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The Immigrant Health Differential in the Context of Racial and Ethnic Disparities: The Case of Diabetes

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Abstract

Purpose: Social and economic disparities between racial/ethnic groups are a feature of the American context into which immigrants are incorporated, and a key determinant of population health. We ask whether racial/ethnic disparities in diabetes vary by nativity and whether native-immigrant disparities in diabetes vary by race and over time in the United States.

Methods: Using the 2000–2015 National Health Interview Survey, we estimate logistic regressions to examine the interaction of race/ethnicity, nativity, and duration in the U.S. in shaping diabetes patterns.

Results: Relative to their native-born co-ethnics, foreign-born Asian adults experience a significant diabetes disadvantage, while foreign-born Hispanic, Black, and White adults experience a significant advantage. Adjusting for obesity, education, and other covariates eliminates the foreign-born advantage for Black and White adults, but it persists for Hispanic adults. The same adjustment accentuates the disadvantage for foreign-born Asian adults. For Black and Hispanic adults, the protective foreign-born effect erodes as duration in the U.S. increases. For foreign-born Asian adults, the immigrant disadvantage appears to grow with duration in the U.S. Relative to native-born White adults, all non-white groups regardless of nativity see a diabetes disadvantage because the racial/ethnic disadvantage either countervails a foreign-born advantage or amplifies a foreign-born disadvantage.

Discussion: Racial/ethnic differentials in diabetes are considerable, and are influenced by each group's nativity composition. Obesity and (for the foreign-born) time in the U.S. influence these disparities, but do not explain them. These findings underscore the importance of unmeasured, systemic determinants of health in America's race-conscious society.

Keywords

immigration; health disparities; race; ethnicity; diabetes

Introduction

Research on diversity and health in America is frequently situated in one of two broad arenas: one literature deals with health inequalities across subpopulations defined by race and ethnicity, and a largely separate body of research considers the health patterns of immigrants. Both fields investigate mechanisms linking social conditions to health

outcomes, but the conceptual and empirical connections between health inequalities in the United States and the health experiences of foreign-born Americans have received less direct attention. Nonetheless, immigration from increasingly diverse origins has dramatically transformed America's demographic profile over the past several decades, and America's complex racial and ethnic relations are a key feature of the social context into which immigrants are incorporated. Thus, characterizing the relationships between race/ethnicity and nativity with health is increasingly important for understanding and addressing health inequalities in America.

Our study examines racial/ethnic and nativity differentials in diabetes, a health outcome that is strongly influenced by social contexts and behaviors and a major contributor to racial and ethnic disparities in health and mortality. After reviewing the literatures on health differentials by race/ethnicity and by nativity, we draw on 16 waves of a large, nationally representative contemporary survey to ask whether and how racial/ethnic differentials in diabetes vary by nativity and whether diabetes disparities between native and foreign-born adults vary by race and ethnicity. We conclude by discussing the influence of foreign-born populations on observed racial/ethnic gaps in health and the concomitant influence of racial/ethnic inequalities on the health of America's foreign-born population.

Racial/Ethnic Disparities in Health

Health inequalities across racial/ethnic groups in the United States are pervasive and well-documented. Relative to their white counterparts, Black Americans face a lower life expectancy (National Center for Health Statistics, 2017), and higher levels of multiple chronic conditions (Williams, 2012; Frieden, 2013). Hispanic Americans enjoy a higher life expectancy than their White counterparts, but a mixed record in terms of chronic conditions and disability (Landale, Oropesa, & Gorman, 2000; Lariscy, Hummer, & Hayward, 2015; Hayward, Hummer, Chiu, González-González, & Wong, 2014). Asian Americans enjoy a very favorable health profile relative to most other groups, with lower death rates in infancy and adulthood (Lauderdale & Kestenbaum, 2002) and lower rates of disability and most though not all chronic conditions (Fuller-Thomson, Brennenstuhl, & Hurd, 2011; Lee et al., 2011).

Researchers in the social and biological sciences have concluded that contemporary racial and ethnic categories are social constructs reflecting particular historical and ongoing power dynamics, rather than biologically-meaningful taxonomic categories (Gravlee, 2009). Scholars of racial/ethnic inequalities in health have built on this foundation to show that such health patterns do not simply result from different biological endowments or behavioral proclivities across racial/ethnic subpopulations, but instead reflect the biological consequences of chronic exposure to racial discrimination, economic deprivation, and social marginalization among communities of color in the United States (Paradies, 2006; Kuzawa & Sweet, 2009; Phelan & Link, 2015; Williams & Sternthal, 2010, Geronimus et al., 2006; Landecker & Panofsky, 2013). Consequently, the most notable racial/ethnic disparities in health have been observed for conditions that are strongly shaped by social structures and socially and environmentally-influenced behaviors (Williams & Sternthal, 2010).

Diabetes has featured prominently in studies of health disparities for several reasons, most notably its large prevalence and the enormous associated health and financial burdens. In the United States, an estimated 30.2 million adults, or 12.2% of those over age 18 have diabetes (Centers for Disease Control and Prevention, 2017). The unadjusted prevalence of diabetes is higher among Native American (15.1%), Asian (8.0%), non-Hispanic Black (12.7%) and Hispanic (12.1%) adults than among non-Hispanic whites (7.4%). Approximately 23.8% of adults with diabetes were either not aware of the condition or did not report having it, with rates of undiagnosed diabetes higher among Asian, non-Hispanic Black, and Hispanic adults relative to their White counterparts. An additional 84.1 million adults (33.9% of Americans over the age of 18) have prediabetes based on their fasting glucose or A1C levels, though only 11.6% reported being told by a health professional that they had this condition (Centers for Disease Control and Prevention, 2017). Diabetes ranks as the seventh leading cause of death in the United States, and it substantially increases the risk of blindness, cardiovascular disease, end stage renal disease, hypertension, stroke, neuropathy, lower limb amputations, and premature death (Centers for Disease Control and Prevention, 2016). Rates of mortality and hospitalization related to diabetes are known to be higher for Black and Hispanic Americans relative to their non-Hispanic White counterparts, while Asian Americans have seen the fastest growth in the prevalence of diabetes over time (McBean et al., 2004; Chow et al., 2012). The total estimated costs of diabetes currently exceed $245 billion (American Diabetes Association, 2013).

The medical and epidemiologic literature on diabetes traditionally focused on individual risk factors, including smoking, obesity, physical inactivity, high blood pressure, high cholesterol, and high blood glucose (Tricco et al., 2012). This research has informed clinical strategies for managing the disease as well as campaigns aiming to educate the public about diabetes prevention and incentivize smoking cessation, increased exercise, and healthier diets (Ali et al., 2013). However, such individual behavioral improvements have proven difficult to maintain over the long term (Hill et al., 2013). This, in combination with increased documentation of diabetes disparities by race and ethnicity, education and income, physical and social neighborhood conditions, and access to healthcare (LaVeist et al., 2009; Gaskin et al., 2014; Chaufan et al., 2011; Heuer & Lausch, 2006) has led diabetes researchers to recognize the limitations of research and interventions focusing only on the proximate determinants of health, and call for more engagement with the broader social determinants of health that influence the more proximate health behaviors and conditions (Clark & Utz, 2014).

