EXTENDED ABSTRACT

A Longitudinal Analysis of Immigrant Adaptation and Immigrant-Native Disparities in Obesity among Older Americans

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Objectives

Is living in the U.S. long-term detrimental to the health of immigrants? Our objective is to use longitudinal data to examine how the immigrant-native gap in obesity changes over time as a function of duration of U.S. residency.

Background

In recent years, obesity has become a major public health concern both nationally and globally. A growing body of research has documented a doubling of the U.S. obesity prevalence between 1980 and 2002 (for example, Ogden et al., 2006). Research demonstrates that obesity is positively associated with the development of chronic diseases, disability, and other health conditions, as well as a heightened risk of mortality (NIH, 1998; Katzmarzyk et al, 2003; Lakdawalla et al, 2004; Flegal et al, 2005). Risk factors and correlates of obesity include older age (except age 70 and over), being female, being a member of a racial/ethnic minority group (except Asian-American), having an unhealthy diet, being physically inactive, and having low socioeconomic status (NIH, 1998).

As with obesity prevalence, the volume of immigration to the U.S. has increased tremendously since the 1970s, with relatively high inflow of immigrants in the 1980s and 1990s. These immigrants have contributed substantially to the overall growth, as well as the racial, ethnic and socio-economic diversity, of the U.S. population (Lollock, 2001). Consequently, it is important to understand how immigrants differ from the U.S.-born across a variety of health characteristics and outcomes in order to assess 1) the potential for new health challenges, 2) changing demand for level and type of health services, and 3) optimal access to and delivery of health services and medical care across various population subgroups. For these reasons, it is also important to understand how the health of immigrants changes over time in the U.S.

While there is a growing body of research examining the health and mortality of immigrants, many studies lack substantial statistical power (e.g. small sample size) or focus narrowly on a specific population (e.g. Hispanic-only, Asian-only, etc.) or geographic area (e.g., Southwest, Los Angeles, etc.). Furthermore, there is no clear consensus in the literature regarding whether adaptation has positive or negative health consequences for immigrants. The expectation according to straight-line assimilation theory is that immigrants will initially report poorer physical and mental health than natives, but with adaptation to U.S. life and culture, they will assume more of the positive health behaviors and lifestyle of the U.S. mainstream, develop similar patterns of health insurance coverage and health care utilization, resulting in health improvements with increasing duration in the U.S. Some studies provide general support for this theory, showing positive effects of acculturation on immigrant health. However, other studies suggest a pattern of segmented assimilation; upon entry into the U.S., immigrants will vary in

initial health status, as well as other important demographic, socio-economic, and social capital characteristics, resulting in various health and socioeconomic trajectories. Results from additional research directly challenge straight-line assimilation theory by demonstrating negative effects of acculturation on immigrant health. However, results have been inconsistent, varying by health measure, immigrant subgroup, or age cohort.

We focus on obesity in this paper. Despite the associated public health concerns, few studies have examined immigrant-native disparities in obesity. Even fewer have examined the middle-aged population, which tends to have higher rates of obesity relative to other groups. Another shortcoming of this literature is reliance on cross-sectional data. Adaptation, however measured, takes place over time. Thus, the effects of adaptation – whether negative or positive -- cannot be fully captured in cross-sectional data. The extant research on obesity suggests that immigrants are initially healthier than natives, and that levels of obesity increase with greater adaptation to the U.S. We address these shortcomings by using longitudinal data collected on a sample of older adults (51-61 in 1992) to examine whether 1) the probability of being obese at baseline differs by immigrant status, duration of time residing in the U.S., and age cohort; and 2) the rate of change in the probability of being obese differs between immigrant and native-born respondents.

Data

We analyze data from the Health and Retirement Survey (HRS). The HRS is a nationally representative panel study of individuals aged 51-61 in 1992 and their spouses (any age). The initial survey comprised a multistage, clustered, area probability sample of 12,652 people in 7,600 households and oversampled Hispanics, blacks and Florida residents. Respondents were interviewed every two years; data collection is currently ongoing. We use data collected from 1992-2002. We limit analyses to respondents who were between 51-61 years old in 1992 and who reported information on body mass index (BMI) in at least one of the survey years. After exclusions, our sample consists of 8,604 U.S.-Born and 939 immigrant respondents.

The majority of respondents (74.3%) provided at least 5 waves of data, with approximately 62% providing data in all 6 waves. Over the course of the study approximately 12% of respondents died: 1,104 natives (13%) and 75 immigrants (8%).

Measures

Obesity: In each survey year, respondents reported their height and weight, which were then used to create a measure of Body Mass Index (BMI). Per conventional standards, we categorized respondents as obese if they reported a BMI $\geq$30.

