Paradox Regained:

Immigrant Health in 21st Century United States*

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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 both 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. Using data from the 2000-2006 Integrated Health Interview Series, we assess the immigrant health paradox in four ways. First, we conduct a systematic assessment of the health of 10 immigrant groups defined in terms of global region of birth. Second, we examine similarity and difference in health by education gradients and assimilation trajectories across immigrant groups. Third, we assess the ability of widely recognized explanatory factors to account for health differences across immigrant groups, educational gradients, and assimilation effects. Finally, we assess the overall implications of immigrant health dynamics for health disparities in the United States. Across four health outcomes, there is remarkable similarity in health advantages, consistency in both educational gradients and detrimental acculturation trajectories, limited ability of the explanatory factors to account for the immigrant health advantage, and enduring differences in health statuses even among those with long tenures in the United States. As these findings highlight the significance of healthy immigrant selection, we discuss implications for 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). During this time, an impressive body of work has emerged that highlights the apparent "paradox" of immigrant health. In one respect, immigrants typically have better health statuses than would be expected given their socioeconomic standing in U.S. society (Padilla, Boardman, Hummer, and Espitia 2002; Palloni and Arias 2004) and the average health status in their sending country (Jasso et al. 2004). In another respect, equally compelling evidence suggests that immigrant health declines over time. Here, 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; Aravena, and Hummer 2005; Cho, Frisbie, Hummer, and Rogers 2004; Lara et al. 2005; LeClere, Jensen, and Biddlecom 1994; Lopez-Gonzales). This is also 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 a fascinating lens into 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 and necessary contributions to the question of the immigrant health paradox. First, evidence on immigrant health advantages and subsequent declines with increased exposure to U.S. society is primarily based on Hispanic immigrants. While Hispanics are clearly an important facet of the immigrant health issue, the late 20th and early 21st centuries have seen dramatic growth in both the Hispanic and non-Hispanic immigrant

2

population, with the latter including increasing numbers of Asian, Southeast Asian, Indian and Pakistani, and African immigrants (see Figure 1). The increasing prevalence of such groups necessitates further systematic analysis to fully understand both immigrant health as a demographic phenomenon and the scope and extent of the immigrant health paradox.

Second, assessment of immigrant health requires simultaneous and comparative assessment of immigrant health dynamics. This includes both socioeconomic gradients in health and assimilation trajectories. Such dynamics have yet to be investigated, particularly in a systematic manner with high quality data that allow for comparisons across multiple immigrant groups. Third, research on health disparities highlights the endogenous factors, such as risk behaviors and access to health care, that translate socioeconomic, racial, ethnic, and sex differences in differential health outcomes (see Chang and Lauderdale 2009; Link and Phelan 1995, 1996; Ross and Wu 1995). In contrast, immigrant health research has not broadly and systematically examined such factors and what they mean for health differentials between the various 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 "WASP" comparator bias in traditional assimilation research (Alba an Nee 2005).

[Figure 1 about here]

PARADOX ELABORATED

The paradox of immigrant health[1] involves three dimensions. First, historically, immigrants have entered the United States with limited human capital and then embarked on a

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[1] Several terms have been offered to describe the health dynamics of immigrants to the US. These include the "Latino (or Cuban or Mexican or Mexican American) health paradox," the "mortality paradox," the

3

multi-year, multi-generational practice of education, occupational, and income attainment (Alba and Nee 1997, 2005; Gordon 1964; Lieberson 1981; Massey 1981; Portes 1997; Warner and Srole 1957; Waters and Jiménez 2005). Given this, any observed health advantages among immigrants seem antithetical to their modal socioeconomic position (Lara et al. 2005) and belie arguments about the "fundamental causes" of health disparities lying in educational, economic, and social disparities (Link and Phelan 1995, 1996).

Research on immigrant health spans several fields and varies in both scope and quality. In one respect, extensive research on Hispanic immigrants shows health advantages across a range of outcomes and across the life span (Lara et al. 2005). Indeed the idea of an immigrant health paradox is often synonymous with Hispanic immigrants, particularly in the U.S. context (Abraido-Lanza et al. 1999; Abraido-Lanza et al. 2005; Elo et al. 2004; Eschbach and Stimpson 2007; Franzini, Ribble, and Keddie 2001; Hummer et al. 2007; Hunt et al. 2003; Markides and Coreil 1986; Palloni and Arias 2004; Patel et al. 2004; Sundquist and Winkleby 1999).

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 (see for example, Frisbie, Cho, and Hummer 2001). Here, the scope of such work is somewhat limited and typically does not account for major cultural, biographical, and the circumstances of immigration differences, particularly those between Central and Southeast Asian immigrants. A small body of work on Arab immigrants has produced few conclusive results (El-Sayed and Galea 2009; Read, Amick, and Donato 2005; Salari 2002), such that El-Sayed and Galea's (2009) systematic review concluded that "there is little consensus about the

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"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.

4

relative burdens of CVD [cardiovascular disease] or diabetes, …little information about the

prevalence of cancers or common mental disorders…, [and 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, unlike for many other immigrant groups" (p. 1). In the end, there have been few, if

any, attempts to compare health systematically across multiple immigrant groups and, equally

important, there have been no attempts to make such comparisons in relation to the multiple U.S.

born racial and ethnic groups who have very different health statuses. As a result, the scope of

the paradoxical nature of immigrant health and its explanation are unknown.

Second, there is evidence that acculturation to American culture is associated with

declines in the health status of immigrants.[2] The paradox of such dynamics lies in the fact that

acculturation is typically associated with increases in socioeconomic standing and economic

resources (Alba and Nee 2005; Hirschman 1983; LaLonde and Topel 1991; Rumbaut 1997;

Waters and Jiménez 2005) and with improved access to health care and increased utilization of

medical services (Chesney et al. 1982; Clark 2002; Elder et al. 1991; Granados et al. 2001; Hu et

al. 1986; Thamer et al. 1997). Yet, even in the face of such health-promoting experiences, health

among immigrants tends to decline over time, with increasing prevalence of hypertension

(Steffen et al. 2006), other cardiovascular disease (Anderson and McNeilly 1993; Espino and

Maldonado 1990; Hazuda 1996; Marmot 1983), diabetes (Fujimoto 1992; Myers and Rodriguez

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[2] Health research has used both acculturation and assimilation to refer to health dynamics that accompany increased exposure to American society. For the purposes of this study, acculturation can be seen as 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 US.

2003; Thomson 2009), and some types of cancers (American Cancer Society 2006; Honda 2004; Kim and Menon 2009; Meyers and Rodriquez 2003; Sohn & Harada 2005).

Although it is clearly paradoxical that health tends to decline in the face of an accumulation of factors that should improve it, the scope of such work is again not large and is generally confined to Hispanic immigrants. 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 ultimately 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.

Third, it is unclear whether the traditional and commonly used explanatory variables in health and health disparity research account for the immigrant health differences, socioeconomic gradients in health among immigrants, or acculturation declines. Importantly, research on health disparities views the mechanisms that link social status and social dynamics to health outcomes as key explanatory factors. Rothman, Greenland, and Lash (2008), for example, describe the goals of modern epidemiology as understanding the links between social conditions, statuses, and experiences and the more proximal causes of disease (see also, Link and Phelan 1995, 1996; Oakes and Kaufman 2006). Given the typical focus on socioeconomic status as the distal causal and particular resources, exposures, behaviors, and experiences as the proximal determinants of health disparities, examination of immigrant health dynamics should follow suit.