The Nativity Differential in Health

Part of the longevity and health differential between racial/ethnic groups in America is associated with the different proportions of foreign-born individuals within each group, and the differential health of the foreign-born relative to the native born (Hummer et al., 1999a; 1999b). Research on the health of foreign-born Americans has traditionally centered around two major puzzles. First, studies repeatedly demonstrate that foreign-born populations maintain longevity and health advantages despite considerable social and economic disadvantages (Argeseanu Cunningham, Ruben, & Venkat Narayan, 2008; Markides & Coreil, 1986), and have flatter socioeconomic gradients than the general population (Lee,

2011). The factors thought to contribute to better health and greater health equity among the foreign born include the self-selection of healthy immigrants (Akresh & Frank, 2008; Bostean, 2013; Palloni & Arias, 2004; Turra & Elo, 2008), immigrants' favorable health behaviors (Antecol & Bedard, 2006; Blue & Fenelon, 2011), and the strong familial ties and social supports among immigrants (Cho, Frisbie, Hummer, & Rogers, 2004; Eschbach, Ostir, Patel, Markides, & Goodwin, 2004; Landale et al., 2000). A second puzzle has to do with the erosion of the foreign-born health advantage as immigrants become more integrated into American society. In particular, the foreign-born health advantage is stronger for recent immigrants than more veteran ones, and has been shown to decline or disappear across generations (Antecol & Bedard, 2006; Cho et al., 2004; Hamilton & Hummer, 2011; Parker Frisbie et al., 2001; Singh & Siahpush, 2002; Uretsky & Mathiesen, 2007). While individual behavior changes (e.g. changes in smoking, diet, and exercise) contribute to the decline or reversal of health advantages over time, they do not fully account for the empirical puzzle of negative acculturation (Riosmena, Kuhn, & Jochem, 2017).

Further complicating these puzzles are the numerous dimensions of heterogeneity within the foreign-born population. For example, while the foreign-born population as a whole enjoys a longevity advantage over native-born Americans, the magnitude of this survival advantage varies considerably among migrants of different origins (Kestenbaum, 1986; Singh & Siapush, 2002; Mehta, Elo, Engelman, Lauderdale, & Kestenbaum, 2016). Furthermore, the foreign-born longevity advantage does not translate uniformly to advantages in health. In fact, the direction, magnitude, and significance of a nativity differential in health varies not only by immigrant origins, but also by duration in the United States as well as across specific health conditions (Huang et al 2011; Engelman et al, 2017).

Prior research suggests that diabetes may present an important exception to the immigrant health advantage (Cunningham et al., 2008; Oza-Frank et al., 2013). For example, foreign-born Hispanic Americans enjoy better outcomes in adult and infant mortality, birth weight, self-reported health, and heart and circulatory diseases (Jasso, Massey, Rosenzweig, & Smith, 2004; Landale et al., 2000; Palloni & Arias, 2004; Singh & Miller, 2004; Teitler, Martinson, & Reichman, 2017), but face high rates of diabetes, kidney and liver diseases, and functional impairment and disability (Hummer & Hayward, 2015; Markides & Rote, 2015). Asian American immigrants have lower rates of disability and many chronic conditions (Huang et al., 2011; Frisbie, Cho, & Hummer, 2001), but higher rates of diabetes and metabolic syndrome (Misra et al., 2010; Mutchler, Prakash, & Burr, 2007). Black immigrants from Africa and the Caribbean tend to report better health and lower rates of functional limitations, though those born in the Caribbean see greater health declines over time (Hamilton & Hummer, 2011; Read, Emerson, & Tarlov, 2005). While one prior study reported no significant difference in diabetes prevalence between foreign-born and U.S.-born black adults (Singh & Hiatt, 2006), Ford et al. (2016) recently found that black immigrants experience less diabetes than their native-born counterparts, an advantage largely attributable to lower rates of obesity among the foreign-born.

Immigrant Health in the Context of Racial/Ethnic Disparities

Sociological research considering the intersection of race/ethnicity and nativity indicates that both of these demographic variables structure inequality in socioeconomic outcomes (e.g. Stewart & Dixon 2010) and in health (Hummer 1999a; 1999b). For foreign-born persons of color, exposure to racial discrimination and its concomitant socioeconomic disadvantage is a potentially important aspect of life in the United States (Cook, Alegría, Lin, & Guo, 2009; Creighton, Goldman, Pebley, & Chung, 2012; Dow, 2011; Hummer & Hayward, 2015; Read & Emerson, 2005). Such stressors may combine with others related to the migration process – including adjustment to new places, a new language, and different social expectations (Angel, Buckley, & Sakamoto, 2001; Bernstein, Park, Shin, Cho, & Park, 2011; Goldman et al., 2014). This combination of stressors may lead to deleterious health behaviors adopted as coping mechanisms, poor access to quality healthcare, and, ultimately, worse physical and mental health outcomes among foreign-born individuals (Pitkin Derose, Bahney, Lurie, & Escarce, 2009; Read & Emerson, 2005; Viruell-Fuentes, Miranda, & Abdulrahim, 2012). Since such processes take time to unfold, patterns of health may vary across foreign-born populations depending on their tenure in the receiving country as well as their particular experiences of being incorporated into the country's racial/ethnic hierarchy.

The few prior studies that considered the combined role of race/ethnicity and nativity in shaping health outcomes in the United States resonate with this argument, offering mixed results for foreign-born of varied racial/ethnic backgrounds. One documents a disability advantage that accrue to foreign-born Black and Hispanic adults but not their Asian and White foreign-born counterparts (Mehta et al., 2013), while another finds a disadvantage for foreign-born Black and Hispanic adults in physical performance measures (Haas et al., 2012). Melvin, Hummer, Elo, & Mehta (2014) found that although foreign-born Black, Asian, and Hispanic persons displayed better health than U.S.-born White persons in middle-age, this pattern was reversed at the oldest ages, when foreign-born persons of color experienced higher rates of functional limitation and disability. Together, these studies suggest that more attention ought to be paid to the way race and ethnicity interact with nativity to shape patterns of population health across ages, over time, and in the context of particular, socially-influenced chronic conditions.

Our paper draws on 16 waves of a large, nationally representative contemporary survey to ask whether and how racial/ethnic differentials in diabetes vary by nativity and whether and how diabetes disparities between native and foreign-born adults vary by race and ethnicity. Past studies of diabetes differentials have tended to focus on specialized samples or single racial/ethnic subpopulations, yielding heterogeneity in the populations studied and in the analytic reference groups. Our study allows multiple comparisons across race/ethnicity and nativity groups for a fuller consideration of how race/ethnicity and nativity status jointly influence the risk of diabetes and shape health disparity patterns.

Data and Methods

Analytic Sample

Our data come from the National Health Interview Survey (NHIS), an annual, cross sectional, and nationally representative survey of the American civilian, non-institutionalized population (Blewett, Rivera Drew, Griffin, King, & Williams, 2016; Parsons et al., 2014). The NHIS is particularly well suited for analyses of health differentials in the context of social disparities because of its large sample size and detailed information about nativity, race/ethnicity, and health.