Duration of Years in the U.S.: Immigrants provided information on their age of arrival to the U.S. Using this information we categorized the duration of years immigrants spent in the U.S. as of 1992 based on quartiles (0-15 years, 16-25 years, 26-35 years, and 36-61 years). US-born respondents serve as the reference group.

Age Cohort: We created a dummy variable based on the age of respondents in 1992 (1 = respondents aged 51-55 in 1992, 0 = respondents aged 56-61 in 1992).

Time: To assess change in the probability of being obese at time *t,* we created a time-varying measure that represents interview year, ranging from 0 (survey year 1992) to 10 (survey year 2002).

Demographics: Demographic characteristics include *sex, race/ethnicity,* and *marital status. Female* was a dichotomous variable coded 1 for female respondents and 0 for males. We

categorized ethnicity into four dummy variables for non-Hispanic White, non-Hispanic Blacks, Hispanics of any race, and other race. Non-Hispanic Whites served as the reference category. *Marital status* is a time-varying covariate categorized as married, widowed, or other.

Socioeconomic Status: We include three measures of the respondents' socio-economic status: *education, household income,* and *household wealth.* We define *education* as the number of years of schooling a respondent completed. *Household income* is a time-varying covariate and is categorized based on quintiles (≤ 10,000, 10,001-19,000, 19,001-35,000, 35,001-62,000, and ≥ 62,001). *Household wealth* is a time-varying covariate which we categorized by quartiles (≤ 1600, 1601-41,500, 41,501-135,000, and ≥ 135,001).

Health Behaviors: We include four time-varying measures of respondents' health behaviors and insurance status: *smoking status, alcoholic drinks per day, number of doctor visits in the last 12 months,* and *health insurance status.* We categorized respondents' *smoking status* as never smoked, past smoker, or current smoker. Respondents' *drinking behavior* was categorized as follows: heavy drinker (≥ 3 drinks/day), moderate drinker (1-2 drinks/day), light drinker (< 1 drink/day), and abstainer (never drink). Respondents also reported on the number of times they went to the *doctors in the past 12 months*. This variable was highly skewed, and thus we created five dummy variables (0 visits, 1-5 visits, 6-10 visits, 11-20 visits, and ≥ 21 visits). We also created a dummy variable to indicate whether a respondent was covered by a health insurance plan at the time of the interview (1 = has health insurance, 0 = no health insurance).

Analytical approach

Appropriate to data with repeated measures, we employ a random-intercept analysis, also referred to as a growth curve model (Singer & Willet, 2003). We specify the random-intercept model as follows:

$$\text{logit}[P(Y_{it}=1 \mid \mathbf{X}, \mathbf{Z}, u_i)] = \mathbf{X}_i'\beta + \mathbf{Z}_{it}'\gamma + u_i \quad (1)$$

where $\text{logit}[P(Y_{it}=1 \mid \mathbf{X}, \mathbf{Z}, u_i)]$ is the odds that respondent *i* is obese at time *t* and assumes that conditional on u_i, Y_{i1} to Y_{in} are independent, t=1,….$\mathbf{T}_i$ is the number of occasions on which respondent *i* was observed, $\mathbf{X}_i'\beta$ is a vector of time-invariant covariates (e.g., race/ethnicity, age cohort and gender), $\mathbf{Z}_{it}'\gamma$ is a vector of time-varying covariates (e.g., survey year, health behaviors, socioeconomic status), and u_i is a random effect that represents unobserved heterogeneity for respondent *i,* and is assumed to be random and normally distributed with mean zero.

Results

Descriptive Statistics

We present sample means in Table 1 for the HRS cohort stratified by immigrant status to examine differences in socioeconomic status, health behaviors, and demographic characteristics at baseline. Approximately 76% of US-born respondents self-reported as non-Hispanic White, 18% as non-Hispanic Black, 4.7% as Hispanic, and 1.2% other ethnicity. Comparatively, the greatest proportion of immigrants self-reported as Hispanic (49.9%), followed by non-Hispanic White (31.9%). A larger percentage of immigrant respondents were between the ages of 51-55 years old compared to US-born. Slightly more than half of the sample were women (approximately 52%), while over 73% reported that they were married at baseline. US-born respondents completed significantly more years of schooling, reported higher household income,

and greater amounts of household wealth compared to immigrant respondents. Immigrants were less likely than the US-born to be current or past smokers, or to be insured.

As a first look at how rates of obesity changes over time, Table 2 presents the bivariate means of obesity between 1992 and 2002 by immigrant status. Immigrants were less likely to be obese than natives at baseline. Although rates of obesity increase for both immigrants and natives, by 2002 the immigrant advantage disappears. Results also suggest that the immigrant advantage varies by duration of U.S. residency and age cohort; immigrants residing in the U.S. for 0-15 years as of 1992 experienced the most rapid increases in obesity rates, as did respondents in the younger age cohort (51-55), on average.

