

**Obesity by Level of Exposure to the U.S.
among Mexican-origin Adults**

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BACKGROUND

High obesity rates in the U.S. threaten the nation's economic and physical health. Obese people have higher death rates than normal weight individuals (Flegal, Graubard, Williamson & Gail, 2005). Obesity is a risk factor for a host of serious health problems; it is associated with higher incidence of coronary heart disease and related morbidity and mortality (Bibbins-Domingo, Coxson, Pletcher, Lightwood & Goldman, 2007) and ischemic stroke (Yatsuya, Folsom, Yamagishi, North, Brancati & Stevens, 2010). Obesity is also significantly associated with higher rates of death due to cancer (Calle, Rodriguez, Walker-Thurmond & Thun, 2003).

Among the adult population, obesity rates vary by a number of sociodemographic factors, including race/ethnicity and sex. Mexican Americans' obesity rates lag only slightly behind those of African Americans; both groups have higher rates than whites. Between 1999-2000 and 2007-2008, obesity rates among Mexican Americans rose from 28.9% to 35.9% for men and from 39.7% to 45.1% for women. In comparison, about one third of white males (31.9%) and females (33.0%) were obese in 2007-2008 as were than one third (37.3%) of African American men and half (49.6%) of women (Flegal, Carroll, Ogden & Curtin, 2010).

Importance of Latinos in Population

Latinos, of whom people of Mexican origin are the largest group, are the fastest growing racial/ethnic group in the U.S. The Census Bureau predicts that Latinos will grow from 16% of the population in 2010 to 30% in 2050. Thus, the health of this group will increasingly affect the health of the nation overall. Mexico is the home country of more immigrants than any other and 40% of Mexicans in the U.S. are immigrants.

Immigrants to the U.S. have lower BMIs and rates of obesity than natives and this pattern holds for Latinos, the largest immigrant group and the most analyzed (Abraido-Lanza, Chao & Florez, 2005; Antecol & Bedard, 2006; Barcenas, et al., 2007; Bates, Acevedo-Garcia, Alegría & Krieger, 2008; Goel, McCarthy, Phillips & Wee, 2004). But as immigrants' time in the U.S. lengthens, their obesity rates approach those of natives. A number of studies have found that length of residence in the U.S. is positively associated with BMI among immigrants in this country; the longer an immigrant has been in the U.S., the more likely he or she is to be obese (Abraido-Lanza, Chao & Florez, 2005; Antecol & Bedard, 2006; Barcenas, et al., 2007; Kaplan, Huguet, Newsom & McFarland, 2004; Kaushal, 2009; Goel, McCarthy, Phillips & Wee, 2004). This relationship varies somewhat by sex, race/ethnicity and SES. The length of residence-obesity association is stronger for Latino females than for males (Antecol & Bedard, 2006; Barcenas, et al., 2007). Kaushal (2009) found the positive duration-obesity pattern among black and Latino immigrants but no such relationship among white and Asian immigrants. Other work that looked at these racial/ethnic groups found a positive association between length of residence and obesity for whites, Latinos and Asians but not blacks (Goel, McCarthy, Phillips & Wee, 2004). This pattern is not confined to the U.S. Research on Canadian immigrants also indicates that they are less likely to be obese upon arrival than natives but that their chances of becoming so rise with duration of residence (McDonald & Kennedy, 2005; Cairney & Østbye, 1999). The role of race/ethnicity differs for male and female immigrants. Regardless of race/ethnicity, recent female immigrants are less likely to be obese than natives but only Asians exhibit this pattern among males (Cairney & Østbye, 1999). Other factors also affect the duration of residence – obesity relationship. Less-educated immigrants are more at risk for increased BMI as their duration of residence lengthens than highly educated immigrants College-educated immigrants

do not experience rising odds of obesity as their time in the U.S. increases whereas the odds of obesity rise with length of residence for less educated immigrants (Kaushal, 2009; Sanchez-Vaznaugh, Kawachi, Subramanian, Sanchez & Acevedo-Garcia, 2008).

Length of residence and generation are the most common ways that exposure to the U.S. is measured. An alternative approach to measuring exposure is based on immigrants' age at arrival. Individuals who arrive at younger ages are quicker to adapt to their new environment and have an easier time learning the language, customs and culture than their older counterparts whose formative years were spent in their home country. Results from previous studies suggest that younger immigrants' odds of becoming obese are higher than those of older immigrants (Kaushal, 2009; Roshania, Narayan & Oza-Frank, 2008). This pattern seems to stem from the alacrity with which younger immigrants adapt American eating habits and relatively sedentary leisure habits.