Our analysis pools 16 waves of the NHIS (2000–2015) and includes 487,152 individuals aged 18 and above who answered the Sample Adult Questionnaire (SAQ). The SAQ asked respondents about their health-related behaviors and outcomes. Individuals who identify as non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, or Hispanic of any race are included in our sample. In the interest of parsimony, we omit the phrase “non-Hispanic” from the text below. Due to sample size limitations, we omitted respondents identifying as members of other race/ethnicity groups (n=5,045). After excluding individuals with missing data on nativity (n=536), duration in the U.S. (n=2,276), other explanatory variables described below (n= 10,611), and diabetes (n=269), our final analytic sample comprised 468,415 adults.

Key Variables

Our dependent variable is a binary indicator of diabetes. This was ascertained via the question “Have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes?” Responses indicating diabetes and borderline diabetes were both coded as positive for the condition.

Our key independent variables are race/ethnicity, nativity (including duration in the United States for the foreign-born), educational attainment, indicators of health behavior, and access to medical care. Race and Hispanic ethnicity are self-reported. While the literature suggests that there is considerable health variation within racial/ethnic groups by region of personal or family origins (Huang et al. 2011, Mehta et al. 2016, Engelman et al. 2017), sample size limitations prevented the disaggregation of Hispanic or Asian respondents by specific country origins. Nativity is a binary variable based on respondents’ reported place of birth. Individuals who reported being born in one of the 50 United States or Washington, D.C. were coded as native-born, while others were coded as foreign-born.[1] We supplement the basic nativity measure with the variable “Years in the U.S.”, which incorporates information on nativity, with, for the foreign-born, information on duration in the United States. This duration is dichotomized as either less than 15 years or 15 years and above, consistent with past studies that have reported this as the time frame after which the immigrant health advantage disappears (Abraído-Lanza, Chao, & Flórez, 2005; Antecol & Bedard, 2006; Uretsky & Mathiesen, 2007).[2]

[1]Individuals born in U.S. Territories are coded as foreign-born. Although the Territories are officially part of the United States, the survey was conducted only among residents of the 50 States and Washington, DC, so those originating in the Territories would have had to migrate to be included in the sample.

We include respondents' educational attainment (categorized as less than high school, high school graduate/GED or equivalent, some college or associate degree, bachelor's degree, graduate degree) in the analysis. We do not adjust for income because approximately two-fifths of our adult respondents (n=185,797) were not working for pay, the majority due to retirement. In addition to concerns about sample loss due to substantial missingness in the income variable, the less informative nature of income for the older population in our sample, along with the problem of endogeneity in the cross-sectional association of income and health for working-age adults (Smith, 1999) render educational attainment a better measure of the socioeconomic heterogeneity in the sample.

Because health behaviors are commonly referenced as potential individual-level explanations for both racial/ethnic health disparities and immigrants' diminished health advantage over time, we examine the influence of ever-smoking status and obesity (as indicated by a BMI score of 30 or above). We consider obesity to be a proxy measure for multiple dietary practices and physical activities. Our final model also considers the impact on diabetes of access to medical care, measured via two constructed binary variables. The first indicates whether the respondent delayed medical care in the past year due to one or more of the following reasons: cost, inability to get a timely get appointment, insufficient clinic operation hours, inability to reach clinic by phone, lacking transportation, or long waiting times at the clinic. The second denotes whether, in the past year, the respondent ever needed but could not afford any kind of care (including at least one of the following: medical care, dental care, eyeglasses, prescription medicines, or mental health care).

All analyses also adjust for survey year, age group (in 5-year intervals except the youngest age group "18–19" and the oldest age group "85+")[3], gender, current marital status (married, living with partner, divorced/separated/widowed, never married), and region of US residence (Northeast, North Central/Midwest, South, West), reflecting the well-known relationships of these variables with the distribution of health. These estimates are not shown in the tables, but are available upon request.

Analysis

We estimate 7 logistic regression models to analyze the association of race/ethnicity and nativity with the relative odds of diabetes. The first model estimates racial disparities in diabetes, comparing Black, Hispanic, and Asian adults with their White counterparts, and adjusting for age, gender, marital status, region of U.S. residence, and survey year. Model 2 adds a binary indicator for nativity to examine the presence of an overall immigrant health differential and explore its impact on racial/ethnic disparities. Next, model 3 adds an interaction term between nativity and race to explore racial/ethnic differences in the immigrant health differential. Model 4 then adjusts the previous analysis for respondents' educational attainment, health behaviors, as well as access to medical care to examine the extent to which these individual-level factors explain the observed disparities. Models 5–7

[2]We tested alternative specifications of duration in the United States in order to better capture different thresholds for the impact of immigrants' life experiences on health. However, small numbers of relatively recent arrivals among non-White foreign born adults rendered these analyses less robust than those using wider time bands.

[3]The 5-year age intervals reflect the relative linearity of disease rates within each 5-year intervals as well as non-linearity in wider age intervals.

replicate models 2–4 while taking duration in the U.S. into consideration. In particular, these models replace the binary nativity variable with a categorical variable comparing individuals born in the U.S. with foreign-born individuals who have been in the U.S. for less than 15 years and 15 years or more. A gender-stratified analysis revealed similar patterns for men and women, so we present findings from the pooled sample. Linear probability models confirmed the robustness of the changes we observe across the logistic models (results available upon request).

To highlight our findings across both race/ethnicity and nativity, we present several figures. The first figure displays diabetes odds ratios for foreign-born adults relative to their U.S.-born co-ethnics. These are based on results from models 3 and 4 for subsamples stratified by race/ethnicity. The second figure summarizes the fully-adjusted (model 4) diabetes odds for all subgroups relative to U.S.-born non-Hispanic White adults. A final figure presents predicted probabilities of diabetes by race/ethnicity, nativity, and duration in the United States based on the final model (7) with average values on all covariates.

Results

Table 1 describes the study sample, comparing across race/ethnicity and nativity. The foreign born comprise a majority among Asian and Hispanic adults, and relatively small minorities among Black and White adults. Foreign-born adults skew younger than their native-born co-ethnics, with the exception of White respondents. While most foreign-born adults have been in the U.S. for 15 or more years, the Asian and Black populations have a higher proportion of more recent arrivals relative to their White and Hispanic counterparts. Foreign-born Asian adults have the highest educational attainment, with about half having a Bachelor's degree or higher. In contrast, more than half of foreign-born Hispanic adults have not completed high school. The biggest nativity gap in educational attainment is seen among Black adults. The foreign-born are less likely than their native-born co-ethnics to be obese or to have ever been smokers. Smoking rates are highest among White adults while obesity rates are highest among Black and Hispanic adults. The biggest nativity gap in both smoking and obesity is observed among Black adults. While Black and Hispanic respondents reported more difficulty accessing healthcare services, foreign-born individuals were slightly less likely to report such difficulties than their native-born co-ethnics.

