

## Latino Health Paradox or Healthy Immigrant Phenomenon?

Adult Morbidity in the Integrated Health Interview Series 2000-2009

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## Abstract

Health is central to research on both immigration and assimilation, and differences in health among immigrants are a focal part of health disparities research. In these fields, immigrant health has been deemed “paradoxical” because a) immigrants tend to have better health than is predicted by their socioeconomic position and b) acculturation into American society is associated with declines in immigrant health status despite increases in socioeconomic position and related utilization of health care. Importantly, much of our understanding of immigrant health and its paradoxical nature come from studies of Hispanics. Using newly released data from the 2000-2009 Integrated Health Interview Series, we extend inquiry to 10 distinct immigrant groups based on global region of birth. The research has three facets. First, we systematically assess health both across different immigrant groups and in relation to the prominent US born racial and ethnic groups. Second, we examine education gradients and assimilation trajectories across immigrant groups. Finally, we assess the ability of widely recognized explanatory factors to account for health differences across immigrant groups, educational gradients, and assimilation effects. Across four health outcomes, health advantages among immigrants are robust regardless of group, educational gradients and marginally detrimental acculturation trajectories are generally consistent, and there is limited ability of the explanatory factors to account for the immigrant health advantages. We conclude that these highlight the significance of healthy immigrant selection and discuss implications for the “paradox” of immigrant health and existing theory and research on assimilation processes and health disparities research.

Issues of immigrant health have been a central feature of immigration research and a focal concern of health disparities research for more than a century (Jasso, Massey, Rosenzweig, and Smith 2004; Kandula, Kersey, and Lurie 2004; Rumbaut 1997). Particularly in the case of Hispanics, an impressive body of work highlights the apparent “paradox” of immigrant health. In one respect, such immigrants typically have better health statuses than would be expected given their socioeconomic standing in U.S. society (Palloni and Arias 2004) and the average health status in their sending country (Jasso et al. 2004). In another respect, acculturation, be it behavioral, linguistic, or simply exposure to U.S. society, seems to foster poorer health (Angel, Buckley, and Sakamoto 2001; Antecol and Bedard 2006; Cho, Frisbie, Hummer, and Rogers 2004; Lara et al. 2005; LeClere, Jensen, and Biddlecom 1994). This too is somewhat paradoxical given that immigrants typically gain ground through acculturation on many of the factors—income and access to health care, for example—that improve health in the native population (Rumbaut 1997). Ultimately, the apparent paradox of immigrant health provides an important lens on the dynamics of health over the life course, the nature of immigration and assimilation, and the complexities of health disparities and their life course context. As such, issues of immigrant health are key avenues for theoretical and empirical advancement.

This paper makes four unique contributions to the question of the immigrant health paradox. First, the majority of evidence on immigrant health advantages and its paradoxical nature is based on research on Hispanic immigrants. While Hispanics are clearly an important facet of immigrant health, recent decades have also seen steady increases in the numbers of Asian, Southeast Asian, Indian and Pakistani, and African immigrants. This provides an opportunity to assess the generality of immigrant health advantages, to see whether the paradox of immigrant health extends to other groups, and to advance theoretical understanding of immigrant health and health disparities more generally.

Second, assessment of immigrant health requires simultaneous and comparative assessment of immigrant health dynamics. This includes both socioeconomic gradients in health and assimilation trajectories. Socioeconomic gradients form the backbone of contemporary sociological perspectives on health and increases in SES viewed as universally associated with better health (e.g., Link and Phelan

1995). In contrast, immigrant health is often situated within the context of “negative assimilation” based on the view that health is seen to decline with increasing exposure to American society (e.g., Rumbaut 1997). The scope of such dynamics however has yet to be investigated, particularly in a systematic manner with high quality data and across multiple immigrant groups.

Third, research on health disparities highlights endogenous factors, such as risk behaviors and access to health care, that translate socioeconomic, racial, ethnic, and sex differences in differential health outcomes (see Link and Phelan 1995; Ross and Wu 1995). Immigrant health research however has not broadly and systematically examined such factors and what they mean for health differentials between the immigrant groups and those born in the United States. Finally, we include multiple comparison populations based on the major racial and ethnic groupings of those born in the United States and thereby avoid the “Anglo” comparator bias in traditional assimilation research (Alba and Nee 2005).

#### PARADOX ELABORATED

A broad view of the paradox of immigrant health suggests four potential dimensions. First, historically, immigrants have entered the United States with limited human capital and then embarked on a multi-year, multi-generational practice of education, occupational, and income attainment (Alba and Nee 2005; Waters and Jiménez 2005). Given this, any observed health advantages among immigrants seem antithetical to their modal socioeconomic position and belie arguments about the “fundamental causes” of health disparities lying in educational, economic, and social disparities. Extensive research on Hispanic immigrants for example shows health advantages across a range of outcomes and across the life span (see review in Lara et al. 2005).

At the same time, research on the health of other immigrant groups is far less extensive. Some research examines health among Asian immigrants and this, too, typically shows health advantages (e.g., Frisbie, Cho, and Hummer 2001). Yet, the scope of such work is somewhat limited and typically does not account for major cultural, biographical, and the circumstances of immigration differences, including those of Central and Southeast Asian immigrants. A small body of work on Arab immigrants is

provocative (Read, Amick, and Donato 2005; Salari 2002), yet El-Sayed and Galea's (2009) systematic review concludes that "the central limitation to our understanding of health among [Arab Americans] in the US is the relative paucity of published studies...(p. 6)." In a similar vein, Venters and Gany's (2009) review of African immigrant health states firmly that the "health status and needs of this diverse population remains largely unexamined..." (p. 1). In the end, there have been few, if any, attempts to compare health systematically across multiple immigrant groups and the scope of the paradoxical nature of immigrant health and its explanation are unknown.

Related to this is the issue of socioeconomic gradients in health. As noted, immigrant health is deemed paradoxical because health status seems orthogonal to socioeconomic position. Given that large and sustained socioeconomic differences in health in the US population in general are well-established (Williams and Collins 1995), socioeconomic gradients in health seem somewhat different for immigrants than they are for those native born. Yet, because the vast majority of research has focused on Latino immigrants, we know relatively little about variation in socioeconomic gradients in health across immigrants and whether the paradoxical nature of health generalizes. Of particular significance are education gradients in health given that the majority of immigrants arrive in adulthood and hence both bring their educational attainment with them and have it as a somewhat fixed aspect of their socioeconomic status over the life course. Although the extent of research is not large, there is some evidence that education may exert different influences on health depending upon both race and nativity (Kimbrow, Bzostek, Goldman, and Rodriguez 2008). Yet, whether the pattern of effects supports the idea of a health paradox is an open question and necessitates a systematic examination of education gradients in health across immigrant groups.

Third, there is evidence that acculturation to American culture is associated with declines in the health status of immigrants. This too is paradoxical given that acculturation is typically associated with increases in socioeconomic standing and economic resources (Alba and Nee 2005; Rumbaut 1997; Waters and Jiménez 2005) and with improved access to health care and increased utilization of medical services (Thamer et al. 1997) that collectively should improve health. Yet, even in the face of such

health-promoting experiences, health among immigrants tends to decline over time, with evidence of increasing prevalence of chronic diseases (e.g., Steffen et al. 2006) and some types of cancers (Sohn & Harada 2005). Yet again, the vast majority of research focuses on Hispanic immigrants and this raises questions about the generality of the effects. Given the diversity of contemporary immigrant pools, cultural and economic difference at the time of entry into the United States, and assumed variation in acculturation experiences (Alba and Nee 2005; Rumbaut 1997; Waters and Jiménez 2005), one might expect that the acculturation-health nexus should be quite variable. At the same time, this is an empirical question that should be addressed through systematic, comparative analysis of acculturation across multiple immigrant groups. To our knowledge, such work has yet to be done.

As a final issue, it is unclear whether commonly accepted explanatory variables in health and health disparity research account for the immigrant health differences, socioeconomic gradients in health among immigrants, or acculturation declines. Ross and Wu (1995) identify work and economic conditions, social psychological processes such as work fulfillment and sense of control, lifestyle, and risk behaviors, and health care as the key factors that explain the effect of education on health. Consistent with this, studies of “unhealthy assimilation” highlight lifestyle and conditions such as smoking, drinking, less exercise and physical activity, and poor diet (Akresh 2007; Antecol and Bedard 2006; Marin and Posner 1995; Park, Myers, Kao, and Min 2009) and stress associated with difficulties in cultural adaptation and discrimination (Finch, Kolody, and Vega 2000; Williams, Neighbors, and Jackson 2008). Yet even with considerable research, we still know little about how well such factors account for immigrant health dynamics and how robust such an accounting is across groups. If such factors were to convincingly account for immigrant health differentials, immigrant health would seem much less paradoxical in that the processes that shape health in general would appear to shape immigrant health. On the other hand, if they have little role in explaining differences in health status among immigrants or if there is wide variation in explanatory power, the paradoxical nature of immigrant health extends.

