohol consumption (never, former, current), serious psychological distress (Kessler-6 psychological distress scale

score ≥13), “ideal” cardiovascular health (never smoking/quit >12 months prior to interview, BMI <25 kg/m$^2$, meeting physical activity guidelines, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes), and cancer.

Note. All estimates are weighted for the survey’s complex sampling design. Trouble falling asleep, trouble staying asleep, nonrestorative sleep, and sleep medication were measured during the survey years 2013-2017.

STROBE Statement—checklist of items that should be included in reports of observational studies

| | Item No | Recommendation |
|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract<br>**Page 2, Lines 7-9** |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found<br>**Pages 4-5, Lines 67-101** |
| **Introduction** | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported<br>**Pages 7-9, Lines 117-172** |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses<br>**Page 9, Lines 172-182** |
| **Methods** | | |
| Study design | 4 | Present key elements of study design early in the paper<br>**Pages 9, Lines 186-193** |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection<br>**Pages 9, Lines 186-193** |
| Participants | 6 | (*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up<br>*Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls<br>*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants<br>**Page 10, Lines 195-207** |
| | | (*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed<br>*Case-control study*—For matched studies, give matching criteria and the number of controls per case<br>**Not applicable** |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable<br>**Pages 10-12, Lines 212-266** |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group<br>**Pages 10-12, Lines 212-266** |
| Bias | 9 | Describe any efforts to address potential sources of bias<br>**Pages 10-12, Lines 212-266 and Table 6** |
| Study size | 10 | Explain how the study size was arrived at<br>**Page 10, Lines 198-207** |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why<br>**Pages 10-12, Lines 212-266** |

| | | |
|---|---|---|
| Statistical methods | 12 | (a) Describe all statistical methods, including those used to control for confounding<br>**Pages 12-13, Lines 268-288 and Table 6** |
| | | (*b*) Describe any methods used to examine subgroups and interactions<br>**Page 13, Lines 272-278 and Lines 282-285** |
| | | (*c*) Explain how missing data were addressed<br>**Page 10, Lines 206-207** |
| | | (*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed<br>*Case-control study*—If applicable, explain how matching of cases and controls was addressed<br>*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy<br>**Pages 12-13, Lines 269-271** |
| | | (*e*) Describe any sensitivity analyses<br>**Page 13, Lines 285-287 and Table 6** |

Continued on next page

| | | |
|---|---|---|
| **Results** | | |
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed<br>**Page 13, Line 293** |
| | | (b) Give reasons for non-participation at each stage<br>**Not applicable** |
| | | (c) Consider use of a flow diagram<br>**Supplemental Figure S1** |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders<br>**Pages 13-14, Lines 292-308 and Tables 1-3** |
| | | (b) Indicate number of participants with missing data for each variable of interest<br>**Tables 1-3** |
| | | (c) *Cohort study*—Summarise follow-up time (eg, average and total amount)<br>**Not applicable** |
| Outcome data | 15* | *Cohort study*—Report numbers of outcome events or summary measures over time<br>**Not applicable** |
| | | *Case-control study*—Report numbers in each exposure category, or summary measures of exposure<br>**Not applicable** |
| | | *Cross-sectional study*—Report numbers of outcome events or summary measures<br>**Page 14, Lines 300-308 and Table 2** |
| Main results | 16 | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included<br>**Table 2, Tables 4-5 and Figures 1-2; Pages 14-16, Lines 310-367** |
| | | (*b*) Report category boundaries when continuous variables were categorized<br>**Tables 4-5, Figures 1-2** |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period<br>**Not applicable** |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses<br>**Table 6, Supplemental Material** |
| **Discussion** | | |
| Key results | 18 | Summarise key results with reference to study objectives<br>**Pages 16-17, Lines 370-385** |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias<br>**Pages 19-20, Lines 436-451** |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence<br>**Page 17-19, Lines 386-435** |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results<br>**Page 20, Lines 452-453 and Lines 457-459** |

| | | |
|---|---|---|
| **Other information** | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based<br>**Page 3, Lines 50-53** |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.