Figure 1 displays the unadjusted prevalence of diabetes by race/ethnicity, nativity, and gender. Men's unadjusted diabetes rates exceed women's rates among White and Asian adults, while women report higher or comparable rates of diabetes among Black and Hispanic adults. The foreign-born enjoy an advantage among Black and White adults, but a disadvantage among Asian adults. Among Hispanic adults, foreign-born men (but not women) have an advantage relative to their native-born co-ethnics. U.S. born black men and women have the highest rates of diabetes, while U.S.-born Asian women and men enjoy the lowest rates. Foreign-born Black women and foreign-born Asian men have notably high rates of diabetes relative to their peers.

Table 2 summarizes results from sequential logistic regressions examining diabetes disparities by both race/ethnicity and nativity. The first model shows a substantially and

significantly higher risk of diabetes for Asian, Black, and Hispanic adults relative to their White counterparts, controlling for basic characteristics including gender, age, marital status and region of residence. Model 2 indicates that the foreign-born are significantly less likely to be diagnosed with diabetes than the U.S-born, but adding an interaction between race/ethnicity and nativity (Model 3) underscores the extent to which the so-called immigrant health advantage varies across racial/ethnic groups in the case of diabetes. Foreign-born White adults have a significantly lower risk of diabetes relative to their U.S.-born co-ethnics. A similarly significant foreign-born advantage is apparent for Hispanic adults, but it is dwarfed by the accentuated risk of diabetes associated with being Hispanic in the U.S, suggesting an overall higher risk of diabetes for foreign-born Hispanic adults relative to native-born White adults. While the interaction coefficient for foreign-born Black adults suggest they experience a foreign-born advantage comparable to that of their foreign-born White counterparts, the high and significant coefficient for being Black in the U.S. nonetheless suggests that foreign-born Black adults experience an increased risk of diabetes relative to U.S.-born White adults. The results for foreign-born Asian adults indicate that they experience a significant and substantially higher risk of diabetes relative to native-born white adults.

Model 4 considers the extent to which the racial/ethnic and nativity differentials may be explained by educational attainment, smoking and obesity, and hardship in access to healthcare-related resources. Each of this is indeed strongly and significantly associated with diabetes in the expected directions, and the high magnitude of the obesity coefficient is particularly notable. Including these variables attenuates the foreign-born advantage for White adults, but amplifies the nativity effect for other groups, albeit in diverse directions. For Hispanic adults, the disadvantage associated with being Hispanic in the U.S. is attenuated while the immigrant advantage is strengthened, reducing the overall disadvantage. Among Asian adults, the opposite effects emerge: controlling for these covariates both restores the significant disadvantage associated with being Asian American and increases the immigrant penalty. For Black adults the adjusted models shows an attenuation of the race coefficient (though it remains high and significant) and the emergence of a small, marginally significant disadvantage for the foreign-born. Overall, these findings suggest that some but not all of the diabetes disadvantage of Black and Hispanic adults is due to lower educational attainment and higher rates of obesity. Among Asian adults, however, the racial and nativity disadvantage becomes more prominent when these variables are considered.

Figure 2 and figure 3 illustrate the findings from theses multivariate. Figure 2 draws on analyses stratified by race/ethnicity to compare the foreign-born to their native-born co-ethnics. Results from model 3, controlling for age, gender, marital status, region of US residence, and survey year show a foreign-born advantage for Black, Hispanic, and White adults, and a disadvantage for Asian adults. When controls for education, obesity, smoking, and access to healthcare are added (Model 4), foreign-born Hispanic adults are the only group to maintain a foreign-born advantage. In contrast, the foreign-born advantage of Black and White adults is eliminated while the disadvantage of foreign-born Asian adults is accentuated. Figure 3 displays the results from model 4 in the pooled sample, indicating that relative to U.S.-born White adults, foreign-born White adults are the only subpopulation that does not have a significant disadvantage in diabetes.

Returning to the regression results in Table 2, the next set of models (5–7) replaces the binary measure of nativity in models 2–4 with a three-level variable measuring both nativity and (for the foreign-born) duration in the United States to examine whether and how the immigrant differential varies as exposure to life in the United States increases. Model 5 shows that, as expected, the reduction in diabetes risk for the foreign-born is greatest for the most recent migrants, and smaller though still significant for migrants with longer duration America. Model 6 shows that this pattern further varies by race/ethnicity. The health advantage of foreign-born White adults is most significant for those who have been in the country for over 15 years – the group that comprises the majority of the foreign-born White population. The durational pattern for foreign-born Black adults does not differ significantly from that of their White counterparts, though there is some suggestion of a disadvantage that accumulates for longer-term migrants. Among Hispanics, we observe the more typically expected pattern, where the health advantage of relatively recent arrivals is large and significant, but wanes for those who have been in the U.S longer. In contrast, among foreign-born Asians we see a foreign-born disadvantage that is larger (and significant) for those with the longest duration in the U.S.

The final model (7) adds educational attainment, health behaviors, and access to medical care to the prior analysis. As before, these variables attenuate the health disadvantage associated with being black and Hispanic in the United States, but accentuate the health disadvantage of Asian Americans. After adjusting for key covariates, duration in the United States does not appear to have a significant relationships with diabetes risk for foreign-born White adults, but Asian and Black immigrants who have been in the U.S. for more than 15 years have large and significant disadvantages. Hispanic immigrants overall enjoy a health advantage, and the advantage seems to be stronger for relatively recent arrivals. Figure 4 translates the results of the final model into predicted probabilities of diabetes, comparing U.S.-born adults with foreign-born co-ethnics of varying duration in the U.S. The predicted probability of diabetes is lowest for White adults, with no significant differences by nativity and duration in the U.S. Hispanic adults have higher predicted rates of diabetes than White adults, but all foreign-born Hispanic adults have significantly lower predicted probabilities of diabetes relative to their U.S.-born co-ethnics. The Hispanic immigrant advantage is greatest for recent arrivals and significantly smaller for those who have been in the U.S. for more than 15 years. The predicted diabetes rates among Black adults are higher than among White adults, and the foreign-born advantage for the most recent arrivals is replaced by a foreign-born disadvantage for those who have been in the U.S. longest. Asian adults have high predicted probabilities of diabetes, with a stepwise pattern that shows diabetes rates increasing for migrants with duration in the United States.

Discussion

Both race/ethnicity and nativity influence population health patterns in the United States, and our analysis highlights their interactions and heterogeneous impacts across demographic groups. While foreign-born adults overall have lower rates of diabetes than native-born adults, the magnitude and direction of the immigrant differential varies markedly by the race/ethnicity of the foreign-born. Our initial analyses show that relative to their native-born co-ethnics, foreign-born Black, White, and Hispanic adults experience a significant

advantage and foreign-born Asian adults experience a significant disadvantage. Controlling for obesity and other socio-demographic and health related characteristics renders the foreign-born advantage non-significant among White and Black adults though it remains significant among Hispanics adults. On the other hand, controlling for obesity and education accentuates the foreign-born disadvantage among Asian adults, who otherwise would be expected to have a considerably more favorable health profile. Relative to native-born White adults, all non-white groups regardless of nativity see a diabetes disadvantage because the racial/ethnic disadvantage either countervails a foreign-born advantage or amplifies a foreign-born disadvantage.