With such issues as a background, we focus on three research questions:

- 1) What is the nature and extent of differences in health both across immigrant groups and in relation to those U.S. born?
- 2) How similar or different are education gradients and assimilation trajectories across immigrant groups?
- 3) How well do explanatory factors such as employment and income, risk conditions, and access to and utilization of health care account for immigrant health differentials and dynamics?

## DATA, MEASURES, AND METHODS

### Data

The Integrated Health Interview Series (IHIS), harmonized data, and documentation (Minnesota Population Center and State Health Access Data Assistance Center 2010) are based on the public use files of the National Health Interview Survey (NHIS). The NHIS is both a “continuing survey and special studies to secure accurate and current statistical information on the amount, distribution, and effects of illness and disability in the United States and the services rendered for or because of such conditions” ([http://www.cdc.gov/nchs/nhis/about\\_nhis.htm](http://www.cdc.gov/nchs/nhis/about_nhis.htm)). A multistage area probability design produces a representative sampling of U.S. households. In each year, sampling consisted of an expected 35,000 households containing 87,500 persons. The annual response rate for the sample selected is close to 90% of eligible households. Given specific interest in comparisons across multiple immigrant groups, our analytic sample includes pooled surveys spanning 2000 to 2009 and is restricted to those 18 years of age and older. Sample sizes varied depending upon health outcome but exceed 250,000 in each case.

### Measures

#### Immigrant Groups

Immigrants are grouped by global region of birth based on the CIA World Fact Book classification. These include “Mexico, Central America, and the Caribbean Islands,” “South America,” “Europe,” “Russia (and former USSR areas),” “Africa,” “Middle East,” “Indian Subcontinent,” “Asia,”

“Southeast Asia,” “Canada, Oceania, and Elsewhere,” and “Unknown.” The size of the immigrant subsamples vary from 615 (Russia and former USSR areas) to 24,522 (Mexico, Central America, Caribbean) with more than four thousand European immigrants, approximately three thousand immigrants from South America or Southeast Asia, over two thousand respondents from (central) Asia or Japan, over a thousand immigrants from the Indian subcontinent, Africa, and Canada, Oceania, or other, and almost a thousand immigrants from the Middle East. Each immigrant group is indexed by a dummy variable in the analyses and we exclude the small number of respondents whose region of birth was not known (n=458). This categorization scheme allows for a more detailed, systematic analysis of variation across immigrant groups than seen in previous work and provides a reasonable balance between the need for broader assessment of the scope of immigrant health dynamics and the intrinsic problem of increasingly small samples that would come with analyses based on nation of origin.

U.S. born.

For purposes of comparison, we further constructed dummy variables that disaggregated the U.S. born population into the key racial and ethnic groupings of “non-Hispanic whites” (reference category), “Hispanics,” “African Americans,” “American Indians,” “Asians,” and “Other.”

Educational Attainment.

When studying immigrant health dynamics, educational attainment has three strategic advantages. First, it is a key determinant of health and a central feature of health disparities in American society (Ross and Wu 1995). Second, it is an aspect of socioeconomic status that is somewhat static and characteristic of the resource set immigrant adults likely have when they arrive. Third, its typical order and timing in the life course make it a determinant of subsequent resources (e.g., income) and consequent behaviors (e.g., risk behaviors, health care utilization), which can be directly modeled. We measure educational attainment with dummy variables indexing those with “less than a high school degree/GED,” “high school graduates” (reference category), those with “some college,” and those with “college degrees.”



## Acculturation.

Although acculturation takes a variety of forms, we focus on the general measure of exposure to American culture, which we assume is at least a partial determinant of the more direct measures of acculturation (i.e., linguistic, cultural, dietary). This is indexed using the total number of years spent in the United States. For those native born, we assigned the value of age and included an interaction term indexing respondents who were born in the United States. This serves two purposes. First, it allows for convergence of the models as it eliminates the linear dependency between years spent in the US and immigrant status. Second, the coding of the components of the interaction term, specifically the coding of those born in the US as “0,” makes the interpretation of the coefficient and odds ratio for the years spent in the US variable specific to those foreign born. In other words, we can interpret the odds ratio for the years spent in the US variable as indicating the immigrant specific effect. Although again there are numerous ways one can conceptualize acculturation, this type of aggregated “exposure” measures has intuitive logic. Moreover, we do incorporate more direct indicators of both positive and negative acculturation as factors that should account for the effects of exposure to American society indexed through years spent in the United States. We scaled acculturation as ten-year increments to facilitate the interpretation of the odds ratios.

## Potential Confounding Variables

As the demographic composition of immigrant populations typically deviate from native populations, particularly early in the immigration cycle, all our models control for age (ranging from 18 to 85 and older), sex (‘females’ coded 1), and marital status (differentiating respondents who are “married,” “divorced or separated,” or “single, never married” (reference category)).

## Mediating Variables

Employment and Income. A first set of potential mediating variables index socioeconomic attainment at the time of survey and hence directly measures post-immigration resources. Employment status

differentiates those “unemployed” or “not in the labor force” (e.g., in school, retired) from those employed (reference category). We also measure income as the ratio of household income relative to poverty threshold (ranging from 1 = 5.0 or greater to 4 = less than .50).

Risk Conditions. Epidemiological research has long recognized the impact of risk conditions on health outcomes and health trajectories. Consistent with much prior research, we focus on three factors. First, “body mass index” is a well-recognized measure for assessing excess weight and where high values are associated with a range of diseases (<http://www.cdc.gov/obesity/causes/health.html>). Second, alcohol consumption is measured through information on the daily consumption of alcohol with information on the frequency of drinking in the past year. From the product of these two measures, we index people who are abstainers (no alcohol consumption), “rare drinkers” (one drink or less per week and the reference category), “moderate drinkers” (between one and three drinks per day), and “heavy drinkers” (four or more drinks per day). Third, smoking is a categorical measure based on two items indicating the average number of cigarettes smoked per day and the total number of days smoked in the previous month. The resulting measure indexes those who do not smoke (reference category), “light smokers” (less than 10 cigarettes per day), and “heavy smokers” (11 or more cigarettes per day). Smoking is a risk factor for a range of diseases including lung cancer, heart disease, emphysema, and hypertension ([/www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/health\\_effects/health\\_effects.htm](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/health_effects.htm)).

#### Health Care Access.

The final explanatory factor we incorporate in our analyses is health care. Access to health care is a key component of preventative medicine (McGlynn et al. 2003) and is implicated in the complexities of immigrant assimilation and the health paradox (Lara et al. 2005). We index this using the question of whether the respondent “needed but couldn’t afford health care in the previous 12 months.” This item was reverse-coded to index those with limited access to health care.

## Health Outcomes

We focus on four distinct health outcomes to assess the robustness of immigrant health. These items are both representative of a range of distinct, but inter-related, health statuses and have also featured in a range of health-related research.

**Self-rated Health.** First, self-rated health asks respondents to indicate their own health status ranging on a five-point scale from excellent to poor. Consistent with much prior work, we recode information to index those who report “fair” or “poor” health (coded ‘1’) compared to those who report better health (coded ‘0’). There is good evidence of the validity of self-reported health as an indicator of health status (Idler and Benyamini 1997) and as reasonably reliable across different ethnic groups (Chandola and Jenkinson 2000).

**Hypertension.** A second measure we consider is whether the respondent has ever been diagnosed with hypertension by a health professional (coded ‘1’). While this type of measure has limitations in that it requires some access to health care, hypertension is an important measure of health in the US given its increasing prevalence and its contributing role as a leading cause of death in the United States (Hyduk et al. 2005). Still given the necessity of some health care utilization for a positive response on this item, we assessed the robustness of the results by restricting the sample to those who reported having a place where they received routine care and replicating the results.

**Diabetes.** We also looked at whether the respondent has ever been diagnosed with diabetes by a health profession. Respondents who reported ever receiving a diagnosis of diabetes were coded ‘1’ with all others coded “0.” Diabetes is widely regarded as one of the most significant diseases in American society and prominent aspect of the on-going epidemic of chronic diseases the contemporary United States. As this measure also has some limitations given that it requires a doctor’s diagnosis, which implies health

care access, we assessed robustness of the results when the sample was restricted to those who reported having a place that they go to for routine care.