Although a number of facets of socioeconomic attainment are important for health (Oakes and Rossi 2003), educational attainment is particularly significant for immigrants. In one respect, educational attainment is among the most powerful and robust predictors of health (Feinstein 1993; Feldman et al. 1989; Frisbie, Cho, and Hummer 2001; Kitagawa and Hauser 1973; Pappas et al. 1993; Robert and House 1994; Ross and Wu 1995). At the same time, educational attainment, due to its occurrence relatively early in the life course, is a dimension of socioeconomic attainment somewhat fixed in the lives of immigrants, yet also a key determinant of subsequent socioeconomic attainment in the acculturation process. Few adult immigrants gain significantly more formal education in their host countries, while economic assimilation in the form of wages and occupations is a central component of assimilation processes (Alba and Nee 2005; Lieberson 1981; Portes 1997; Waters and Jiménez 2005). Although there is relatively little research that examines the education-health relationship among immigrants, recent research suggests that education may exert different influences on health depending upon both race and nativity (Kimbro, Bzostek, Goldman, and Rodriguez 2008). In the end, education gradients in health among immigrants have not been subject to systematic investigation, yet should have profound implications for health and may be important for understanding the paradoxical nature of immigrant health.

Equally important, the mechanisms that link education to health among immigrants need to be understood. Ross and Wu's (1995) seminal research identified 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; Dubowitz et al. 2007; Finch, Do, Frank, and Seeman, 2009; Mainous et al. 2006; Marin and Posner 1995; Park, Myers, Kao, and Min 2009; Perez-Escamilla 2009; Warner et al. 2010; Weicha 1996) and psycho-social stress associated with difficulties in cultural adaptation (Balls Organista, Organista, and Kurasaki 2003; Cook, Alegria, and Guo 2009; Oppedal, Røysamb, and Sam 2004) and discrimination (Finch, Kolody, and Vega 2000; Finch and Vega 2003; Gee 2008; Lauderdale 2006; Mossakowski 2003; Viruell-Fuentesa 2007; 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 would be reinforced.

Together, health disparities both across immigrant groups and in relation to fundamental social resources that they bring to their host country, apparent acculturation declines, and the question of whether socioeconomic attainment, risk behaviors, and health care access and utilization, can account for difference in health across immigrant groups or in relation to those U.S. born, are the fundamental features of immigrant health dynamics. They also outline the multiple dimensions of the immigrant health paradox in U.S. society. As such, they provide a foundation for systematic empirical investigation. Such investigation is all the more necessary given the growth and rapid change in the composition of U.S. immigrants and limitations in prior research. With important gains accruing from further assessment of the scope and nature of immigrant health, we focus on four 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 key explanatory factors such as employment and income, risk conditions, and access to and utilization of health care account for immigrant health differentials and dynamics?

4) How do immigrant health dynamics, particularly acculturation, translate into health disparities?

DATA, MEASURES, AND METHODS

Data

The data are from the Integrated Health Interview Series (IHIS), harmonized data, and documentation (Minnesota Population Center and State Health Access Data Assistance Center 2010) based on the public use files of the National Health Interview Survey (NHIS). Conducted continuously since 1957, 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). 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. After 1997, one sample adult was randomly selected to be the subject for a Sample Adult questionnaire. The annual response rate for the sample selected is close to 90% of eligible households. Given specific interest in comparisons across multiple immigrant groups, particularly adults, our analytic sample includes pooled

surveys spanning 2000 to 2006 and is restricted to those 18 years of age and older. Sample sizes range from 199,906 to 202,898 adult respondents, depending upon the health outcome being modeled.

Measures

Immigrant Groups

Immigrants are grouped by global region of birth based on the CIA World Fact Book classification. These include the "Mexico, Central America, and the Caribbean Islands" [hereafter "Hispanic"], "South America," "Europe," "Russia (and former USSR areas)," "Africa," "Middle East," "Indian Subcontinent," "Asia," "Southeast Asia," "Canada, Oceania, and Elsewhere,"[3] and "Unknown." The size of the immigrant subsamples vary from 516 (Russia and former USSR areas) to 20,223 (Hispanic) with more than 2,000 respondents from each of South America, Europe, and Southeast Asia and 900 respondents or more from each of Africa, the Indian subcontinent, Asia, and Canada, Oceania, and Elsewhere. 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=92). While there clearly is nation-level heterogeneity within each region, preliminary investigation showed significant variation in both nation-level life expectancy and infant mortality across regions (results available from the first author). Moreover, the 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

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[3] Due to confidentiality concerns, Canadian immigrants were categorized as "Elsewhere." Examination of a parallel measure of "global region of birth" using data from the 2000 Census (Ruggles et al. 2010) showed that Canadians accounted for the vast majority of the "Elsewhere" category, followed by those from Oceanic nations such as Australia and New Zealand. Hence, we label this group "Canada, Oceania, and Elsewhere."

the need for broader assessment of immigrant health dynamics and the intrinsic problem of increasingly small samples that come from analyses of immigrants 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," "African Americans," "American Indians," "Asians," "Other," and "Hispanics."

Focal Explanatory Variables

Educational Attainment. Although there are a number of ways to measure socioeconomic status for health research (Oakes & Rossi 2003), we focus on 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 somewhat static and characteristic of the resource set immigrant adults likely have when they arrive.[4] Third, its typical order and timing in the life course make it a proximal cause of subsequent resources (e.g., income) and consequent behaviors (e.g., risk behaviors, health care utilization), which can be directly modeled. Educational attainment ranges from 'less than high school graduate/GED' coded 1, to 'graduate or professional degree' coded 4.

Acculturation. In health research, acculturation takes a variety of forms, including socioeconomic (Marks et al. 1987), linguistic (Stein and Fox 1990), and even dietary dimensions

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[4] We assessed the reasonableness of this assumption using data from the five percent file of the 2000 Census (Ruggles et al. 2010). Specifically, we regressed educational attainment on an interval measure of "years in the United States" (ranging from 1 to 5) conditional on age while restricting the sample to all immigrants who arrived in the US as adults (18 years old or older). While positive and statistically significant, the relevant coefficient was very small ($b = .033$, $\beta = .012$) and would not have been statistically significant were the sample not almost a million cases (966,874). Given this, we view our assumption as more than reasonable.

(Akresh 2007). Here, we focus on the more general measure of exposure to American culture, which we assume is at least a partial determinant of the more direct measures of acculturation. This is indexed using the total number of years spent in the United States (ranging from 'less than five years' coded 2.5 to '15 or more years,' where codes varied depending upon immigrant group).[5] In addition to its intuitive logic, the latter operationalization has been used in a number of high quality studies (Angel, Buckley, and Sakamoto 2001; Antecol and Bedard 2006; Cho, Frisbie, Hummer, and Rogers 2004; Frisbie, Cho, and Hummer 2004; Goel et al. 2004; LeClere, Jensen, and Biddlecom 1994; Mooteri, Petersen, Daqubati, and Pai 2004). Moreover, as we discuss below, we incorporate more direct indicators of both positive and negative acculturation as factors that should account for the effects of exposure to American society directly indexed through years spent in the United States.