With the notable exception of Asian adults, we find that the good health of America's non-White foreign-born population contributes to narrowing the large racial/ethnic disparities in diabetes. Our findings on the association between duration in the United States and diabetes prevalence among populations of color also hint at the potentially concomitant influence of racial/ethnic inequalities on the health of America's non-White foreign-born population. For Black and Hispanic adults, the protective foreign-born effect appears to erode as duration in the United States increases. In the case of Hispanic adults, longer-term immigrants still see an advantage, but their diabetes prevalence rates are trending towards convergence with those of their U.S.-born co-ethnics. In the case of Black adults, long-term immigrants experience higher diabetes rates relative not only to more recent arrivals, but also relative to their U.S.-born co-ethnics. For foreign-born Asian adults, the immigrant disadvantage appears to grow with duration in the United States. Our findings are consistent with prior analyses of particular subpopulations (e.g. Ford et al. 2016, Lee et al. 2011; Chow et al. 2012, McBean et al. 2004), and suggest that racial/ethnic inequality in America may influence the health of immigrants over the long term.

In supplementary analyses (results available upon request) we also investigated the role of mental health in mediating the association between race/ethnicity and nativity with diabetes, and found that although feeling sad or nervous is associated with higher odds of poor health outcomes, these mental health conditions to not explain or attenuate the observed health disparities by race/ethnicity, nativity, and duration in the United States. Adjusting for language proficiency, a key indicator of acculturation likewise did not alter our main results, further suggesting that the fundamental causes of health disparities by race/ethnicity and nativity reside not in individual traits but in more upstream determinants of health in America's race-conscious society. Structural factors that are pervasive yet hard to measure in surveys – e.g. exposure to economic hardship, discrimination, social marginalization, and concentrated disadvantage – are likely influencing patterns of population health through multiple stress-related pathways that remain to be elaborated.

Some limitations to this analysis should be noted. In particular, while grouping together foreign-born and native-born persons by race/ethnicity serves to highlight the interaction of these two dimensions of identity, the aggregation masks important variations within each population. In particular, within each of our analytic groups, health patterns may further vary based on more specific places of origin and other personal, group, and contextual characteristics not measured in this study. Prior research has, for example, identified important difference in health by country of origin with the Asian-American (Misra et al.

2010, Mutchler et al. 2007, Huang et al. 2011), Hispanic-American (Hummer & Hayward 2015, Markides & Rote 2015), and Black-American (Hamilton & Hummer 2011, Read et al. 2005) communities. Notably, there is also unmeasured heterogeneity in American tenure among the U.S.-born. In particular, given the relatively recent timeline of immigration from Asia and Latin America, native-born Hispanic and Asian adults are more likely than their White and Black counterparts to be second or third-generation immigrants, adding another layer of complexity to the nativity comparison and potentially influencing some of the broader observed racial/ethnic disparities.

Furthermore, although we pool 16 years of the NHIS, the survey is cross-sectional, so our analysis cannot discern change over time. Thus, results about differences between foreign-born persons who have spent varying amounts of time in the United States should be interpreted with caution, as they could represent differences due to the length of exposure to the United States as well as differences between migrant cohorts or the period of immigration. Finally, the NHIS data, while rich in detail on demographic and health variables, offers little information about segregation, discrimination, or other community-level contextual and structural characteristics that may drive health inequalities, particularly over the long term.

Immigrants acculturate into a US population characterized by a high degree of race-consciousness and profound inequalities. While the history of race relations in the United States gives particular prominence to Black/White comparisons, the arrival of new immigrant groups and the social changes that ensue are rendering the terrain of social stratification and health disparities increasingly more dynamic and complex. Our analysis has documented some of the variation between groups defined by race/ethnicity and nativity and shown that the most commonly referenced individual-level determinants of health are not sufficient to explain broad population-level differences in diabetes. Relatively high levels of undiagnosed diabetes (CDC 2017) and more financial and other barriers to accessing healthcare for populations of color suggest that many may be disproportionately less likely to know about their diabetes status, rendering our results conservative underestimates of true racial/ethnic differentials in diabetes.

A key challenge for future research will be to collect and analyze richer data that can better tap into broader social determinants of diabetes as well as the other chronic conditions that shape overall disparities in longevity and disability. Prior research has shown that both race/ethnicity and nativity have implications for individuals' access to institutions and resources that promote or hinder health via a variety of complex mechanisms that include early-life conditions, education and employment opportunities, family and social ties, and access to physical and social environments that influence behaviors in multiple material and psychosocial ways. Incorporating information about the immigration acculturation process and the many manifestations of social inequality in individual lives into health surveys will help illuminate these evolving determinants of health in an increasingly diverse America.

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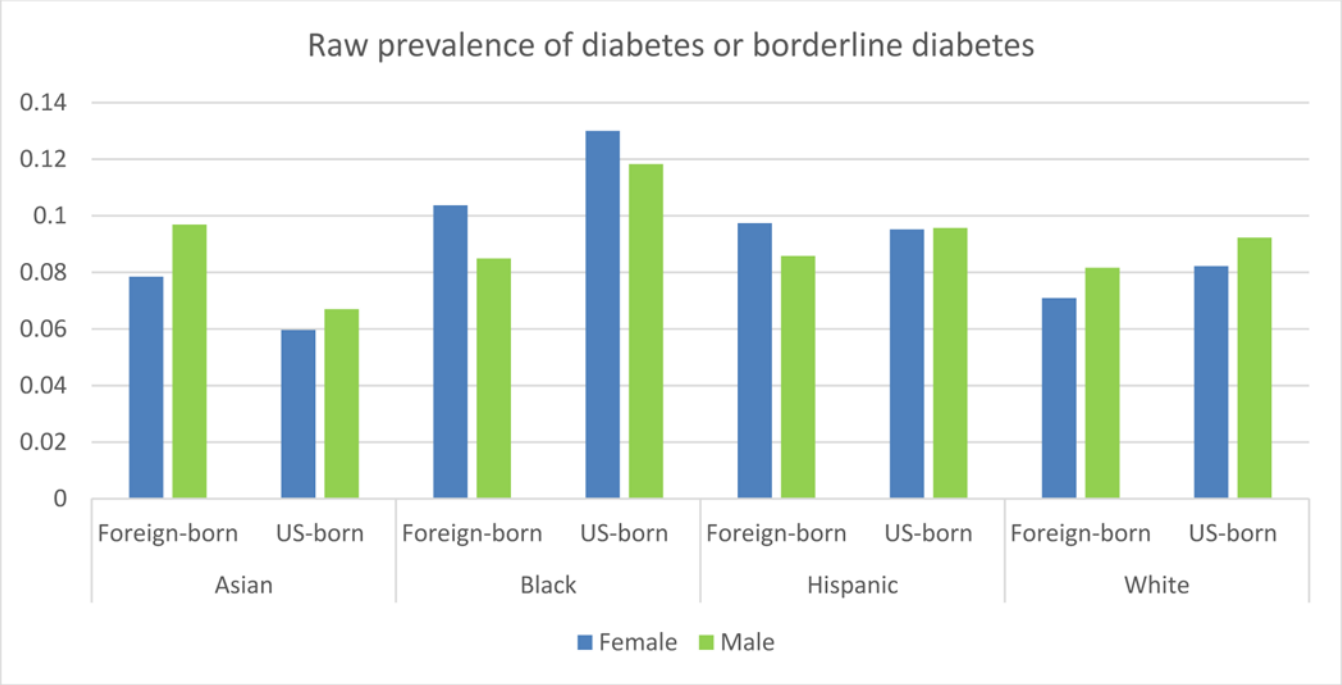

Figure 1: Raw prevalence of diabetes by race/ethnicity, nativity, and gender. (Source: NHIS 2000–2015, n = 468,415)

Notes: Estimated using NHIS adult sample weights. “Asian”, “Black”, and “White” all include only non-Hispanic individuals. Estimates are based on respondents’ reports of doctor-diagnosed diabetes and borderline diabetes.