Length of residence and exposure of immigrants to U.S. society is assumed to be positively related to increasing rates of obesity through changes in people's dietary behaviors and physical activity. The greater immigrants' exposure to the U.S. the more likely they are to adopt the eating and leisure activities, both healthy and unhealthy, that are the American norm and that are linked to the high rates of overweight and obesity in the U.S., including a more sedentary lifestyle and higher caloric intake. Longer length of residence is associated with unhealthy behaviors (high alcohol intake, current smoking, high BMI), but also with higher exercise rates (Abraido-Lanza, Chao & Florez, 2005). Other work has found an inverse association between duration of residence and physical activity; recent immigrants have lower physical activity prevalence than longer-term residents who, in turn, engage in less activity than natives (Tremblay, Bryan, Pérez, Ardern & Katzmarzyk, 2006).

Dietary change is also associated with length of exposure among immigrants; recent immigrants eat more fruits and vegetables than natives, a difference that declines with longer U.S. residence (Akresh, 2007; Dubowitz, Smith-Warner, Acevedo-Garcia, Subramanian, Peterson, 2007). This is also true for young people; more acculturated children eat more fast-food and enjoy snacks and desserts more than less acculturated youth (Hrboticky & Kronl, 1984; Unger, Reynolds, Shakib, Spruijt-Metz, Sun & Johnson, 2004).

Research provides support for the positive relationship between level of exposure to the U.S. and obesity among Latinos. The greater the level of exposure Latinos have to the U.S., the greater their rates of obesity. This study builds on this research by examining the effect of level of exposure, measured jointly as age at immigration and length of residence, on Mexicans. It also analyzes the role of sociodemographic factors such as age, education, marital status and poverty status in the relationship between length of residence and the odds of obesity both for males and females across length of residence categories. This will provide information on whether level of exposure is uniformly or disparately associated with obesity for males and females (who have higher rates of obesity overall) and whether similar factors affect the odds of obesity for males and females among less exposed and more exposed immigrants and people of Mexican descent born in the U.S.

Research Questions

The following research questions are posed:

- 1) What are the sex-specific patterns of obesity across level of exposure categories among immigrant and native-born Mexicans?

2) Do sociodemographic factors previously shown to be associated with the risk of obesity affect the patterns in the relationships between level of exposure and risk of obesity for males and females?

3) What are the differences in the associations between risk factors and the odds of obesity within level of exposure categories for males and females? Do predictors of obesity function differently within these categories for males and females?

Answers to these questions will increase our understanding of obesity in a large and growing population and aid in identifying and targeting subgroups of this population for prevention and intervention.

DATA AND METHODS

Data

The National Health and Nutrition Examination Survey (NHANES) is the data source for this study. The NHANES program began in the early 1960s. In 1999, the survey became a continuous program that has a changing focus on a variety of health measurements. The survey examines a nationally representative sample of about 5,000 persons each year. The NHANES interview includes demographic, socioeconomic, dietary, and health-related questions. The examination component consists of medical and physiological measurements. An important advantage of the NHANES data set is that each participant's height and weight is measured by examiners. This approach avoids the inaccuracy inherent in self-reported height and weight. Three waves of data (2003-2004, 2005-2006, 2007-2008) were combined to produce sufficient numbers of respondents of Mexican origin to conduct analyses. Survey weights provided by NHANES allow analyses to be nationally representative of the population.

Sample

The sample includes all respondents ages 24-70 who identified themselves as of Mexican origin or descent. The bottom cutoff age was chosen because most adults above age 23 have completed their formal schooling; thus, the education measures are likely to reflect completed education. The final sample includes 1,083 males and 1,117 females.

Variables

Dependent Variable

Obesity is a label for a range of weight that is greater than what is generally considered healthy for a given weight. For adults, obesity is determined by using weight and height to calculate a number called a body mass index (BMI). BMI is an indirect measure of body fat but is the most common measure used. For most people, it correlates with their amount of body fat; moreover, because it requires only height and weight to calculate it is a simple and inexpensive method of measurement and screening (CDC, website). The BMI formula is: weight in kilograms / height in meters². An adult with a BMI value of 18.5 to 24.9 is considered to be of normal weight for height; those whose BMI is 25.0 to 29.9 are labeled overweight and those above 29.9 are considered obese. The outcome of interest is a dichotomous variable, whether or not respondents' height and weight placed them in the obesity category; that is, they have a BMI of 30 or higher.