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) and sex with 'females' coded 1, two key determinants of the likelihood of immigration.[6] Although it is more ambiguous as to whether marital status should be considered an exogenous or endogenous to immigration processes, we treat it as exogenous and hence include both being "married" and being "divorced, separated, or widowed" as control variables.

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[5] 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 US" for those foreign-born, and the continuous measure of "years in the US." The specific values we use are the group specific mean for those who lived in the US "fifteen years or longer." These results are available from the first author.

[6] Given that some argue for important contingencies between sex and immigrant group (e.g., Read and Gorman 2006), we examined interactions of race/immigrant group by sex. Few of the parameter estimates were statistically significant and goodness of fit, notably the BIC statistic, overwhelmingly favored the more parsimonious models.

Mediating Variables

Employment and Income. A first set of potential mediating variables index socioeconomic attainment at the time of survey and hence directly measure post-immigration resources. Employment status differentiates those "unemployed" or "not in the labor force" (e.g., in school, retired) from those employed. We also measure income and income deprivation resource in terms of the ratio of household income relative to poverty threshold (ranging from 1 = 5.0 or greater to 14 = less than .50).

Risk Conditions. Epidemiological research has long recognized the impact of risk conditions on health outcomes and health trajectories (Lantz et al. 2001). 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 (U.S. Department of Health and Human Services 2001). Although there are defined cut-offs for excess weight (Gallagher et al. 1996), these cutoffs are ultimately quite arbitrary and thus we include BMI as a continuous measure.[7] 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), "moderate drinkers" (reference category), and "heavy drinkers" (more than 3.5 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

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[7] Our results remain the same when dummy variables indexing 'overweight' (25 >= BMI >=29.9) and 'obese' (BMI >= 30) are substituted for the continuous measure.

(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, coronary heart disease, emphysema, and hypertension

(/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 who can afford health care, a

conceptualization consistent with expectations from the immigrant assimilation literature (Lara et

al. 2005).

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-Reported Health. First, self-reported health asks respondents to indicate their own health

status ranging on a five-point scale from excellent to poor. Consistent with much prior work (see

for example, Ross and Wu 1995), we recode information to index those who report "poor" health

compared to those who report better health. There is wide 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).

Diabetes. We also looked at whether the respondent has ever been diagnosed with diabetes by a health profession. While this measure has some limitations given that it requires a doctor's diagnosis, which implies health care access, 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 (Task Force on Community Preventive Services 2002).

Hypertension. As another aspect of significant aspect of chronic disease, we considered whether the respondent has ever been diagnosed with hypertension by a health professional. Again this type of measure has some limitations in that it requires some access to health care, yet hypertension is a complimentary measure of health standing that indexes both an increasingly prevalent health condition and a leading cause of death in the United States (Hyduk et al. 2005).

Severe Mental Distress. A final health outcome is "severe psychological distress." This is measured through a series of questions asking how often, during the 30 days prior to the survey, has the respondent felt (1) so sad that noting could cheer you up, (2) nervous, (3) restless or fidgety, (4) hopeless, (5) that everything was an effort, (6) worthless. The respondent would answer on a 0-4 point scale with 0 for 'none of the time' and 4 for 'all of the time.' Using the "Kessler" cut-off, the respondent is defined as likely to be experiencing severe mental illness if the sum of the scores was 13 or greater (coded 1).

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 the "immigrant health paradox," Hispanic immigrants are clear outliers with respect to educational attainment in that they have the lowest educational attainment among all immigrant groups (1.5). This is lower than any of the native-born groups, including African Americans (1.94) and American Indians (1.8). In comparison to other immigrant groups, the differences are even greater: South American immigrants have the next lowest educational attainment (2.15), while immigrants from Asia (2.58), Russia (2.64), and the Indian subcontinent (3.03) have the highest educational attainment. In general, immigrants have higher educational attainment than those U.S. born, with the exception being native-born Asians, the "model minority" (Kao and Thompson 2003). 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 Hispanics 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 (12.20 and 13.35, respectively). Other immigrants have typically spent between 16 and 18 years in the United States. Not surprisingly, European immigrants and those from Canada, Oceania, and Elsewhere have the longest average tenure (30.92 and 29.77 years, respectively). Given research showing health declines associated with longer time spent in the

16

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.

Finally, it is clear from the mean values on the health outcomes that there is a pattern of

immigrant advantage. Yet, given variation in educational attainment and acculturation just

discussed, 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.

Contingencies in Education Gradients and/or Acculturation Processes by Immigrant Group

Given these patterns, a first question we address is the consistency of health dynamics

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 200,000 cases, the Bayesian Information Criterion (BIC) (Raftery 1995) and Akaike

Information Criterion (AIC) (1974) are complementary statistics for arbitrating the value of

adding k-way interactions of education, acculturation, and immigrant group.

[Table 2 about here]

Table 2 shows the relevant BIC and AIC values for logistic regression models predicting

self-reported 'poor' health, diagnosed diabetes, hypertension, and severe mental distress. For

17

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 BIC and AIC made 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 105,812. When the two-way interactions involving educational attainment are added to the model, the BIC value is 105,948. Here, the increase of 136 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 (105,892) 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 (106,143) much greater than the comparable fit statistics for either two-way interaction model (ΔBIC = 195 and 251). A similar pattern of results appears for the other health outcomes.

In contrast, the less conservative AIC measure produces more mixed support for the interaction models. Specifically, it suggests moderate support for education by immigrant group contingency models for severe psychological distress and weak support for self-reported health, diabetes, and hypertension. For the acculturation models, the AIC suggests weak support for the same health outcomes, but no support for psychological distress (ΔAIC = 4). For the three-way interaction models, there is no clear pattern of support as almost all differences in AIC are small

and four of the eight are positive. In the end, the degree of support for group based contingencies in education and acculturation by the AIC is quite weak and suggests, when tested as a set, evidence in favor of the more parsimonious common effects models. Given this, we focus attention on the main effects models to address the remaining research questions.[8]

[Table 3 about here]

Assessing the Scope of Immigrant Health Differentials

Table 3 shows coefficients for models predicting self-reported 'poor' health, diagnosed diabetes, diagnosed hypertension, and mental distress. 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 independent of acculturation experiences and thus provide an initial lens into the size and scope of immigrant health differentials.

Beginning with self-reported health (model 1), immigrants consistently report better health. For example, the odds of reporting poor health are 56 percent lower among Hispanic immigrants ($e^{-.824} = .44$), 69 percent lower among immigrants from Europe ($e^{-1.184} = .31$) and 80 percent lower among those from Canada, Oceania, or Elsewhere ($e^{-1.623} = .20$). Six of the ten immigrant groups report significantly better health in comparison to those U.S. born, while three groups report health comparable to non-Hispanic whites. Only immigrants from Russia report significantly poorer self-rated health ($e^{.659} = 1.93$).

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[8] Clearly, our strategy is more conservative and more in line with the evidence from the BIC statistic. As Hauser (1995: 177) notes, "…people are uncomfortable with this kind of conservatism-with or without the legitimation of the BIC approximation-even though its rewards are likely to include both scientific parsimony and external validity…BIC not only tells us which "significant" findings should be ignored but which should have been pursued most seriously."