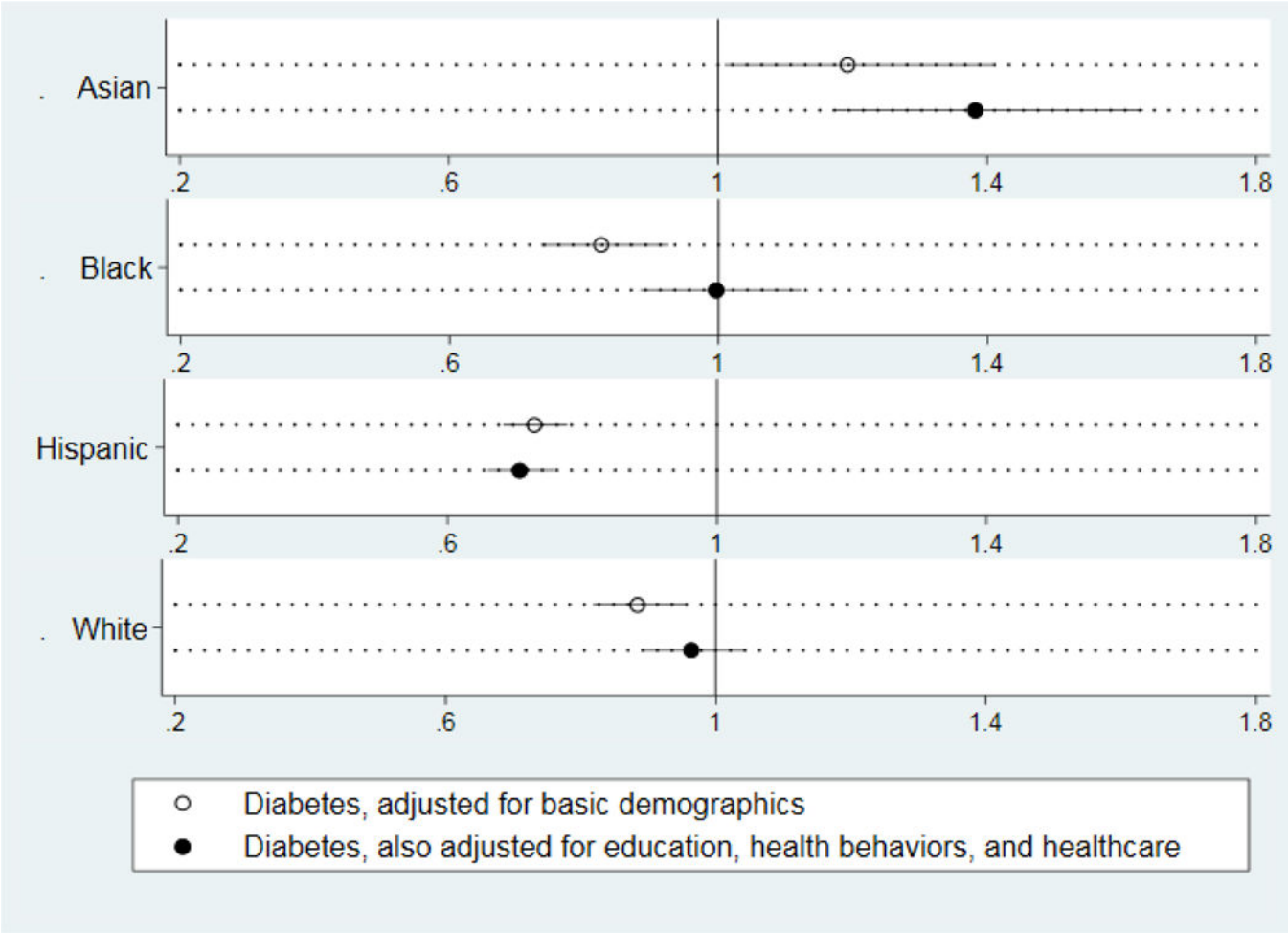

Figure 2: Odds ratios of diabetes for the foreign-born relative to their U.S.-born co-ethnics. (Source: NHIS 2000–2015, n = 468,415)

Notes: Estimated using NHIS adult sample weights. Odds ratios are adjusted for (1) basic demographics including: age, gender, marital status, region of US residence, and survey year; and (2) basic demographics, education, smoking, obesity, and access to medical care. All analyses are stratified by race/ethnicity. “Asian”, “Black”, and “White” all include only non-Hispanic individuals.