Disability. A final health outcome is disability. This is probably the most stringent and rigorous measure of health in that it based off of a self-report of what the health literature calls “limitations in activities of daily living.” Here, respondents were asked whether “Because of a physical, mental, or emotional problem, does anyone in the family need the help of other persons with personal care needs, such as eating, bathing, dressing, or getting around inside the house?” Respondents who indicated yes on any of the items were coded ‘1.’

[ Table 1 about here ]

#### Model Estimation and Missing Data

As each health status measure is a dichotomous indicator, all models involve logit regression where the log of the odds of a particular health status (e.g., fair or poor self-rated health, diagnosed hypertension) is modeled as a function of unit variation in a set of predictor variables. More formally,

$$P(y_i \neq 0 | x_i) = \frac{\exp(x_i B)}{1 + \exp(x_i B)}, \quad (1)$$

where the probability that  $y$  for period  $i$  is not equal to zero is condition on a set of covariates,  $x$ , for person  $i$  and where the likelihood function is defined as

$$\ln L = \sum_{i \in S} w_i \ln F(x_i B) + \sum_{i \in S} w_i \ln \{1 - F(x_i B)\} \quad (2)$$

We handled missing data using the multiple imputation protocol in Stata 11.1. In particular, there were substantial amounts of missing data on two of the items, body mass index (10.3 percent missing) and the poverty ratio (22.9 percent missing). Although not shown in the tables, all models include a fixed

period effect based on the year the survey was administered. For ease of interpretation, relevant table entries are odds ratios for the predictor variables, as well as their 95 percent confidence intervals (see discussion of the advantages of such a representation in Gelman and Stern 2006). Given the large sample size, the vast majority of effects are statistically significant at conventional levels. To avoid cluttering the tables, we do not include asterixes to indicate statistically significant odds ratio. Parameters that are not statistically significant can be identified by confidence intervals that overlap with 1.0. The substantive importance of specific odds ratios is determined by their size and direction. Where necessary, we use Stata's LINCOS procedure to assess whether the difference between 'significant' and 'not significant' effects is itself statistically significant (Gelman and Stern 2006).

## RESULTS

Descriptive information in Table 1 provides some interesting preliminary information on similarity and difference in immigrant health dynamics across groups. First and particularly germane to the issue of a "health paradox," immigrants from Mexico, Central America, and the Caribbean are clear outliers with respect to educational attainment in that they have the lowest educational attainment among all immigrant groups. While 60 percent have less than a high school degree, none of the other immigrant groups have percentages less than 19 percent. In the context of the overall sample, immigrants have somewhat higher attainment. There are two implications that follow from this. First, a fuller understanding of immigrant health needs to account for educational differences. Second, conclusions about immigrant health based on traditional Hispanic immigrants are drawing from a particularly unique part of the educational attainment distribution and may not generalize to other groups.

Equally important, acculturation also varies across groups. In comparing across groups, those from the Indian subcontinent and African immigrants have on average the shortest tenure in the United States (12.5 and 13.6 years, respectively). Other immigrants have typically spent between 16 and 19 years in the United States. Not surprisingly, European immigrants and those from Canada, Oceania, and Elsewhere have the longest average tenure (32.1 and 31.2 years, respectively). Given research showing

health declines associated with longer time spent in the U.S., comparisons of health among immigrant groups will be influenced by differential exposure to American society and, hence, controlling for length of time in the United States is important for both understanding and making comparisons of immigrant health statuses.

[ Table 1 about here ]

Finally, it is clear from the mean values reported that there is clear variation in health outcomes. Yet, given variation in educational attainment and acculturation just discussed, as well as other sociodemographic differences, simple average differences across immigrant groups and in comparison to those born in the U.S. in the average levels of health will be inherently misleading. We hold off discussing such differences until models are appropriately specified.

#### Education Gradients and/or Acculturation Processes by Immigrant Group

Before turning to the question of similarity and difference in health statuses, we first consider whether there is group-variation in educational and acculturation gradients that would complicate assessment of health across immigrant groups. We do so in a straightforward manner by estimating 1) two-way interactions between educational attainment and immigrant group to assess variation in educational gradients across immigrant groups, 2) two-way interactions between acculturation and immigrant group, and 3) the three-way interactions between education, acculturation, and immigrant group to fully assess variation in immigrant health dynamics. With a sample in excess of 250,000 cases, the Bayesian Information Criterion (BIC) (Raftery 1995) is particularly suited for arbitrating the value of adding k-way interactions of education, acculturation, and immigrant group.

Table 2 shows the relevant BIC values for logit regression models predicting self-reported ‘fair’ or ‘poor’ health, diagnosed hypertension, diagnosed diabetes, and disability. For each health outcome, a base model that includes dummy variables for each racial and immigrant group (with non-Hispanic whites as the reference category), age, sex, and marital status to account for compositional differences,

educational attainment, and, for immigrant groups, acculturation was estimated and then comparisons via the difference in the BIC with the two two-way interaction models and the three-way models.

To summarize a fair amount of information in a succinct manner, the relevant BIC values for each comparison for each outcome indicates little support for the more complex specifications where the effects of educational attainment and acculturation vary across immigrant group. For example, in the case of diabetes (column 2, Table 2), the BIC value for the base model is 132,857. When the two-way interactions involving educational attainment are added to the model, the BIC value is 133,160. Here, the increase of 303 indicates extremely strong support for the more parsimonious model (Raftery 1995). Similarly, the BIC value for the model including two-way interactions between acculturation and immigrant group (132,941) is also greater than that of the base-line model and again supports the more parsimonious base model. Finally, the three-way model has a BIC value (133,355) much greater than the comparable fit statistics for either two-way interaction model ( $\Delta\text{BIC} = 418$  and  $195$ ). A similar pattern of results appears for the other health outcomes, although the model for the full set of three-way interactions and disability did not converge due to a large number of perfectly determined outcomes (i.e., limited variation on both independent and dependent variables.) Given the overall pattern of the BIC across models and outcomes, we focus attention on the main effects models to address the remaining research questions.

[ Table 2 about here ]

### The Scope of Immigrant Health Differentials

Table 3a shows odds ratios for models predicting self-rated ‘poor’ or ‘fair’ health and diagnosed hypertension, while table 3b reports similar statistics for diagnosed diabetes and disability. The first set of models (1, 3, 5, and 7) includes dummy variables indexing U.S. born racial groups and the 10 immigrant groups, age, sex, marital status, educational attainment, and acculturation. These models specify group differences in health conditional on educational resources that are typically brought to the

United States and acculturation experiences. Thus, they provide an initial lens into the size and scope of immigrant health differentials.

Beginning with self-rated health (model 1), immigrants consistently report better health. Indeed, nine of the ten immigrant groups report significantly better self-rated health compared to non-Hispanic whites, Blacks, American Indians, native born Hispanics, and those identifying as an Other racial or ethnic group. In comparison to non-Hispanic whites, odds ratios range from .52 (Middle Eastern) to .13 (Canada, Oceania, Elsewhere) with immigrants from Mexico, Central America, and the Caribbean having an odds ratio that falls squarely towards the middle (OR = .29). The one exception is Russian immigrants whose self-rated health is not significant different from non-Hispanic whites, yet is still significantly better than U.S. born Hispanics (OR = 1.39), Blacks (OR = 1.70), American Indians (OR = 1.67), and Others (OR = 1.50). It is also worth noting that the general pattern of odds ratios is consistent with almost all other research on self-rated health in that reports of poorer health increase with age, are lower among those married, yet higher among those divorced, are higher among racial and ethnic minorities, are significantly greater among those with low educational attainment and substantially lower among those with high educational attainment, and show small increases for immigrants based on increased length of time in the US.

Turning to model 3, all ten immigrant groups have significantly lower odds of reporting a diagnosis of hypertension in comparison to non-Hispanic whites. Here, odds ratios range from .21 for immigrants from Asia to .43 for immigrants from Russia. Again, Hispanic immigrants are far from unique and again are found towards the middle of the distribution (OR = .34). All immigrant groups also report better health than the U.S. born Hispanics (OR = .98), Blacks (OR = 1.93), American Indians (OR = 1.38), Asians (OR = 1.12), and Other (OR = 1.36) racial and ethnic groups. While there are statistically significant differences among immigrant groups, these differences are small in magnitude and considerably smaller than those seen in comparison to those born in the U.S. Consistent with a number of previous studies, the odds ratios for poorer health are larger at older ages, are smaller among women, are



higher for those with lower educational attainment and lower for those with higher educational attainment, and increases somewhat the longer that immigrants are in the U.S.