With respect to diagnosed diabetes (model 3), nine of ten immigrant groups report significantly lower likelihoods. Here, odds ratios range from 40 percent lower for African ($e^{-.505}$ = 0.60)) to 79 percent lower for South American ($e^{-1.554}$ = 0.21) immigrants. The outlier group among immigrants is those from the Indian subcontinent who have diagnosed rates of diabetes similar to that of non-Hispanic whites. Immigrants also have similarly lower odds of diagnosed hypertension (model 5). Here, all immigrant groups have lower likelihoods with odds ratios ranging from .30 for Russian ($e^{-.351}$ = 0.70) to .60 for Asian ($e^{-.928}$ = 0.40) immigrants. Finally, eight of ten immigrant groups have significantly lower odds of severe mental distress. Here, odds ratios range from .40 for immigrants from South America ($e^{-.513}$ = 0.60) to .73 for immigrants from Canada, Oceania, and Elsewhere ($e^{-1.323}$ = 0.27). To summarize, after controlling for age, sex, marital status, educational attainment, and acculturation, Hispanic, South American, European, African, 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 Asian immigrant have better health for three of four outcomes. Russian, Middle Eastern, and Indian immigrants have significantly better health for two health outcomes.

As an equally consequential issue, patterns of health disparities by race and ethnicity, education and assimilation declines are also salient. In the former case, the oft-cited pattern of racial disparities is also seen. In the case of self-rated health, African Americans have 1.43 times ($e^{.360}$ = 1.57) and American Indians have twice the odds of reporting poor health ($e^{.723}$ = 2.06). African Americans and American Indians have significantly higher odds of diabetes and hypertension, and American Indians have significantly higher odds of severe psychological distress. In terms of education, each increase in degree attainment decreases the odds of self-

20

reported 'poor' health by 56 percent ($e^{-.825}$ = 0.44), the odds of diabetes by 23 percent ($e^{-.259}$ = 0.77), the odds of hypertension by 16 percent ($e^{-.179}$ = 0.84), and the odds of severe mental distress by 49 percent ($e^{-.678}$ = 0.51). With respect to acculturation, each year spent in the United States increases the odds of reporting poor health by 2.6 percent ($e^{.026}$ = 1.03), the odds of diabetes by 3 percent ($e^{.030}$ = 1.03), the odds of hypertension by 1.6 percent ($e^{.016}$ = 1.16), and the odds of severe psychological distress by 2 percent ($e^{.020}$ = 1.02). Both are clearly important features of immigrant health dynamics and are important engines of health status and health trajectories among immigrants.

Accounting for Immigrant Health Dynamics

Models 2, 4, 6, and 8 in Table 3 include a block of variables that are central explanatory factors in health disparities research. These include socioeconomic standing through employment and poverty, risk conditions such as smoking, drinking, and body mass index, and access to health care. There are five conclusions. First, the effects of the explanatory factors on health are generally as expected. Being outside of the labor force and low income increase the risk of poor health, as do smoking and excess weight increase risk (and alcohol consumption shows the same U-shaped pattern seen in other research (e.g., Ross and Wu 1995). Access to health care improves health. Second, racial disparities in health are substantially attenuated. For example, the effect of being African American (relative to non-Hispanic whites) for self-reported 'poor' health is reduced by 54 percent ([.360-.167]/.360), while difference between American Indians and non-Hispanic whites declines by 35 percent ([.723-.467]/.723). The size of the declines varies across outcomes but declines are seen across all outcomes. Third, the set of mediating variables also substantially reduce educational differences in health. For all outcomes,

the educational disparities are reduced by over 50 percent. Fourth and more germane to our research questions, the set of explanatory factors do virtually nothing to account for acculturation declines in health. In two cases, the acculturation effect increases; in the other two cases, the effects decrease by approximately 10 percent. Finally and perhaps most important, the set of mediating variables do little to account for health differentials between immigrants and non-Hispanic whites (and by extension other U.S. born racial groups). Of the six significant differences for self reported health, four of them increase in size, two (South American and African) declines marginally, and the previously non-significant effect for immigrants from the Indian subcontinent becomes marginally significant. For diabetes, reductions are small and typically in the neighborhood of 10 percent. While there are more consistent reductions in the size of the coefficients for diagnosed hypertension and severe mental distress, the magnitude of the reductions is small in all cases (< 20 percent) and all coefficients remain statistically significant in the subsequent model.

[Figure 2 about here]

Initial Advantages and Acculturation Declines: Enduring Differences or Converging Health?

A final issue addressed is the implications of immigrant health dynamics for health disparities in the United States. Here we ask a simple question: how do immigrants fare relative to similar sex and similar aged native-born Americans under different levels of acculturation? We answer this question by calculating predicted probabilities based on models 1, 3, 5, and 7 from Table 3 and focusing specific attention on changes due to different extents of acculturation (5 years versus 20 years). Here, probabilities are calculated for a benchmark individual who is a 55-year-old male. We allow for the reality of educational disparities to influence the expected

probabilities by assigning each racial and immigrant group its group-specific average educational attainment. This ensures that we are not creating fictive comparison groups while still focusing the lens on the implications of acculturation. Importantly, changing the reference category to females, persons of a different age, or persons with a different level of educational attainment will only change the magnitude of the predicted probability and will not change the relative differences across racial or immigrant groups. We show these probabilities as bar charts in Figure 2.

There are three clear conclusions. First, declines in health with increased acculturation are clear and substantively important. Relative risk ratios for poor health across shorter and longer tenure vary between 1.1 and 1.5, regardless of outcome. Second, even immigrants who have been in the United States for 20 or more years typically have better health those U.S. born. All such immigrant groups except for those from the Indian subcontinent have lower probabilities of diabetes. All such immigrant groups also have lower likelihood of hypertension, while seven of ten long tenured immigrant groups, with the exceptions being Hispanics, Russians, and those from the Middle East, have better self-reported health and lower likelihood of severe psychological distress.

Finally, in comparison to other racial groups in the United States, immigrant health advantages are large, even for those who have spent the majority of their adult lives in the United States. In all cases, immigrants with long tenures in the U.S. have better health than American Indians. Similarly, African Americans have generically poorer health than immigrants who have been in the United States for long periods, even for African Immigrants who they would purportedly share a similar racial classification. Similarly, immigrants from Asia and Southeast Asia have lower probabilities of diabetes, hypertension and severe psychological distress than

native born Asians, regardless of how long they have been in the U.S. and Hispanic immigrants have better health than U.S. born Hispanics, regardless of health outcome or tenure in the United States. In each case, immigrants have visibility lower probabilities of poor health outcomes, even after decades spent in the United States.

DISCUSSION

The results of this research paint a fascinating portrait of immigrant health dynamics in the United States. In particular, they suggest a consistency of health advantages that has yet to be acknowledged, highlight limits in existing explanatory frameworks, and show a pattern of enduring differences in health that have important implications for theory and research.