Random-Intercept Models

Although the bivariate findings are suggestive, the differences seen in Table 2 between US-born and immigrants do not truly model change over time and do not consider important confounders. To address these relationships, we will run a series of random-intercept models. We chose random-intercepts models rather than fixed-effects models because sensitivity analyses showed that the fixed-effect model, which makes no distributional assumptions but only provides estimates for factors that vary within person and over time (Agresti 2002), did not yield substantively different estimates than the random-intercept model.

We will enter covariates to the model in blocks in order to assess whether mediating relationships help to explain differences between immigrants and US-born respondents. Model 1, our baseline model, will include basic demographics (e.g., race/ethnicity, sex, age cohort), as well as information on years since arrival in the US, time, and interactions between years since arrival and time. The interactions between years since arrival and time will allow us to test whether changes in obesity occur at a different rate for immigrants depending on their length of stay in the United States compared to the US-born. Model 2 will include measures of socioeconomic status, including household income and wealth, as well as years of schooling. By including information of socioeconomic status, we can test whether differences in socioeconomic status between immigrants and US-born explain differential rates of obesity. Model 3 will add information on health behaviors to Model 1, to test whether the types of health behaviors respondents engaged in are related to differential obesity rates by immigrant status. Our final model, Model 4, will include all of the covariates entered into previous models.

TABLE 1: Characteristics of HRS Sample at Baseline by Immigrant Status [a]

	U.S. BORN N=8604	IMMIGRANT N=939
DEMOGRAPHIC CHARACTERISTICS		
Race/Ethnicity [b]		
Non-Hispanic White	76.1	31.9
Non-Hispanic Black	18.1	8.4
Hispanic	4.7	49.9
Other	1.2	9.8
Age Cohort (51-55 in1992) [b]	48.5	52.3
Female	52.2	55.3
Marital Status		
Married	73.7	73.3
Widowed	6.4	5.8
Other	16.3	16.8
SOCIOECONOMIC STATUS		
Years of Schooling [b]	12.3	9.9
Household Income [b]		
≤10,000	12.5	21.8
10,001-19,000	12.7	16.7
19,001-35,000	23.3	21.9
35,001-62,000	28.5	22.5
≥62,001	22.9	17.0
Household Wealth [b]		
≤1600	10.6	22.0
1601-41,500	20.3	25.7
41,501-135,000	33.7	23.2
≥135,001	35.4	29.1
BEHAVIORS		
Smoking Status [b]		
Current Smoker	28.0	20.0
Past Smoker	37.0	32.3
Never Smoked	35.0	47.7
Drinks Per Day		
Heavy Drinker (3+)	5.4	4.0
Moderate Drinker (1-2)	10.6	9.9
Light Drinker (<1)	44.6	43.9
Abstainer	39.4	42.1
Health Insurance [b]	66.2	52.4
Item non-response	3.6	3.4
Number of Doctor Visits in last 12 months		
≥21	2.9	4.2
11-20	7.4	6.2
6-10	11.0	7.0
1-5	57.6	55.4
0	20.6	26.4

NOTES:
[a] All variables are dummy coded and may be interpreted as percents, unless otherwise noted
[b] Group differences are significant at $p<.05$ in 1992

TABLE 2: Proportion of HRS Sample Obese by Years Since Immigration, Age Cohort, and Survey Year [a]

	1992	*2002*	*Change*
BORN IN THE UNITED STATES			
51-55 Years	24.2	31.1	*6.9*
56-61 Years	23.9	28.1	*4.2*
FOREIGN BORN			
51-55 Years	21.4	31.7	*10.3*
Difference of the Difference			**3.4**
56-61 Years	21.7	27.5	*5.8*
Difference of the Difference			**1.6**
0-15 YEARS SINCE IMMIGRATION AS OF 1992			
51-55 Years	21.9	37.5	*15.6*
Difference of the Difference			**8.7**
56-61 Years	19.5	31.0	*11.5*
Difference of the Difference			**7.3**
16-25 YEARS SINCE IMMIGRATION AS OF 1992			
51-55 Years	21.9	31.0	*9.1*
Difference of the Difference			**2.2**
56-61 Years	18.7	30.8	*12.1*
Difference of the Difference			**7.9**
26-35 YEARS SINCE IMMIGRATION AS OF 1992			
51-55 Years	16.7	25.2	*8.5*
Difference of the Difference			**1.6**
56-61 Years	23.0	28.3	*5.3*
Difference of the Difference			**1.1**
36-61 YEARS SINCE IMMIGRATION AS OF 1992			
51-55 Years	30.7	40.3	*9.6*
Difference of the Difference			**2.7**
56-61 Years	24.4	21.0	*-3.4*
Difference of the Difference			**-7.6**

NOTES:
[a] All variables are dummy coded and may be interpreted as percents, unless otherwise noted

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