[ Table 3a about here ]

All ten immigrant groups also have similarly lower odds of diagnosed diabetes compared with non-Hispanic whites (model 5, table 3b). Here, odds ratios range from .13 (South American and European immigrants) to .64 (Indian subcontinent) with immigrants from Mexico, Central America, and the Caribbean again falling towards the middle of the distribution (.23). In contrast, the odds of diagnosed diabetes are significantly higher for U.S. born Hispanic (OR = 1.68), Black (OR = 1.89), American Indian (OR = 2.18), Asian (OR = 1.22), and Other (OR = 1.46) racial and ethnic groups. As with self-rated health and hypertension, there are increases in risk of diabetes with acculturation. Here, every 10 years spent in the U.S. increases the odds of immigrants reported diagnosed diabetes by 24 percent. The pattern of effects with respect to the other sociodemographic and socioeconomic variables is also consistent with expectations and with prior research.

Finally, all ten immigrant groups have significantly lower odds of disability compared to non-Hispanic whites and, based on formal tests, US born Hispanics (OR = 1.25), African Americans (OR = 1.25), American Indians (OR = 1.66) and those identifying as racial or ethnic Others (OR = 1.63). With the exception of those from Russia, the Middle East, or the Indian subcontinent, immigrants also have significantly better health than U.S. born Asians (OR = .55). In comparison to non-Hispanic Whites, odds ratios range from .04 for immigrants from Canada, Oceania, and Elsewhere to .50 for immigrants from Russia. As with the previous health outcomes, immigrants from Mexico, Central America, and the Caribbean have likelihoods of disability that fall to the middle of the distribution (.15). Formal tests indicate some differences among immigrant groups but these differences are again substantively small and much smaller than those seen in comparisons with those born in the U.S. Acculturation declines in health are also seen with respect to disability where each 10 years that an immigrant spends in the U.S. is associated with a 12 percent increase in the odds of a reported disability. As before, the patterns of

effects for the other variables, such as age, sex, marital status, and education, included in the model are consistent with expectations and substantively similar to those seen in prior health research.

To summarize, after controlling for age, sex, marital status, educational attainment, and acculturation, Hispanic, South American, European, African, Middle Eastern, Asian, Southeast Asian, and Canadian, Oceania, and Elsewhere immigrants have significantly better health than native born non-Hispanic Whites (and African Americans, American Indians, and Hispanics) for all four health outcomes, while Russian immigrants have better health for three of four outcomes. In 39 of 40 cases, immigrants report significantly better health.

[ Table 3b about here ]

#### Accounting for Immigrant Health Dynamics

The final aspect of our assessment of the scope of the immigrant health paradox examines the ability of well-recognized proximal determinants of health to account for health advantages to account for the health disparities that we have identified. These include socioeconomic standing through employment and poverty, risk conditions such as smoking, drinking, and body mass index, and access to health care. These are shown in models 2 and 4 in Table 3a and models 6 and 8 in Table 3b. There are four conclusions.

First, the effects of the explanatory factors on health are generally as expected. Being outside of the labor force and having a low income increase the risk of poor health across all four outcomes, as do higher body mass and smoking. Alcohol consumption is generally associated with better health with the one exception being increased risk of hypertension associated with heavy drinking (OR = 1.13). This may be anticipated given prior research showing variable effects and in the effects of drinking on general health outcomes (e.g., Ross and Wu 1995). Access to health care is associated with better health.

Second, racio-ethnic and educational disparities in health are substantially attenuated. For US born Blacks, American Indians, and Hispanics, the odds ratios showing poorer health relative to non-Hispanic whites all decrease with the inclusion of the more proximal determinants of health and they do

so for all four health outcomes. Likewise, the disadvantages of low educational attainment and the advantages of high educational attainment are substantially reduced for all outcomes. Third and particularly germane to our research questions, the inclusion of more proximal causes of health do virtually nothing to account for acculturation declines in health. In two cases, the acculturation effect increases; in the other two cases, the decrease is trivial.

Finally and perhaps most important, the set of mediating variables also do relatively little to account for health differentials between immigrants and non-Hispanic whites (and by extension other U.S. born racial groups). Of the nine effects showing health advantages for immigrants for self reported health (model 2), the largest decrease in effect size is 16 percent (Southeast Asians) with the majority of effects either decreasing by less than 10 percent or actually increasing in magnitude (including the previously non-significant effect for Russian immigrants). In contrast, the effects for race decline by 17 percent for Hispanics, 29 percent for Blacks, 36 percent for American Indians, 84 percent for Asians, and 25 percent for Others. Similarly, education effects are also attenuated with effects decreasing by 47 to 57 percent.

Explanation is somewhat greater for diagnosed hypertension and diabetes, but even here declines in effect sizes are about half for immigrants groups as they are for education and are typically lower than those seen among U.S. born racial minorities. For diagnosed diabetes (model 4), reductions are small and typically in the neighborhood of 10 percent with the only substantial reductions seen for Asian and Southeast Asian immigrants (> 40 percent). Approximately, 30 and 10 percent of acculturation declines in hypertension and diabetes, respectively, are accounted for by poor employment and poverty, risk behaviors, and limited access to care.

Finally, the inclusion of proximal causes of health does nothing to account for immigrant advantages in disability. In all ten cases, effects increase in size. In contrast, proximal causes of health account for 24 to 59 percent of racial disparities and 82 to 100 percent of educational disparities in disability. We graphically show the changes in odds ratios across models for all the relevant variables in Figure 1.

## Robustness Assessments

We assessed the robustness of our findings in several ways. First, we considered the question of whether age at arrival mattered for immigrant health dynamics. Here, we calculated a measure based on age and length of time in the U.S. and re-examined the models within quantiles of those who arrived as children (less than 18), those who arrived in early adulthood (ages 18 to 35), and those who arrived in older adulthood (age 36 and older). While there was some variation in parameters, the overall pattern of effects was similar to those shown here. Second, given that we do not know specifically where people received their education and this may be consequential for its association with health, we adopt a strategy offered by Zeng and Xie (2004) where we create a proxy measure of place of education based on age, education, and year of immigration. Incorporating a proxy measure of place of education does nothing to alter our interpretations. Third, we adopted several different strategies for measuring and coding “years spent in the US” including retention of the categorical coding in the IHIS raw data files, place marker substitution, and the coding of those U.S. born as “0.” In no case did it fundamentally alter our conclusions. Fourth, we assessed the possibility of age-grading by dividing the sample into younger (less than 35) and older (36 and older) respondents. Again, there is some variation in effects but it is neither large enough nor consistent enough to alter our conclusions. Finally, we restricted the sample to those respondents who reported having a primary place for care to mitigate the possibility that variation in reported hypertension or diabetes is really variation in diagnosis. Again, the results are substantively similar to those shown. All supplementary analyses are available from the first author.

[ Figure 1 about here ]

## DISCUSSION

The results of this research paint a fascinating portrait of immigrant health dynamics in the United States. The consistency of immigrant health dynamics is quite remarkable. Immigrants from regions with very different cultures, very different histories, large differences in average health (e.g., life

expectancy, infant mortality), differences in political and social structures, differences in exposure to disaster, famine, civil war, or other political violence, and differences in economic development have large and robust health advantages. Similarly, consistency in education gradients and acculturation declines and the limited ability of widely acknowledge determinants of health to account for immigrant advantages, determinants that simultaneously play a large role in accounting for racial and educational disparities, are also striking. While there clearly are some differences in the point estimates for particular immigrant groups compared to others, minor differences in slopes for education and acculturation across groups, and small differences in the extent of mediation, such differences seem almost trivial compared to the consistency of uniform differences both with respect to non-Hispanic whites and the prominent U.S. born racial and ethnic groups within the United States. Such consistency is not anticipated by, and may in fact be antithetical to, the emphasis on post-immigration experiences and varied or “segmented” assimilation that characterizes much contemporary immigration scholarship (see discussions in Alba and Nee 2005; Rumbaut 1997; Waters and Jiménez 2005). The same can be said for the health disparities literature where primary attention focuses on paradoxical health among Hispanics (see discussions in Lara et al. 2005) and/or highlights gaps in access or utilization of health care (e.g., Hunt et al. 2004; LeClere et al. 1994). In contrast, the “healthy immigrant” phenomenon (Sorlie et al. 1993) appears to generically and robustly describe the American situation.