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, the general failure to account for differences between immigrants and those born in the U.S., and enduring differences after accounting for extensive acculturation are also remarkable. 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 both the uniform differences with respect to non-Hispanic whites and the dominant U.S. born racial groups within the United States. Indeed, we have no quarrel with the idea that there are differences in health status across immigrant groups

24

(see for example, Oza-Frank and Narayan 2010), but we view the robust differences between immigrants and those U.S. born as more substantial, less acknowledged, and having important theoretical and empirical implications that have yet to receive adequate research attention. In our view, such consistency is not anticipated by and is in fact antithetical to much, if not most, of the immigration literature with its emphasis on post-immigration experiences and varied or "segmented" assimilation (see discussions in Alba and Nee 2005; Rumbaut 1997; Waters and Jiménez 2005). The same can be said for the health disparities literature, which focuses primary attention on paradoxical health among Hispanics (see discussions in Hunt, Schneider, and Comer 2004; Lara et al. 2005; Palloni and Arias 2004) and/or highlights gaps in access or utilization of health care that may ultimately undermine health (Diaz 2002; Jenkins et al. 1996; LeClere et al. 1994). In contrast, the "healthy immigrant" phenomenon (MacDonald and Kennedy 2004; Sorlie et al. 1993) appears to generically and robustly describe the American situation.

Our findings indicate a scope to the issue 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 (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 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, the field of immigration studies is organized around the idea that different immigrants have different social and cultural backgrounds, different types of social networks in the United States, and, not unrelated, have different acculturation experiences (Alba

25

and Nee 2005; Waters and Jiménez 2005). Given the scope, generality, consistency, and resilience to mediation of immigrant health advantages, our findings suggest limited utility in group-specific explanations.

As a related point, the conceptualization of the issue as a "Latino" or "Hispanic" health paradox, at least with respect to morbidity in adults, would seem misguided. This conceptualization is clearly powerful. In one respect, it fuels both scientific inquiry and has produced literally hundreds of studies. At the same time, it infuses popular culture through acclaimed documentaries such as *Unnatural Causes* that single out Latinos as the gold standard example of the health complexities of immigrants. Our findings indicate that there is nothing unique about the health of Hispanic immigrants in relation to most other immigrant groups and highlights a need for a broader conceptualization. Still, we recognize that research on Latino health and its paradoxical nature is much broader than our narrow investigation of adult morbidity. Yet, we view this as a call for research on infant and child mortality, adult mortality, and low birth weight among non-Hispanic immigrants to assess the robustness of the immigrant health advantage.[9]

The acculturation declines that we observe also have significant implications. It may be tempting to conclude that there is something profoundly "toxic" about American society that produces declines in immigrant's health with increased acculturation (Williams 2010). Yet, in one respect, this should not be surprising. Every branch of science assumes some relationship between exposure and outcome and contemporary medical and health sciences is acutely attuned to issues of "dose" in understanding health dynamics. Given this, more time spent in the United

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[9] While we are aware of the excellent work of Singh and colleagues on immigrant-native born differences in mortality (Singh and Hiatt 2006; Singh and Mohammad 2002; Singh and Siahpush 2001), the reported results pool all immigrants and come from the 1980s and 1990s. This means that mortality among immigrants is driven largely by Hispanic immigrant mortality given that they were far and away the largest immigrant group during this period.

States or the adoption of American customs and habits should result in immigrants increasingly resembling Americans with respect to health. That we observe such a robust and general pattern of acculturation declines buttresses this view.

In another respect, the nature of such declines and their implications is somewhat misunderstood. 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 do go a long way in accounting for racial and educational disparities in health, for immigrants they seem almost unimportant, and paradoxically so.

The oft-reported health declines with acculturation also appear somewhat overstated. Many immigrant groups have better health than U.S. born non-Hispanic whites decades after arrival, in some instances have better health than U.S. born non-Hispanics who have higher educational attainment, and generally maintain substantial health advantages over U.S. born racial minorities regardless of time in the United States. Given where immigrants' health tends to end up, the typical life cycle of immigrants involves enduring health advantages that extend for decades after arrival and appear independent of a range of factors that account for significant portions of racial and socioeconomic disparities among those U.S. born. Thus, the generic "toxicity" of American society for immigrants seems questionable.

In the end, the remarkable consistencies in immigrant health dynamics point strongly to issues of selection in accounting for immigrant health dynamics. We are not the first to highlight issues of selection. Indeed, several scholars have offered thoughtful elaborations of the key

issues (Akresh and Frank 2008; Jasso et al. 2004; Palloni and Arias 2004; Palloni and Morenoff 2001). Similarly, "healthy immigrant" arguments also characterize research in a number of countries (Guendelman et al. 1999; MacDonald and Kennedy 2004; Sorlie et al. 1993). 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 selection issue in the Hispanic context,

> If the observed differences between Hispanic and non-Hispanic mortality is a result of migration effects, one cannot conclude that there are characteristics – genetic, socially produced, or culturally acquired – conferred on individuals by virtue of their membership in the group, that translate into health advantages and lower mortality…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).

Although our conclusions ultimately conflict with those of Palloni and Arias, their 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, and its enduring quality, 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 all the more powerful given that immigration in contemporary America largely involves Latin America, the southern hemisphere and Asian nations and the lower life expectancies in these regions (www.wo.int/healthinfo/statistics/mortality_life_tables/en/). Regardless of health conditions in the sending countries, immigrant health advantages 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 be important aspects of health disparities. 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" categories in both the 2000 U.S. Census and the 2000-2006 IHIS samples as well as examining the extent of "speaking English" in the 2000 U.S. Census. In the former case, differences were trivial. In the latter case, prevalence of not speaking English at all was greatest for "Hispanic" and "South American" immigrants (17.3 and 7.3 percent, respectively) and should be mitigated by the Spanish language interview protocol, while prevalence for other immigrant groups was quite small, ranging from 6.3% (Russians, Asians) to less than 2% (Europeans, Africans, and Canada, Oceania, and elsewhere). Still, we recognize that the IHIS immigrant sample may not include the full distribution of immigrants in the United States and may exclude those with limited English or Spanish.

29

Third, Jasso and colleagues (2004) quite rightly point out the possibility of cohort effects in immigrant health differentials. We would go even further and argue that age at arrival, when one arrived, and how long one has been in the United States are jointly implicated in immigrant health. At the same time, such complexities are well beyond the IHIS data, particularly for the types of multivariate analyses that are the foundation of our analyses. Such questions are, however, important and should be taken seriously as more data becomes available.

A final issue is the potential for social desirability bias. Although the NHIS data are methodologically rigorous and widely used in population health research, they are dependent upon self-report and the typical methodological caveats apply. In the specific instance, social desirability may mean that immigrants will be less likely to report health problems given their cultural position in the United States and the presence of "authoritative" interviewers from the federal government. We have tried to mitigate this by using a variety of health outcomes with varying degrees of social and personal interpretation and by examining a variety of immigrant groups, but social desirability bias is always a possibility. Still, given its speculative nature, proving this is a task for those wishing to challenge our findings on such grounds.

In the end, our findings and the selection issues they highlight indicate a significant disjuncture between contemporary research methods and a "counterfactual" approach to causal estimation in the social sciences (Morgan and Winship 2007) that is gaining increased traction in public health circles (Greenland 2000; Kaufman and Cooper 1999; Oakes and Kaufman 2006). The field, much like us, has traditionally adopted a strategy of regression-data reduction. Such an approach has clear utility (Berk 2004). In the case of our research, such an approach has proved extremely useful in highlighting the commonality of the immigrant health advantage and the paradox of its resilience to explanation through widely accepted mechanisms. At the same

time, such an approach does little to formally estimate the causal impact of immigration to the United States or to parse out the extent of the selection effect (both of which should have considerable theoretical and policy relevance). In the end, the counterfactual for immigrant health questions is neither other immigrants nor U.S. born comparisons. Instead, it is the potential immigrant that did not immigrate and instead lived five, 10, or 20 years in their country of birth (Jasso et al. 2004). Even more precisely, it is the person who would have immigrated but for reasons outside of their own choice set was unable to. It is against this comparison that we would actually understand the immigration component of health disparities and whether it is paradoxical.