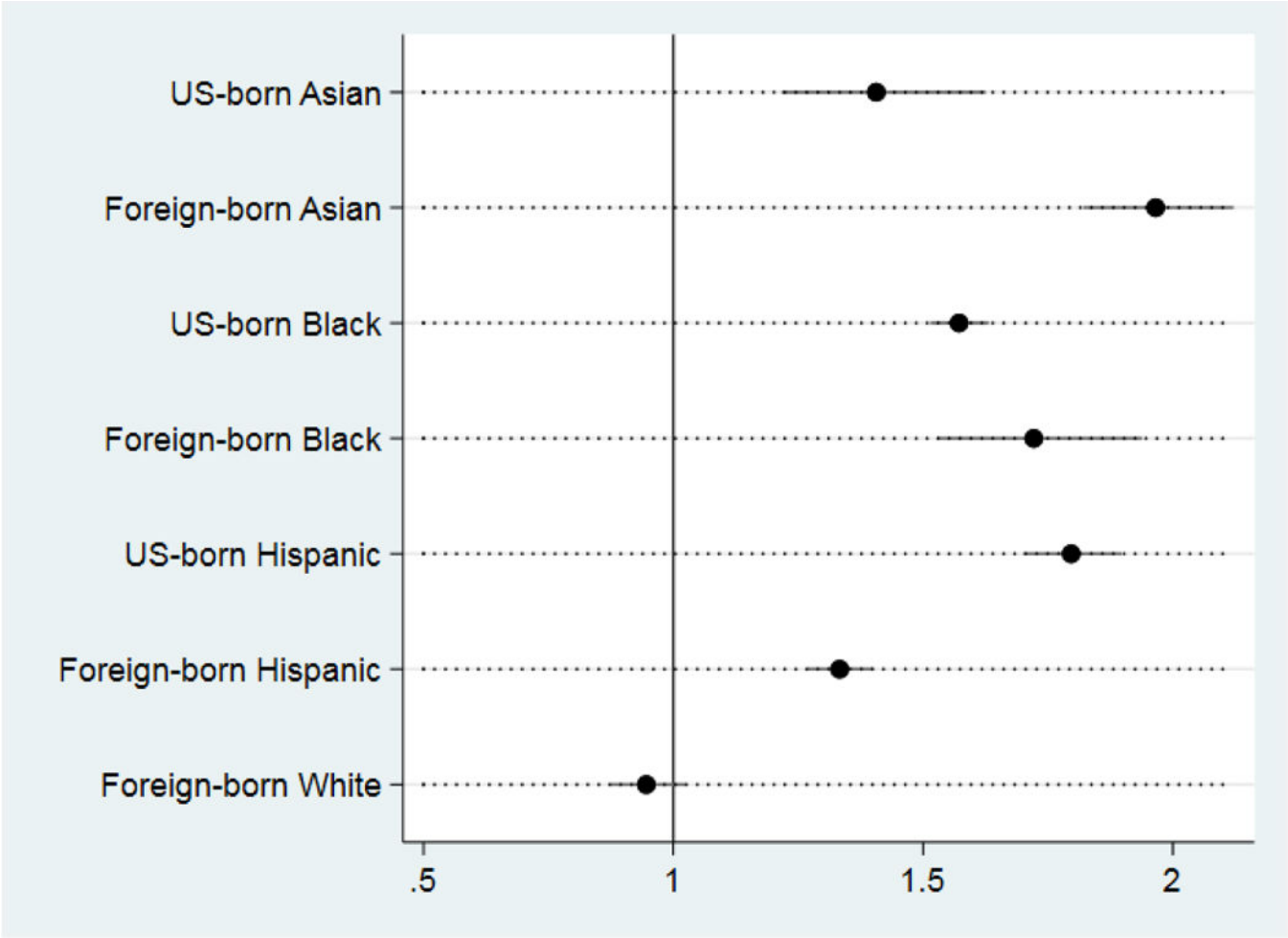

Figure 3: Odds ratios of diabetes for selected demographic groups compared to U.S.-born non-Hispanic White adults. (Source: NHIS 2000–2015, n = 468,415)

Notes: Estimated using NHIS adult sample weights. Odds ratios are adjusted for age, gender, marital status, region of US residence, education, smoking, obesity, access to medical care and survey year. “Asian”, “Black”, and “White” all include only non-Hispanic individuals.

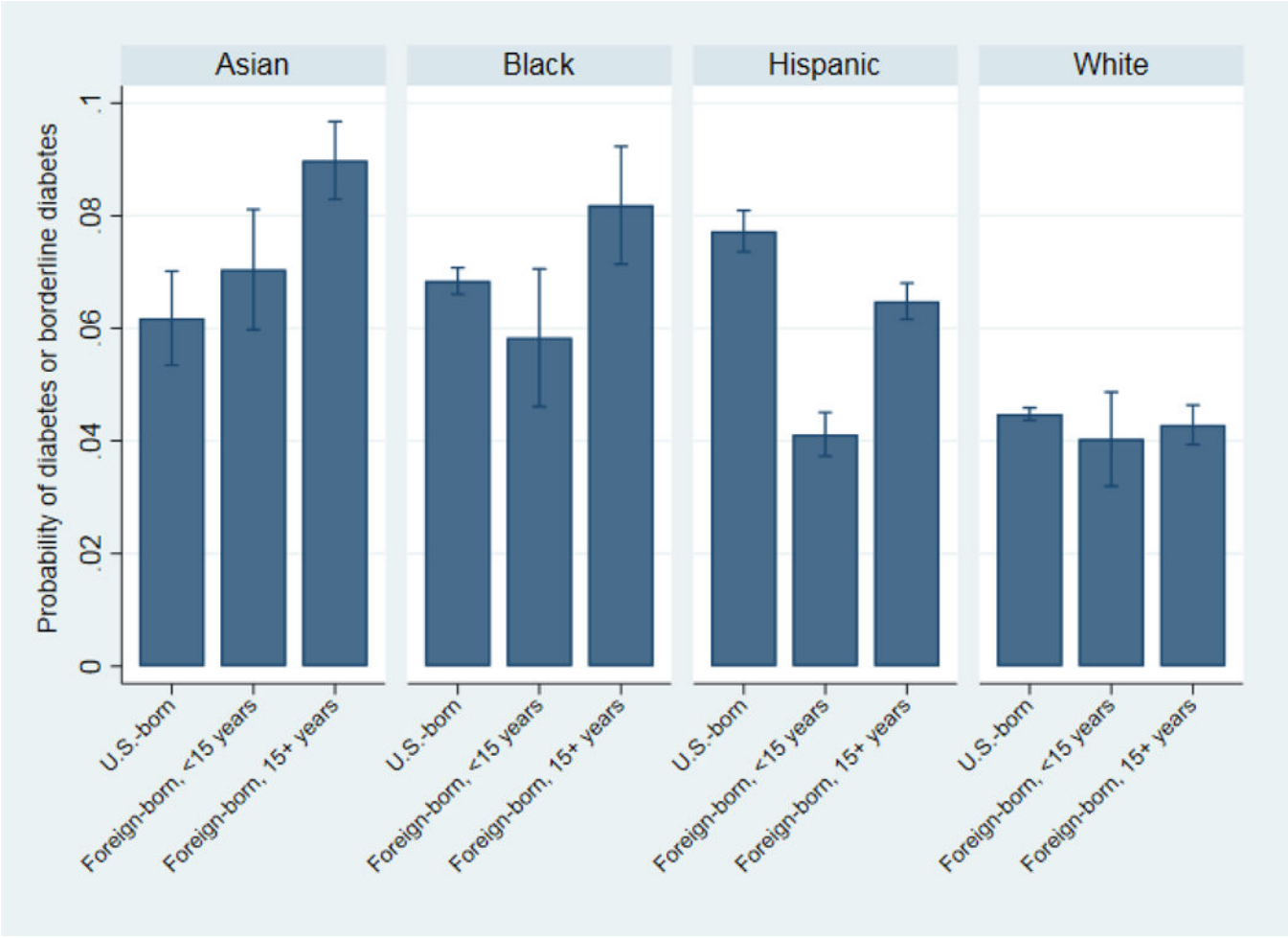

Figure 4: Predicted probabilities of diabetes, by race/ethnicity and duration in the United States. (Source: NHIS 2000–2015, n = 468,415)

Notes: Estimated using NHIS adult sample weights. Odds ratios are adjusted for age, gender, marital status, region of US residence, education, smoking, obesity, access to medical care and survey year. “Asian”, “Black”, and “White” all include only non-Hispanic individuals.