Our findings indicate a scope that is too general to accommodate the post-immigration explanations that currently dominate the field. For example, explanations of Latino health emphasize both differences in behavior that mitigate health risks and differences in social networks, particularly strong intergenerational relations, as explanations for health that belie typical socioeconomic position (see discussions in Lara et al. 2004; Palloni and Morenoff 2006). These may indeed be significant traits among Hispanic immigrants and be associated with better health, but seem difficult to accept as explanations when one recognizes that Hispanic immigrants’ health is little different from that of immigrants from South America, Europe, Africa, India, Asia, Southeast Asia, Canada, and so on. Indeed, immigration studies are organized around the idea that different immigrants have different social and

cultural backgrounds, different types of social networks in the United States, and thus have different acculturation experiences (Alba and Nee 2005; Waters and Jiménez 2005). Given the scope, generality, consistency, and resilience to mediation of immigrant health advantages, our findings suggest limits to group-specific explanations.

The acculturation declines that we observe also have significant implications. Much prior work has concluded that there is something toxic about American society that produces declines in immigrant's health with increased acculturation (e.g., Williams 2010). Yet, the nature of such declines and their implications appear more complicated than previously acknowledged. For one, accounting for more direct measures of socioeconomic, behavioral, and experiential acculturation that are widely viewed as more proximal causes of disease do little to explain declines in health that accompany increased exposure to American society. For immigrants and their health, the toxic aspects of US society are not poverty or unemployment, the adoption of vices or poor eating habits that increase weight, or problems accessing health care. Although such factors go a long way in accounting for racial and educational disparities in health, they seem less important for immigrants and paradoxically so. At the same time, the oft-reported health declines with acculturation appear somewhat overstated. Given the size of the effects observed and rate of health decline with acculturation, immigrant groups will have better health than U.S. born non-Hispanic whites decades after arrival and, in some instances, have better health than U.S. born non-Hispanics who have substantially higher educational attainment. Thus, the generic "toxicity" of American society for immigrants seems overstated and its etiology poorly understood.

In the end, the remarkable consistencies in immigrant health dynamics highlight the importance of selection in accounting for immigrant health dynamics. Clearly, we are not the first to bring this issue up and several scholars have offered thoughtful elaborations of the key issues (see for example, Akresh and Frank 2008; Jasso et al. 2004; Palloni and Arias 2004; Palloni and Morenoff 2001). At the same time, such explanations have been rejected "rather hastily" (Palloni and Morenoff 2006: 154) and have "received no more than passing attention as an alternative explanation" (Palloni and Morenoff 2006: 159). As Palloni and Arias (2004: 388) summarize the issue in the Hispanic context,

Hispanic migrants are selected from the origin population for certain traits, including better physical and psychological health. *The population of successful migrants is not a random draw from the health distribution of the origin population. On average, migrants are healthier than those who do not migrate and may be healthier than the average individual in the receiving population* (emphasis added).

This description of selection dynamics could not be more apt for our findings. Given the breadth and consistency of the immigrant health advantage and the independence of the immigrant health advantage from many of the behaviors, processes, and experiences that researchers have identified as proximal causes of health and disease, it would seem that selection into migration trumps many social and cultural differences in countries of origin and moderates exposure to American society, at least in the context of health. Such selection processes seem particularly powerful given that immigration in contemporary America increasingly involves feeder countries in Latin America, the southern hemisphere and Asia where life expectancies are lower and various morbidities significantly higher. Regardless of this, health advantages for those who have immigrated to the U.S. are large and robust.

Although our research uses high-quality and widely used data, there are still a number of limitations. First, there clearly is heterogeneity within the 10 “global regions of birth” that may reveal significant variation in health. Given this, we encourage future research that makes explicit and systematic comparisons across ethnic, racial, and nation-based immigrants within the key regions of the globe. Second, the NHIS interviews were only administered in English and Spanish. This means immigrants who do not speak either of these languages are excluded from the samples. We took this issue seriously and investigated its likely impact by both comparing distributions on key variables (e.g., age, sex, education, income) across the “global region of birth” and examining the extent of “speaking English” in the IHIS and 2000 U.S. Census. Although we did not identify any significant differences between samples, the IHIS immigrant sample may not include the full distribution of immigrants in the U.S.

Third, Jasso and colleagues (2004) quite rightly point out the possibility of cohort effects in immigrant health differentials. We tried several strategies to examine this issue but ultimately such complexities are well beyond the study of immigrant health in the IHIS data, particularly for the multi-group analyses that are the foundation of our work. Although we are not sure that such analyses would substantially alter our conclusions, such questions are important and should be taken seriously as more data becomes available.

Finally, the NHIS data, while methodologically rigorous and widely, are dependent upon self-report and the typical methodological caveats apply. Self-report could lead to social desirability bias or the possibility that immigrants may be less likely to comprehend things like diagnoses which could lead to both under-reporting of specific conditions and a misevaluation of their own health. We have tried to mitigate this by using a variety of health outcomes, but reporting bias is always a possibility.

These caveats acknowledged, the analyses shown present some compelling evidence that immigrant health is even more paradoxical than previously envisioned. In comparison to each other, to those U.S. born, to themselves (or other cohorts) over time, accounting for economic, habit, and the medical-institutional change that comes with acculturation, or based on crude estimates of average health in modal countries of birth, immigrants have better health than we would expect with respect to any of these comparison points. Yet, the similarity of health dynamics across immigrants highlights the “immigration” aspect of immigrant health rather than the economic and cultural differences that immigrants bring with them to the United States or the variation in acculturation and acculturation experiences. As such, the details of the immigration process, details that begin in the sending country, would seem particularly important. Given this, the development of methods that cross borders, make use of policy changes or lottery processes (whether socially or environmentally determined) that introduce randomization into immigration processes, and/or allow for matching in ways that have not been implemented, would seem valuable. Such work may ultimately reveal that immigrant health is not nearly as paradoxical as currently conceived. But resolving the paradox would do well to recognize the remarkable similarities of health and health dynamics across immigrant groups and treat this as the point



of departure for the next generation of theory and research on immigrant health dynamics and their implications for population health and health disparities in the United States.

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## ENDNOTES

1. Several terms have been offered to describe the health dynamics of immigrants to the U.S. These include the "Latino health paradox," the "mortality paradox," the "epidemiological paradox," and the "infant mortality paradox." We recognize differences between the various terms and do not claim to address all their complexities, particularly those associated with mortality differentials. Instead, our objective is to establish a common standard for evaluation and to make systematic assessment across multiple immigrant groups.
2. Health research has used both acculturation and assimilation to refer to health dynamics that accompany increased exposure to American society. For our purposes, acculturation is the "process by which immigrants adopt the attitudes, values, customs, beliefs and behaviors of a new culture" (Abraido-Lanza, Chao, & Florez 2005, p. 1244) and is an outcome that evolves with increased time spent in the U.S.
3. Values for the open-ended top category were coded based on values derived from the 2000 IPUMS-USA Census (Ruggles et al. 2010). Specifically, we cross classified a parallel measure of "global region of birth" based on reported country of birth, the categorical measure of "years in the U.S." for those foreign-born, and the continuous measure of "years in the U.S." The specific values we use are the group specific mean for those who lived in the U.S. "fifteen years or longer." Given that the weighted IHIS samples reflect the population of the U.S. captured in both the decennial censuses and the American Community Surveys, this provides a more precise accounting of the top end of time spent in the U.S. given variation in the composition of immigrant cohorts over the 20<sup>th</sup> century. These results are available from the first author.

4. We examined interactions of race/immigrant group by sex. Few of the parameter estimates were statistically significant and the BIC measure of goodness of fit overwhelmingly favored the more parsimonious models.
5. The poverty ratio measures was the most consistently measured indicator of income in the IHIS data and provided a more fine grained analysis than would have been possible with measures of personal or family income.
6. Our results remain the same when dummy variables indexing 'overweight' ( $25 \leq \text{BMI} \leq 29.9$ ) and 'obese' ( $\text{BMI} \geq 30$ ) are substituted for the continuous measure.
7. In the case of hypertension, the replication analyses are actually particular strong in assessing bias due to variation in contact with health care providers. Diagnosis of hypertension merely requires a blood pressure test which a standard protocol for any medical examination in the U.S. In contrast, a diagnosis of diabetes requires serological examination of glucose or HbA1c.
8. Finch and colleagues (2002) also make a compelling case that the meaning of self-rated health varies by acculturation and hence time spent in the U.S. is an important control variable for such models.
9. Given that odds ratio are derived from a non-linear link function, we translated the odds ratios back into logit coefficients and assessed the change in coefficient across models. Calculation of changes in marginal effects yields similar conclusions.
10. Essentially, this is a three-way interaction of educational attainment, place of education proxy, and immigrant group.
11. With the exception being disability, the inclusion of the foreign-education proxy caused the education gradients for immigrants to flatten somewhat.
12. We formally tested this using the linear combination procedure in Stata 11.1 using estimates from models 1, 3, 5, and 7. Out of the forty tests, there only 12 instances where differences in health would be statistically indistinguishable between immigrants and non-Hispanic whites within 50

years of living in the U.S and there were only 4 instances where differences would be statistically indistinguishable within 30 years.