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, immigrant health appears paradoxical. 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. Pending such work, immigrant health will remain paradoxical. Still, resolving the paradox should begin with recognition of the remarkable similarities of health and health

dynamics across immigrant groups and view 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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Table 1. Descriptive Statistics, IHIS 2000-2006.

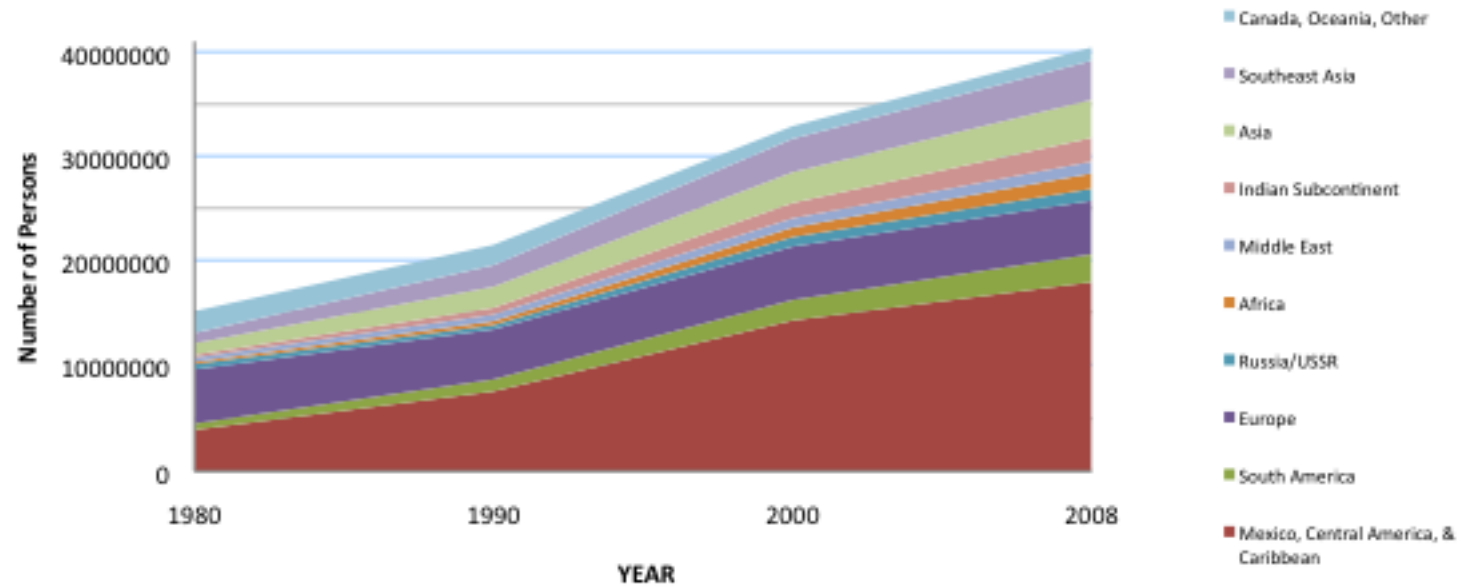|	Full Sample		Hispanic		South American		European		Russian		African		Middle Eastern		Indian Subcontinent		Asian		Southeast Asian		Canada, Oceania, Other	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Control Variables																						
Age	46.78	17.86	41.35	15.47	42.46	14.48	51.48	18.67	48.85	19.26	38.32	12.77	43.19	16.06	38.46	13.14	44.90	16.71	42.86	14.82	50.64	19.90
Female	0.57	0.50	0.55	0.50	0.55	0.50	0.58	0.49	0.58	0.49	0.46	0.50	0.47	0.50	0.42	0.49	0.58	0.49	0.55	0.50	0.58	0.49
Married	0.48	0.50	0.56	0.50	0.55	0.50	0.52	0.50	0.59	0.49	0.49	0.50	0.58	0.49	0.72	0.45	0.60	0.49	0.62	0.49	0.50	0.50
Divorced, Separated, Widowed	0.28	0.45	0.21	0.41	0.23	0.42	0.29	0.46	0.27	0.44	0.17	0.37	0.19	0.39	0.08	0.27	0.17	0.37	0.15	0.36	0.29	0.45
US Born																						
Black	0.14	0.35	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
American Indian	0.01	0.08	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
Asian	0.03	0.17	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
Other	0.03	0.17	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
Hispanic	0.17	0.38	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
Immigrant Groups																						
Hispanic	0.10	0.30	1.00	0.00	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
South American	0.01	0.11	,---	,---	1.00	0.00	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
European	0.02	0.13	,---	,---	,---	,---	1.00	0.00	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
Russian	0.00	0.05	,---	,---	,---	,---	,---	,---	1.00	0.00	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
African	0.00	0.07	,---	,---	,---	,---	,---	,---	,---	,---	1.00	0.00	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---
Middle Eastern	0.00	0.06	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	1.00	0.00	,---	,---	,---	,---	,---	,---	,---	,---
Indian	0.01	0.07	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	1.00	0.00	,---	,---	,---	,---	,---	,---
Asian	0.01	0.09	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	1.00	0.00	,---	,---	,---	,---
Southeast Asian	0.01	0.11	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	1.00	0.00	,---	,---
Canada, Oceania, Other	0.00	0.07	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	,---	1.00	0.00
Educational Attainment	2.09	0.83	1.50	0.69	2.15	0.84	2.29	0.91	2.64	0.94	2.45	0.89	2.44	0.99	3.03	0.96	2.58	0.95	2.38	0.88	2.35	0.86
Acculturation	,---	,---	17.87	9.90	16.32	10.60	30.92	13.82	16.50	14.04	13.35	9.54	17.31	9.82	12.20	8.71	17.87	10.46	17.69	8.14	29.77	15.86
Employment and Income																						
Unemployed	0.03	0.17	0.04	0.20	0.03	0.18	0.02	0.15	0.02	0.12	0.06	0.23	0.02	0.16	0.03	0.18	0.02	0.15	0.03	0.18	0.02	0.14
Not in Labor Force	0.34	0.48	0.33	0.47	0.26	0.44	0.40	0.49	0.43	0.50	0.18	0.38	0.37	0.48	0.25	0.43	0.36	0.48	0.27	0.45	0.41	0.49
Poverty Ratio	6.10	4.22	8.87	3.66	6.91	4.00	5.23	4.00	6.40	4.45	6.75	4.23	6.39	4.55	5.01	4.35	5.91	4.44	5.55	4.22	4.93	4.02
Risk Behaviors and Statuses																						
BMI	26.72	4.98	27.04	4.46	25.74	4.14	25.79	4.43	25.57	4.62	25.88	4.49	25.66	4.33	24.53	3.50	23.07	3.29	24.02	3.50	25.83	4.73
Abstainer	0.56	0.74	0.67	0.67	0.51	0.65	0.43	0.69	0.54	0.70	0.66	0.63	0.62	0.62	0.69	0.57	0.62	0.65	0.63	0.63	0.45	0.72
Drink_Rare	0.70	0.46	0.81	0.39	0.79	0.41	0.63	0.48	0.78	0.41	0.81	0.40	0.83	0.38	0.86	0.35	0.82	0.39	0.85	0.36	0.60	0.49
Drink_Heavy	0.18	0.39	0.12	0.32	0.10	0.30	0.23	0.42	0.11	0.31	0.09	0.29	0.07	0.25	0.07	0.25	0.11	0.31	0.07	0.26	0.25	0.43
Smoker_Light	0.11	0.31	0.10	0.30	0.12	0.32	0.09	0.29	0.09	0.28	0.08	0.28	0.11	0.32	0.06	0.25	0.10	0.31	0.09	0.29	0.08	0.27
Smoker_Heavy	0.11	0.31	0.03	0.17	0.03	0.18	0.09	0.28	0.07	0.25	0.03	0.18	0.09	0.29	0.02	0.14	0.05	0.22	0.03	0.16	0.10	0.29
Access to Health Care	0.92	0.27	0.92	0.28	0.91	0.29	0.94	0.24	0.93	0.26	0.91	0.29	0.92	0.27	0.96	0.19	0.96	0.21	0.96	0.19	0.95	0.22
Health Outcomes																						
Self-Reported 'Poor' Health	0.03	0.18	0.04	0.18	0.02	0.14	0.03	0.16	0.07	0.26	0.01	0.12	0.04	0.20	0.01	0.09	0.02	0.15	0.02	0.14	0.02	0.14
Diabetes	0.08	0.28	0.08	0.27	0.04	0.20	0.07	0.25	0.08	0.27	0.06	0.24	0.05	0.23	0.07	0.26	0.06	0.23	0.06	0.24	0.06	0.25
Hypertension	0.27	0.44	0.19	0.39	0.14	0.35	0.26	0.44	0.27	0.45	0.15	0.36	0.16	0.36	0.12	0.33	0.17	0.37	0.19	0.39	0.26	0.44
Psychological Distress	0.06	0.24	0.07	0.25	0.05	0.22	0.05	0.22	0.07	0.25	0.03	0.18	0.08	0.27	0.03	0.16	0.04	0.18	0.04	0.20	0.03	0.17