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Table 1:

Selected Demographic, Socioeconomic, and Health-Related Characteristics of the U.S Population (Aged 18 and above) by Race/Ethnicity and Nativity

Characteristic	US-born Asian	Foreign-born Asian	US-born Black	Foreign-born Black	US-born Hispanic	Foreign-born Hispanic	US-born White	Foreign-born White	Total
Sample size	5129	16636	62381	6444	32590	48453	283309	13473	468415
Proportion (of the sample)	0.01	0.04	0.13	0.01	0.07	0.10	0.60	0.03	1.00
Female	0.50	0.52	0.56	0.51	0.51	0.49	0.52	0.52	0.52
Age									
18–34	0.50	0.32	0.36	0.36	0.53	0.37	0.27	0.25	0.31
35–54	0.28	0.44	0.38	0.46	0.31	0.43	0.37	0.39	0.38
55–74	0.15	0.21	0.21	0.16	0.13	0.16	0.27	0.26	0.24
75+	0.07	0.04	0.05	0.03	0.03	0.04	0.09	0.11	0.08
Marital status									
Married	0.42	0.71	0.34	0.50	0.44	0.62	0.58	0.64	0.56
Living with partner	0.06	0.03	0.07	0.06	0.09	0.07	0.06	0.04	0.07
Separated/Divorced/Widowed	0.10	0.09	0.23	0.18	0.14	0.14	0.17	0.17	0.17
Never married	0.42	0.18	0.36	0.27	0.34	0.17	0.18	0.15	0.21
Region									
Northeast	0.15	0.21	0.13	0.41	0.11	0.16	0.19	0.29	0.18
North Central/Midwest	0.11	0.14	0.19	0.11	0.10	0.08	0.29	0.18	0.24
South	0.17	0.23	0.60	0.40	0.35	0.37	0.35	0.26	0.37
West	0.57	0.43	0.08	0.08	0.44	0.39	0.18	0.27	0.21
Duration of residence in US									
U.S.-born	/	/	/	/	/	/	/	/	0.84
<15 years	/	0.44	/	0.46	/	0.43	/	0.32	0.07
15+ years	/	0.56	/	0.54	/	0.57	/	0.68	0.09
Educational attainment									
Less than HS	0.06	0.11	0.19	0.13	0.20	0.51	0.11	0.11	0.15
HS diploma	0.17	0.16	0.31	0.26	0.31	0.23	0.29	0.22	0.28
Some college	0.35	0.20	0.33	0.33	0.35	0.16	0.31	0.26	0.30
Bachelor’s degree	0.27	0.30	0.11	0.19	0.10	0.07	0.19	0.23	0.18

Characteristic	US-born Asian	Foreign-born Asian	US-born Black	Foreign-born Black	US-born Hispanic	Foreign-born Hispanic	US-born White	Foreign-born White	Total
Graduate degree	0.15	0.22	0.05	0.09	0.04	0.03	0.10	0.18	0.09
Health Behavior									
Ever a smoker	0.28	0.22	0.37	0.16	0.33	0.25	0.47	0.42	0.42
Obese (BMI>=30)	0.16	0.09	0.40	0.25	0.36	0.29	0.28	0.21	0.29
Access to Resources									
Delayed medical care last year	0.15	0.14	0.20	0.18	0.21	0.20	0.18	0.16	0.18
Couldn’t afford care last year	0.11	0.12	0.24	0.22	0.24	0.25	0.18	0.17	0.19

Source: NHIS 2000–2015, Sample Adult Questionnaire.

Notes: All estimates are calculated using the adult sample weights. “Asian”, “Black”, and “White” all include only non-Hispanic individuals.

Table 2:

Odds ratios of diabetes (Source: NHIS 2000–2015, n = 468,415)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Race/Ethnicity (Ref: White)							
Asian	1.30*	1.49*	1.13	1.41*	1.51*	1.13	1.41*
	(1.22 – 1.39)	(1.39 – 1.60)	(0.98 – 1.30)	(1.22 – 1.63)	(1.41 – 1.63)	(0.98 – 1.30)	(1.22 – 1.62)
Black	1.85*	1.87*	1.86*	1.57*	1.87*	1.86*	1.57*
	(1.79 – 1.91)	(1.80 – 1.93)	(1.80 – 1.93)	(1.51 – 1.63)	(1.80 – 1.93)	(1.79 – 1.92)	(1.51 – 1.63)
Hispanic	1.80*	2.00*	2.15*	1.80*	2.00*	2.14*	1.79*
	(1.73 – 1.87)	(1.91 – 2.09)	(2.04 – 2.27)	(1.70 – 1.90)	(1.91 – 2.09)	(2.03 – 2.26)	(1.69 – 1.89)
Nativity							
Foreign-born		0.84*	0.87*	0.95			
		(0.80 – 0.87)	(0.81 – 0.94)	(0.87 – 1.02)			
Asian *Foreign-born			1.35*	1.48*			
			(1.14 – 1.62)	(1.24 – 1.77)			
Black *Foreign-born			1.00	1.16+			
			(0.87 – 1.15)	(1.00 – 1.34)			
Hispanic *Foreign-born			0.85*	0.78*			
			(0.77 – 0.94)	(0.71 – 0.87)			
Years in the U.S. (Ref: U.S.-born)							
Less than 15 years					0.63*	0.77+	0.90
					(0.58 – 0.68)	(0.63 – 0.96)	(0.72 – 1.11)
15+ years					0.90*	0.89*	0.96
					(0.86 – 0.95)	(0.82 – 0.97)	(0.88 – 1.04)
Asian *Less than 15 years						1.25	1.28
						(0.93 – 1.68)	(0.94 – 1.74)
Asian *15+ years						1.42*	1.57*
						(1.19 – 1.71)	(1.30 – 1.89)
Black *Less than 15 years						0.90	0.94

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
						(0.66 – 1.21)	(0.69 – 1.28)
Black *15+ years						1.07	1.27*
						(0.91 – 1.25)	(1.08 – 1.50)
Hispanic *Less than 15 years						0.66*	0.57*
						(0.52 – 0.83)	(0.45 – 0.73)
Hispanic *15+ years						0.93	0.87+
						(0.83 – 1.03)	(0.78 – 0.97)
Educational Attainment (Ref: Less than HS)							
High school diploma / GDE				0.82*			0.82*
				(0.79 – 0.85)			(0.79 – 0.85)
Some college				0.78*			0.78*
				(0.75 – 0.81)			(0.75 – 0.81)
Bachelor's degree				0.57*			0.57*
				(0.54 – 0.60)			(0.54 – 0.60)
Graduate dgree				0.57*			0.56*
				(0.53 – 0.60)			(0.53 – 0.60)
Health Behaviors							
Ever a smoker				1.10*			1.10*
				(1.07 – 1.13)			(1.07 – 1.13)
Obese (BMI>=30)				3.03*			3.02*
				(2.95 – 3.11)			(2.94 – 3.10)
Access to Resources							
Delayed medical care last year				1.29*			1.29*
				(1.25 – 1.34)			(1.25 – 1.34)
Needed but couldn't afford care last year				1.45*			1.45*
				(1.40 – 1.50)			(1.40 – 1.51)

Notes:

1) 95% confidence intervals in parentheses.

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[*]p<0.01,

[+]p<0.05.

[2)]All models also control for age (in 5-year intervals), gender, marital status, region of US residence, and survey year.

[3)]All estimates are calculated using the adult sample weights and are based on respondents' reports of doctor-diagnosed diabetes and borderline diabetes.

[4)]"Asian", "Black", and "White" include only non-Hispanic individuals.