**Table 1. Descriptive Statistics**

Variable	Immigrant Group based on Global Region of Birth																					
	Full Sample		Mexico, Central America, Caribbean (N=24,522)		South America (N=2,892)		Europe (4,344)		Russia (N=615)		Africa (N=1,295)		Middle East (N=809)		Indian Subcontinent (N=1,685)		Asia (N=2,261)		Southeast Asia (N=3,058)		Canada, Oceania, Other (N=1,154)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
<b>Health Status</b>																						
Self-rated Health (Fair or Poor)	.15	.36	.17	.37	.09	.29	.13	.34	.23	.42	.07	.25	.13	.33	.05	.21	.09	.28	.11	.31	.10	.30
Diagnosed Hypertension	.29	.46	.20	.40	.15	.36	.30	.46	.29	.45	.17	.38	.14	.34	.16	.36	.18	.38	.22	.41	.33	.47
Diagnosed Diabetes	.09	.29	.09	.28	.05	.21	.08	.27	.07	.26	.05	.21	.07	.25	.10	.30	.06	.24	.08	.27	.10	.30
Disability	.02	.15	.02	.13	.00	.07	.02	.16	.07	.25	.00	.07	.02	.15	.01	.09	.01	.12	.02	.13	.01	.11
<b>Sociodemographic Confounders</b>																						
Age (in years)	49.84	18.85	42.37	16.27	44.28	15.37	55.42	19.12	50.72	20.01	39.10	13.48	44.47	16.22	39.90	14.32	46.40	17.69	44.97	15.70	54.53	20.01
Female	.58	.49	.57	.49	.59	.49	.61	.49	.61	.49	.47	.50	.48	.50	.42	.49	.59	.49	.59	.49	.62	.49
Married	.48	.50	.55	.50	.53	.50	.52	.50	.61	.49	.50	.50	.57	.49	.72	.45	.58	.49	.61	.49	.49	.50
Divorced/Separated/Widowed	.29	.45	.21	.41	.24	.43	.32	.47	.27	.44	.18	.39	.19	.39	.08	.27	.17	.38	.16	.36	.32	.47
<b>Race/Ethnicity</b>																						
Hispanic	.17	.37	.91	.28	.85	.36	.04	.20	.00	.03	.03	.18	.01	.07	.00	.05	.01	.08	.01	.08	.04	.19
Black	.14	.35	.09	.29	.07	.26	.03	.17	.00	.03	.71	.46	.00	.03	.00	.05	.00	.06	.00	.05	.02	.14
American Indian	.01	.08	.01	.09	.01	.08	.00	.02	.00	.00	.00	.05	.00	.00	.01	.11	.00	.01	.00	.01	.02	.12
Asian	.04	.19	.01	.09	.04	.20	.01	.08	.00	.04	.03	.17	.02	.15	.92	.27	.93	.25	.96	.19	.07	.25
Other	.02	.15	.08	.27	.07	.25	.01	.10	.00	.00	.03	.16	.00	.07	.00	.05	.01	.11	.01	.12	.02	.15
<b>Educational Attainment</b>																						
Less than High School	.23	.42	.60	.49	.19	.40	.19	.39	.11	.31	.12	.33	.16	.37	.09	.28	.14	.35	.15	.36	.15	.35
Some College	.15	.36	.05	.23	.20	.40	.17	.37	.29	.45	.26	.44	.25	.43	.31	.46	.26	.44	.29	.45	.23	.42
College Graduate	.08	.27	.02	.14	.08	.28	.13	.33	.21	.41	.14	.35	.18	.38	.38	.49	.21	.41	.12	.32	.12	.32
<b>Acculturation</b>																						
Years spent in US for Immigrants (10 year intervals)	4.55	2.15	1.80	1.00	1.64	1.06	3.21	1.31	1.90	1.51	1.36	.97	1.77	.99	1.25	.90	1.82	1.05	1.82	.82	3.12	1.51
Years spent in US by US born - Flag	4.21	2.59	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
<b>Proximal Causes of Health</b>																						
Unemployed	.03	.17	.04	.20	.04	.19	.02	.15	.02	.15	.06	.24	.03	.18	.04	.19	.02	.15	.03	.17	.02	.13
Not in Labor Force	.41	.49	.37	.48	.27	.45	.49	.50	.47	.50	.21	.41	.39	.49	.28	.45	.39	.49	.30	.46	.48	.50
Poverty Ratio	1.98	1.37	2.86	1.24	2.26	1.32	1.75	1.32	2.00	1.40	2.15	1.38	2.06	1.39	1.61	1.42	1.92	1.36	1.79	1.35	1.62	1.32
Body Mass Index	26.64	4.95	27.07	4.51	25.64	4.17	25.93	4.57	25.24	4.48	26.10	4.48	25.46	4.00	24.70	3.49	23.04	3.41	24.01	3.47	25.94	4.53
Abstainer	.47	.50	.61	.49	.46	.50	.38	.49	.48	.50	.60	.49	.61	.49	.64	.48	.60	.49	.59	.49	.39	.49
Moderate Drinker	.57	.50	.68	.47	.57	.50	.50	.50	.57	.50	.69	.46	.71	.45	.71	.46	.66	.47	.66	.47	.51	.50
Heavy Drinker	.16	.36	.09	.29	.09	.29	.21	.41	.11	.31	.08	.27	.05	.22	.07	.25	.08	.28	.07	.25	.22	.42
Light Smoker	.09	.29	.09	.29	.11	.31	.08	.26	.09	.28	.08	.27	.11	.31	.07	.26	.08	.28	.09	.28	.10	.30
Heavy Smoker	.09	.28	.02	.15	.03	.17	.07	.25	.06	.23	.03	.17	.09	.29	.02	.13	.03	.18	.02	.14	.07	.26
Limited Access to Health Care	.07	.25	.08	.28	.08	.28	.05	.22	.07	.26	.09	.29	.08	.28	.04	.20	.04	.19	.03	.18	.05	.21

**Table 2. Bayesian Information Criterion (BIC) Statistics for Model Fit: Assessing Two-way and Three-way Interactions for Immigrant Group, Educational Attainment, and Acculturation, IHIS, 2000-2009.**

	Health Status					
	Self-rated Health	Hypertension	Diabetes	Disability		
Base Model	177,320	243,444	132,857	42,832		
Base Model plus Immigrant Group by Educational Attainment Interactions	177,512	243,734	133,160	43,107		
Base Model plus Immigrant Group by Acculturation Interactions	177,405	243,531	132,941	42,908		
Base Model plus Three-way Interactions of Immigrant Group, Educational Attainment, and Acculturation	177,751	244,030	133,355	DNC		
Note. All models also include controls for period, age, sex, marital status, and race.						



**Table 3a. Adjusted Odds-Ratios: Health Status Regressed on Race/Ethnicity, Immigrant Group, Educational Attainment, Acculturation without and with Controls for other socioeconomic characteristics, socioeconomic attainment, behavioral risk factors, and access to health care, IHIS, 2000-2009.**