Table 2. BIC and AIC Goodness of Fit Evaluation for Educational and Acculturation Contingencies, IHIS 2000-2006.

	Self-Reported 'Poor' Health		Diabetes		Hypetension		Psychological Distress	
	Value	Δ	Value	Δ	Value	Δ	Value	Δ
Base Model								
BIC	55047	.---	105812	.---	196215	.---	87207	.---
AIC	54822	.---	105587	.---	195990	.---	86982	.---
Two-way: Education by Group								
BIC	55164	117	105948	136	196359	144	87294	87
AIC	54784	-38	105570	-17	195981	-9	86917	-65
Two-way: Acculturation by Group								
BIC	55128	81	105892	80	196299	84	87302	95
AIC	54801	-21	105576	-11	195982	-8	86986	4
Three-way: Education, Acculturation, and Group								
BIC: vs Education by group model	55332	168	106143	195	196557	198	87496	202
BIC: vs Acculturation by group model	55332	204	106143	251	196557	258	87496	194
AIC: vs Education by group model	54770	-14	105571	1	195984	3	86925	8
AIC: vs Acculturation by group model	54770	-31	105571	-5	195984	2	86925	-61

Table 3. Estimates from Logit Models Predicting Health Status, Integrated Health interview Series 2000-2006.

	Self-Reported 'Poor' Health (N=202804)		Diabetes (N=202803)		Hypertension (N=202678)		Psychological Distress (N=200199)	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Age	0.032***	0.0117***	0.043***	0.038***	0.056***	0.054***	-0.007***	-0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Female	-0.097***	-0.401***	-0.177***	-0.324***	-0.070***	-0.035***	0.366***	0.282***
	(0.029)	(0.031)	(0.019)	(0.020)	(0.013)	(0.013)	(0.022)	(0.025)
Married	0.052	0.326***	0.256***	0.223***	0.140***	0.121***	-0.263***	-0.085***
	(0.046)	(0.050)	(0.031)	(0.032)	(0.019)	(0.020)	(0.030)	(0.032)
Divorced/Separated/Widowed	0.288***	0.396***	0.179***	0.150***	0.177***	0.160***	0.424***	0.350***
	(0.051)	(0.054)	(0.034)	(0.034)	(0.021)	(0.021)	(0.034)	(0.036)
Racial/Ethnic Groups								
African American	0.360***	0.167***	0.626***	0.388***	0.659***	0.509***	-0.065**	-0.162***
	(0.036)	(0.040)	(0.024)	(0.027)	(0.017)	(0.018)	(0.030)	(0.032)
American Indian	0.723***	0.467***	0.878***	0.680***	0.419***	0.267***	0.537***	0.351***
	(0.132)	(0.138)	(0.094)	(0.100)	(0.073)	(0.075)	(0.099)	(0.104)
Asian	-0.355**	-0.246	0.237**	0.359***	0.114*	0.239***	0.233**	0.353***
	(0.148)	(0.157)	(0.094)	(0.100)	(0.068)	(0.070)	(0.115)	(0.116)
Other	0.306***	0.142*	0.357***	0.275***	0.229***	0.175***	0.527***	0.428***
	(0.082)	(0.080)	(0.058)	(0.060)	(0.042)	(0.043)	(0.053)	(0.055)
Hispanic	0.141***	0.080	0.440***	0.336***	-0.027	-0.139***	-0.062	-0.023
	(0.052)	(0.056)	(0.036)	(0.038)	(0.026)	(0.028)	(0.038)	(0.040)
Immigrant Groups								
Hispanic	-0.824***	-0.844***	-0.913***	-0.816***	-0.629***	-0.488***	-0.620***	-0.544***
	(0.132)	(0.138)	(0.081)	(0.084)	(0.050)	(0.051)	(0.072)	(0.075)
South American	-1.141***	-1.082***	-1.554***	-1.392***	-0.873***	-0.672***	-0.513***	-0.450***
	(0.199)	(0.202)	(0.139)	(0.143)	(0.085)	(0.087)	(0.125)	(0.129)
European	-1.184***	-1.272***	-1.421***	-1.260***	-0.853***	-0.708***	-0.725***	-0.708***
	(0.262)	(0.270)	(0.140)	(0.144)	(0.081)	(0.083)	(0.141)	(0.143)
Russian	0.659**	0.243	-0.729***	-0.875***	-0.351***	-0.337**	0.088	0.000
	(0.260)	(0.261)	(0.207)	(0.217)	(0.127)	(0.131)	(0.215)	(0.220)
African	-0.764**	-0.696**	-0.505***	-0.415**	-0.764***	-0.623***	-0.715***	-0.638***
	(0.317)	(0.331)	(0.161)	(0.166)	(0.107)	(0.112)	(0.212)	(0.214)
Middle Eastern	-0.054	-0.310	-0.672***	-0.721***	-0.783***	-0.717***	0.137	0.030
	(0.236)	(0.231)	(0.210)	(0.218)	(0.133)	(0.138)	(0.179)	(0.176)
Indian	-0.416	-0.621*	-0.028	-0.024	-0.650***	-0.545***	-0.785***	-0.888***
	(0.365)	(0.375)	(0.159)	(0.163)	(0.121)	(0.123)	(0.238)	(0.240)
Asian	-0.238	-0.377	-1.040***	-0.824***	-0.928***	-0.681***	-0.900***	-0.945***
	(0.246)	(0.256)	(0.159)	(0.163)	(0.104)	(0.106)	(0.187)	(0.188)
Southeast Asian	-0.457**	-0.574**	-0.775***	-0.657***	-0.591***	-0.404***	-0.709***	-0.634***
	-0.238	(0.251)	(0.145)	(0.151)	(0.095)	(0.100)	(0.172)	(0.169)
Canada, Oceania, Other	-1.623***	-1.824***	-1.405***	-1.288***	-0.824***	-0.703***	-1.323***	-1.378***
	(0.323)	(0.329)	(0.194)	(0.195)	(0.113)	(0.114)	(0.233)	(0.235)
Educational Attainment	-0.825***	-0.335***	-0.259***	-0.074***	-0.179***	-0.077***	-0.678***	-0.290***
	(0.024)	(0.025)	(0.012)	(0.014)	(0.008)	(0.009)	(0.017)	(0.019)
Acculturation	0.026***	0.034***	0.030***	0.029***	0.016***	0.014***	0.020***	0.022***
	(0.005)	(0.006)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
Employment and Income								
Unemployed	.---	0.480***	.---	0.015	.---	0.052	.---	0.730***
		(0.119)		(0.067)		(0.042)		(0.051)
Not In Labor Force	.---	2.186***	.---	0.395***	.---	0.247***	.---	0.811***
		(0.049)		(0.026)		(0.016)		(0.027)
Poverty Ratio	.---	0.0676***	.---	0.011***	.---	0.005**	.---	0.057***
		(0.006)		(0.003)		(0.002)		(0.004)
Risk Behaviors/Statuses								
BMI	.---	0.037***	.---	0.106***	.---	0.099***	.---	0.030***
		(0.003)		(0.002)		(0.001)		(0.002)
Abstainer	.---	0.349***	.---	0.230***	.---	0.078***	.---	0.140***
		(0.020)		(0.013)		(0.010)		(0.017)
Drinker-Rare	.---	0.434***	.---	0.467***	.---	0.099***	.---	0.113***
		(0.077)		(0.043)		(0.024)		(0.043)
Drinker-Heavy	.---	0.124	.---	-0.089*	.---	0.198***	.---	0.136***
		(0.085)		(0.049)		(0.026)		(0.046)
Smoker-Light	.---	0.461***	.---	0.010	.---	0.013	.---	0.545***
		(0.048)		(0.037)		(0.022)		(0.032)
Smoker-Heavy	.---	0.660***	.---	0.138***	.---	0.092***	.---	0.876***
		(0.042)		(0.032)		(0.021)		(0.029)
Access to Health Care	.---	-1.242***	.---	-0.506***	.---	-0.381***	.---	-1.187***
		(0.040)		(0.033)		(0.024)		(0.028)
Intercept	-3.668	-6.087	-4.396	-7.625	-3.593	-6.369	-1.348	-2.942
	(0.074)	(0.154)	(.047)	(0.098)	(.031)	(0.067)	(.049)	(0.100)