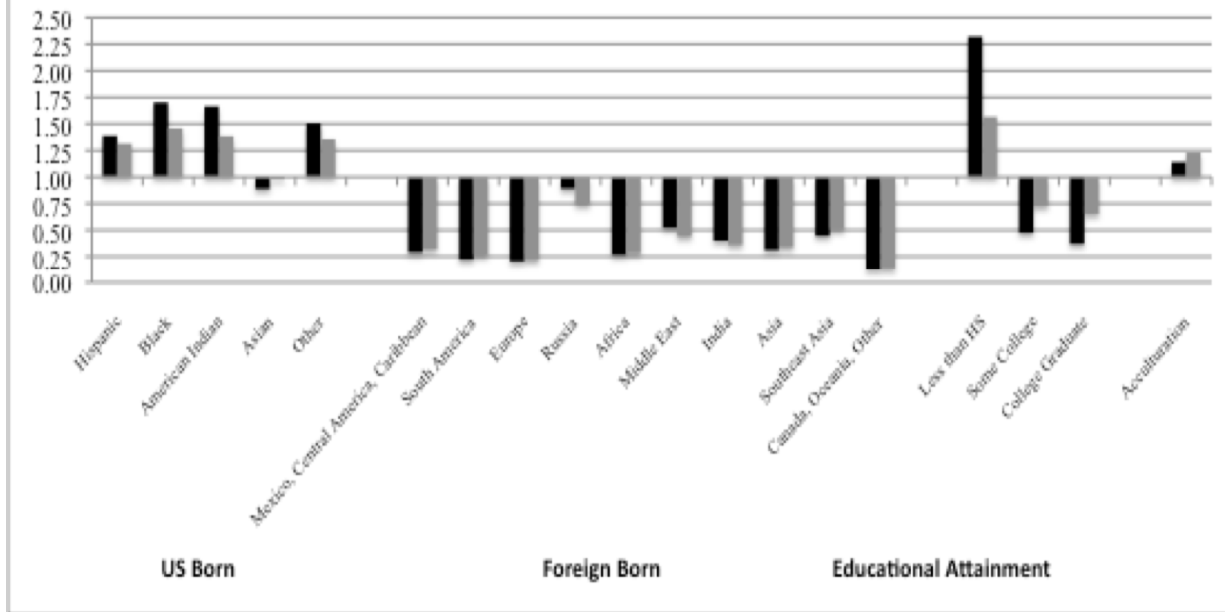
	Self-rated Fair/Poor Health (N=250,591)		Diagnosed Hypertension (N=250,245)	
	Model 1	Model 2	Model 3	Model 4
<b>Age</b>	1.05 (1.05-1.05)	1.04 (1.03-1.04)	1.07 (1.07-1.07)	1.07 (1.07-1.07)
<b>Female</b>	1.02 (.99-1.04)	.79 (.77-.81)	.94 (.92-.96)	.95 (.93-.97)
<b>Married</b>	.90 (.87-.93)	1.11 (1.07-1.16)	1.15 (1.12-1.19)	1.13 (1.09-1.16)
<b>Divorced/Separated</b>	1.15 (1.11-1.20)	1.19 (1.14-1.24)	1.22 (1.18-1.26)	1.2 (1.16-1.24)
<b>Race/Ethnicity</b>				
<i>Hispanic</i>	1.39 (1.33-1.45)	1.31 (1.25-1.38)	.98 (0.94-1.02)	.86 (.93-.97)
<i>Black</i>	1.70 (1.65-1.76)	1.46 (1.41-1.51)	1.93 (1.88-1.99)	1.67 (1.62-1.72)
<i>American Indian</i>	1.67 (1.47-1.89)	1.38 (1.21-1.58)	1.38 (1.23-1.55)	1.21 (1.07-1.36)
<i>Asian</i>	.89 (.77-1.02)	.98 (.85-1.14)	1.12 (1.02-1.25)	1.30 (1.17-1.45)
<i>Other</i>	1.50 (1.40-1.62)	1.36 (1.25-1.47)	1.34 (1.25-1.44)	1.27 (1.18-1.36)
<b>Immigrant Group</b>				
<i>Mexican, Central American, Caribbean</i>	.29 (.26-.33)	.32 (0.28-0.36)	.34 (0.30-0.38)	.44 (.39-.50)
<i>South American</i>	.22 (.19-.27)	.26 (.22-.32)	.24 (.21-.28)	.35 (.29-.41)
<i>European</i>	.20 (.17-.25)	.22 (.18-.26)	.26 (.23-.31)	.35 (.29-.41)
<i>Russian</i>	.89 (.69-1.15)	.74 (.56-.98)	.43 (.34-.55)	.50 (0.39-0.64)
<i>African</i>	.27 (0.21-0.34)	.28 (.22-.37)	.30 (0.25-0.36)	.39 (.32-.47)
<i>Middle Eastern</i>	.52 (.40-.68)	.44 (.34-.58)	.26 (.21-.34)	.32 (.25-.41)
<i>Indian</i>	.40 (.30-.53)	.36 (.27-.48)	.36 (.29-.43)	.43 (.35-.53)
<i>Asian</i>	.31 (.24-.40)	.36 (.27-.48)	.21 (.18-.26)	.32 (.26-.39)
<i>Southeast Asian</i>	.44 (.36-.55)	.51 (.40-.64)	.38 (.32-.45)	.52 (.44-.62)
<i>Canada, Oceania, Other</i>	.13 (.09-.17)	.13 (0.10-0.18)	.27 (.22-.34)	.36 (.29-.44)
<b>Educational Attainment</b>				
<i>Less than highschool</i>	2.32 (2.25-2.39)	1.57 (1.52-1.61)	1.21 (1.18-1.24)	1.09 (1.06-1.12)
<i>Some college</i>	.47 (.45-.50)	.73 (.69-.76)	.76 (0.74-0.79)	.88 (.85-.91)
<i>College graduate</i>	.37 (.35-.39)	.65 (.61-.70)	.74 (0.71-0.77)	.88 (.85-.92)
<b>Acculturation (for those foreign born)</b>	1.14 (1.10-1.19)	1.23 (1.18-1.28)	1.11 (1.07-1.14)	1.07 (1.04-1.11)
<b>Acculturation x Nativity</b>	.76 (.73-.78)	.73 (.70-.75)	.80 (.77-.83)	.84 (.81-.87)
<b>Socioeconomic Attainment</b>				
<i>Unemployed</i>	--- ---	1.29 (1.20-1.39)	--- ---	1.03 (.97-1.10)
<i>Not in labor force</i>	--- ---	3.16 (3.05-3.26)	--- ---	1.32 (1.29-1.36)
<i>Poverty ratio</i>	--- ---	1.22 (1.21-1.24)	--- ---	1.01 (1.00-1.02)
<b>Behavioral Risk Factors</b>				
<i>Body Mass Index</i>	--- ---	1.06 (1.06-1.06)	--- ---	1.11 (1.11-1.12)
<i>Abstainer</i>	--- ---	1.88 (1.78-1.99)	--- ---	1.17 (1.12-1.21)
<i>Moderate Drinker</i>	--- ---	.77 (.73-.82)	--- ---	.92 (.89-.96)
<i>Heavy Drinker</i>	--- ---	.79 (.76-.83)	--- ---	1.13 (1.10-1.17)
<i>Light Smoker</i>	--- ---	1.64 (1.57-1.71)	--- ---	1.08 (1.04-1.12)
<i>Heavy Smoker</i>	--- ---	2.14 (2.06-2.23)	--- ---	1.15 (1.12-1.20)
<b>Access to Medical Care</b>	--- ---	3.22 (3.10-3.35)	--- ---	1.42 (1.36-1.47)

Note. All models include fixed effects for period. Confidence intervals are in parentheses.

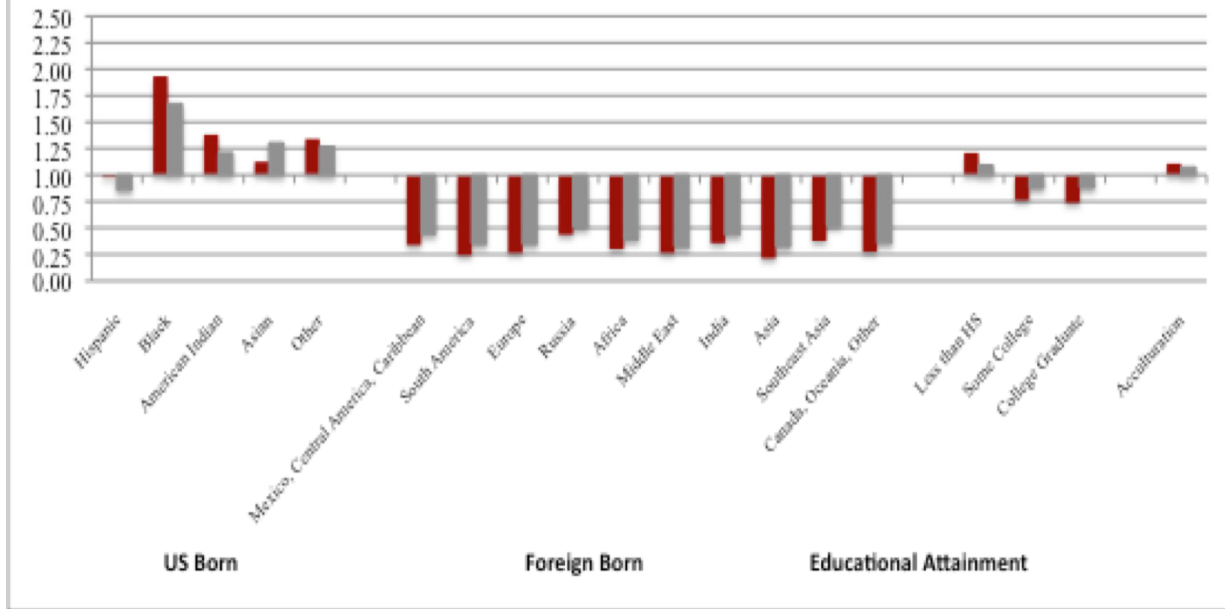
**Table 3b. Adjusted Odds-Ratios: Health Status Regressed on Race/Ethnicity, Immigrant Group, Educational Attainment, Acculturation without and with Controls for other socioeconomic characteristics, socioeconomic attainment, behavioral risk factors, and access to health care, IHIS, 2000-2009.**