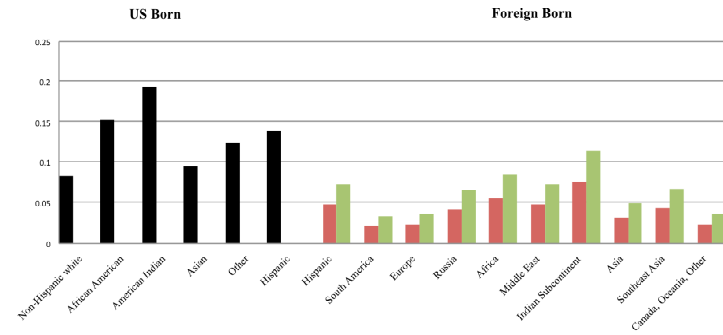Figure 1. Total Foreign-Born by Region of Birth, 1980 to 2008.

Note. Based on data from the 2000 US Census from IPUMS-USA (Ruggles et al. 2010).
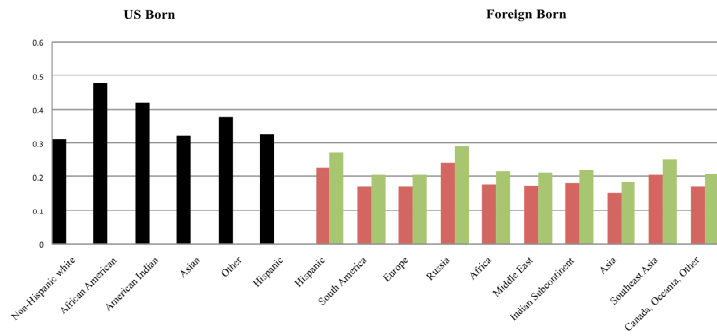
Figure 2a. Predicted Probability of Self-Reported Poor Health: US Born vs. Immigrants in US 5 and 20 Years, IHIS 2000-2006.
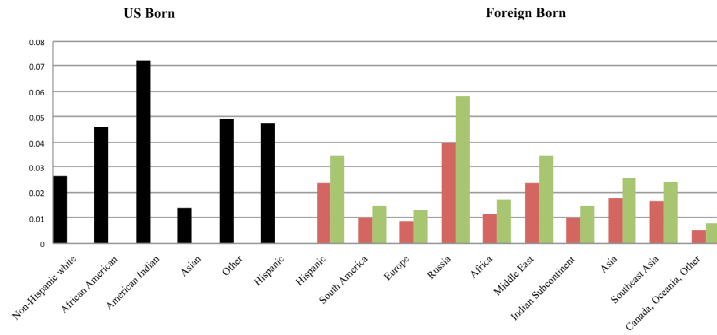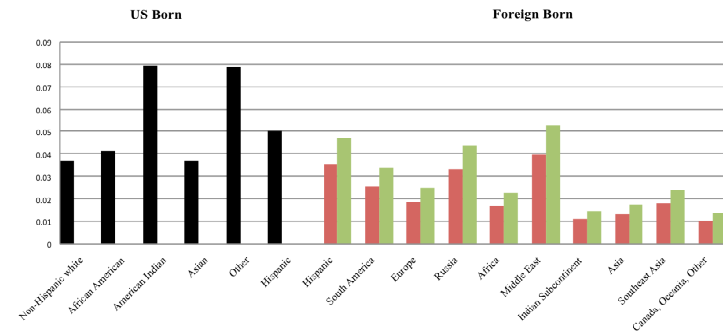
Figure 2b. Predicted Probabilty of Diagnosed Diabetes: US Born vs. Immigrants in US 5 and 20 Years, IHIS 2000-2006.

Figure 2c. Predicted Probabilty of Diagnosed Hyptertension: US Born vs. Immigrants in US 5 and 20 Years, IHIS 2000-2006.

Figure 2d. Predicted Probabilty of Severe Psychological Distress: US Born vs. Immigrants in US 5 and 20 Years, IHIS 2000-2006.