	Diagnosed Diabetes (N=250,408)		Disability (N=250,691)	
	Model 5	Model 6	Model 7	Model 8
<b>Age</b>	1.06 (1.06-1.06)	1.06 (1.05-1.06)	1.08 (1.08-1.09)	1.05 (1.05-1.06)
<b>Female</b>	.84 (.82-.87)	.69 (.67-.71)	1.19 (1.12-1.27)	.90 (.84-.96)
<b>Married</b>	1.28 (1.22-1.35)	1.23 (1.17-1.30)	.56 (.50-.62)	.66 (.59-.73)
<b>Divorced/Separated</b>	1.23 (1.16-1.29)	1.18 (1.12-1.25)	.78 (.71-.87)	.88 (.79-.98)
<b>Race/Ethnicity</b>				
<i>Hispanic</i>	1.68 (1.59-1.77)	1.49 (1.41-1.58)	1.25 (1.10-1.42)	1.10 (.96-1.25)
<i>Black</i>	1.89 (1.82-1.97)	1.50 (1.44-1.56)	1.66 (1.53-1.80)	1.37 (1.27-1.49)
<i>American Indian</i>	2.18 (1.89-2.51)	1.87 (1.61-2.17)	1.75 (1.27-2.41)	1.42 (1.02-1.96)
<i>Asian</i>	1.22 (1.05-1.42)	1.41 (1.21-1.64)	.55 (.36-.85)	.52 (.34-.82)
<i>Other</i>	1.46 (1.33-1.60)	1.35 (1.22-1.49)	1.63 (1.34-1.98)	1.45 (1.19-1.76)
<b>Immigrant Group</b>				
<i>Mexican, Central American, Caribbean</i>	.23 (.20-.28)	.30 (.25-.36)	.15 (.10-.24)	.13 (.09-.21)
<i>South American</i>	.13 (.10-.17)	.19 (.15-.24)	.05 (.03-.11)	.05 (.03-.11)
<i>European</i>	.13 (.10-.17)	.19 (.15-.19)	.12 (.07-.22)	.10 (.06-.19)
<i>Russian</i>	.26 (.18-.37)	.26 (.18-.38)	.50 (.27-.94)	.30 (.16-.55)
<i>African</i>	.33 (.25-.43)	.40 (.31-.53)	.13 (.06-0.30)	.12 (.05-.28)
<i>Middle Eastern</i>	.25 (.17-.36)	.27 (.19-.40)	.42 (.22-.79)	.30 (.16-.56)
<i>Indian</i>	.64 (.49-.84)	.73 (.55-.96)	.30 (.12-.73)	.22 (.09-.54)
<i>Asian</i>	.19 (.14-.25)	.28 (.21-.38)	.22 (.11-.46)	.18 (.08-.37)
<i>Southeast Asian</i>	.32 (.25-.42)	.43 (.33-.56)	.32 (.16-.63)	.26 (.13-.52)
<i>Canada, Oceania, Other</i>	.14 (.10-.20)	.20 (.14-.28)	.04 (.02-0.10)	.03 (.01-0.08)
<b>Educational Attainment</b>				
<i>Less than highschool</i>	1.31 (1.27-1.36)	1.09 (1.05-1.13)	1.59 (1.48-1.70)	1.09 (1.01-1.17)
<i>Some college</i>	.68 (.65-.72)	.86 (.82-.91)	.64 (.56-.72)	.96 (0.85-1.09)
<i>College graduate</i>	.67 (.63-.71)	.90 (.84-.96)	.59 (.50-.69)	1.01 (.86-1.19)
<b>Acculturation (for those foreign born)</b>	1.24 (1.18-1.31)	1.21 (1.15-1.28)	1.12 (.99-1.27)	1.21 (1.07-1.38)
<b>Acculturation x Nativity</b>	.70 (.67-.74)	.73 (.69-.77)	.70 (.62-.79)	.65 (.58-.74)
<b>Socioeconomic Attainment</b>				
<i>Unemployed</i>	--- (.97-1.18)	1.07 (.97-1.18)	--- (1.48-1.70)	1.60 (1.08-2.38)
<i>Not in labor force</i>	--- (1.39-1.51)	1.45 (1.39-1.51)	--- (12.20-16.18)	14.05 (12.20-16.18)
<i>Poverty ratio</i>	--- (1.01-1.04)	1.03 (1.01-1.04)	--- (1.08-1.16)	1.12 (1.08-1.16)
<b>Behavioral Risk Factors</b>				
<i>Body Mass Index</i>	--- (1.12-1.13)	1.13 (1.12-1.13)	--- (1.00-1.02)	1.01 (1.00-1.02)
<i>Abstainer</i>	--- (1.89-2.15)	2.01 (1.89-2.15)	--- (2.27-3.25)	2.72 (2.27-3.25)
<i>Moderate Drinker</i>	--- (.63-.72)	.67 (.63-.72)	--- (.56-.83)	.68 (.56-.83)
<i>Heavy Drinker</i>	--- (.58-.65)	.61 (.58-.65)	--- (.55-.74)	.64 (.55-.74)
<i>Light Smoker</i>	--- (1.07-1.19)	1.13 (1.07-1.19)	--- (1.09-1.37)	1.22 (1.09-1.37)
<i>Heavy Smoker</i>	--- (1.19-1.32)	1.25 (1.19-1.32)	--- (1.18-1.47)	1.32 (1.18-1.47)
<b>Access to Medical Care</b>	--- (1.52-1.69)	1.60 (1.52-1.69)	--- (1.73-2.11)	1.91 (1.73-2.11)
<b>Note. All models include fixed effects for period. Confidence intervals are in parentheses.</b>				

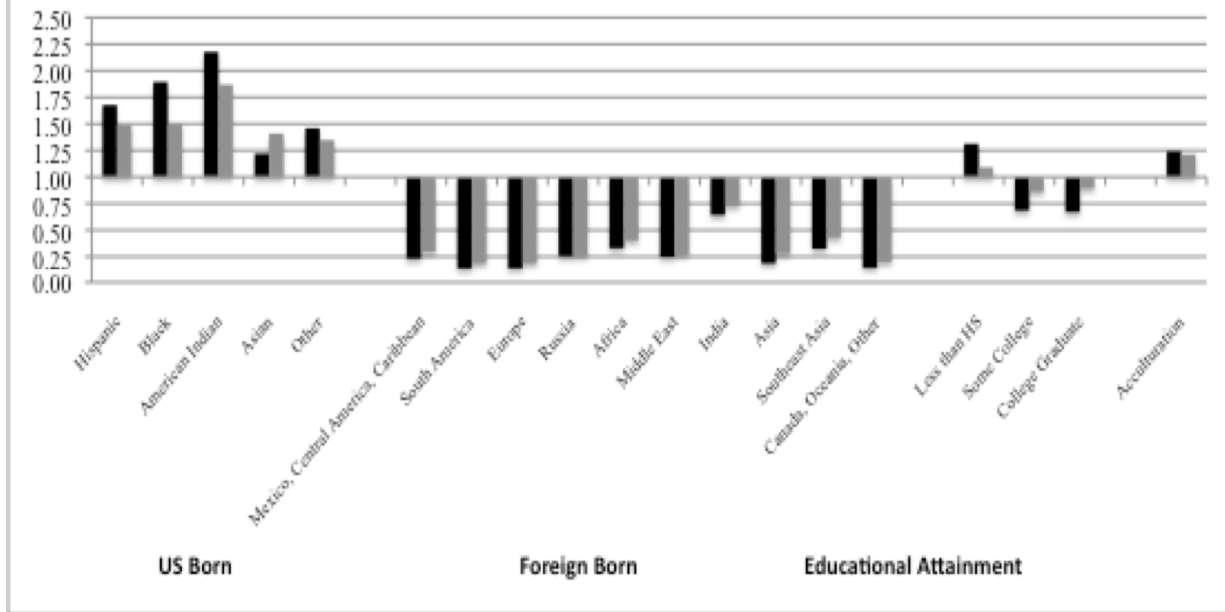
**Figure 1a. Odds Ratios for Self-rated Health**



**Figure 1b. Odds Ratios for Diagnosed Hypertension.**



**Figure 1c. Odds Ratios for Diagnosed Diabetes.**



**Figure 1d. Odds Ratios for Disability.**