Independent Variables

Level of exposure to the U.S. The key independent variable is level of exposure to the U.S. Respondents were asked their country of birth; those who were born outside the U.S. were asked the length of time, in years, that they have lived in the U.S. Using age at interview, age at immigration was calculated. Length of residence and age at immigration were both dichotomized. Respondents' length of residence was categorized by whether they had lived in the U.S. for less than 20 years or for 20 years or more. Their age at immigration was categorized by whether they arrived in the U.S. before age 20 or as an adult of 20 years old or older. Based on these two variables, immigrants were then divided into four categories: 1) Adult immigrants who were recent immigrants (<20 years); 2) Adult immigrants who were long-term immigrants (\geq 20 years); 3) Young immigrants who were recent immigrants; and 4) Young immigrants who were long-term immigrants. Together with U.S.-born Mexican Americans, a five-category variable was constructed, with natives acting as the reference group (Table 1). Recent adult immigrants have the least exposure to the U.S. due to their older age at arrival and their shorter duration of residence. Among the foreign-born, younger, long-term immigrants have the most exposure because they arrived as children or teens and have been in the U.S. for at least two decades.

Table 1. Distribution of Exposure to the U.S.

Exposure Categories	%	Age at Immigration	Length of Residence
Adult, recent immigrants	29.3	\geq 20 years old	<20 years
Adult, long-term immigrants	5.7	\geq 20 years old	\geq 20 years
Younger, recent immigrants	12.5	<20 years old	<20 years
Younger, long-term immigrants	14.6	<20 years old	\geq 20 years
U.S. Born	37.9	----	----

Educational attainment. Adult respondents were asked what their highest grade or level of school completed or their highest degree they earned. Education was coded as a three-

category variable: less than high school completion, high school completion and some education beyond high school.

Poverty status. Respondents were asked the total number of people in their families and their total family income. Poverty status was calculated as the ratio of family income for a given family size to the poverty line for that family size. Poverty status was divided into three categories, 0-100% of poverty, 101-200% and greater than 200% of poverty.

Socioeconomic status. The socioeconomic status (SES) variable was constructed from the education and poverty variables and contains five levels. The lowest level includes respondents with less than a high school education living below the poverty line; the highest level includes respondents with any post-secondary education and living above 200% of poverty. The relatively low SES of Mexican immigrants dictates the education and poverty categories used in the analyses. Unlike the general population and, indeed, unlike U.S.-born Mexican Americans, most Mexican immigrants have not gone beyond high school and most live in families whose incomes put them below 200% of the poverty line. Table 2 presents the poverty status and education for each level of the SES variable.

Table 2. Socioeconomic Status Defined by Education and Poverty Status.

Education:	<HS	HS	>HS
Poverty Level:			
≥100% SES Level	Low	Low-Medium	Medium
101-200% SES Level	Low-Medium	Medium	High-Medium
>200% SES Level	Medium	High-Medium	High

Sex. Males and females were analyzed separately.

Marital status. Respondents were asked their current marital status. This variable contains three categories: currently married or living with a partner, previously married, that is separated, divorced or widowed, or never married.

Age. Age is a continuous variable, measured in years.

Analysis

Bivariate analyses ascertain exposure to the U.S. patterns in obesity rates for males and females. Multivariate logistic regression models predict the odds of being obese. In each, U.S.-born participants serve as the reference category. The first set of models address the second research question. They include exposure to the U.S.-sex interaction terms to estimate the relationship between level of exposure and the odds of obesity for males and females before and after the inclusion of SES and control variables. The second set of models address the third research question and estimate the odds of obesity across education and poverty levels within each relevant exposure category, using level of exposure-SES interaction terms. Separate models are conducted for males and females. To address the statistical issues raised by the clustered and stratified nature of NHANES, SUDAAN statistical software was used to adjust standard errors and significance levels for these design effects.

RESULTS

Bivariate Results

Older immigrants who were recent arrivals made up almost half (47.2%) of immigrant Mexicans (Table 3). Those who came as children or teens and have been in the U.S. for at least two decades comprised almost one quarter (23.6%).

U.S.-born males have higher rates of obesity than immigrants. Among immigrant males, recent arrivals have the lowest rates at about one in five. The most acculturated immigrants, those who came before adulthood and have lived in the U.S. for more than twenty years have rates similar to natives. Half (49.0%) of female U.S.-born Mexican Americans are obese. About four in ten recent immigrants and the most acculturated were obese; long-term immigrants who arrived as adults had the highest obesity rate.

Table 3. Percent Obese by Age at Arrival & Length of Residence

Level of Exposure	Adult Arrival, Recent Immigrant	Adult Arrival, Long-term Immigrant	Young Arrival, Recent Immigrant	Young Arrival, Long-term Immigrant	U.S.-born
Exposure to U.S.	Least			Most	
% of Immigrants	47.2	9.1	20.1	23.6	----
% Obese					
Males***	21.7	25.8	21.7	37.2	40.8
Females*	39.7	58.3	39.7	41.6	49.0

*p≤0.05; ***p≤0.001

Table 4 presents the distribution of SES categories within level of exposure categories for males and females. The vast majority of immigrants who arrived as adults, along with young, recent arrivals fell into low, low-medium or medium SES categories. In comparison, one quarter (26.1%) of males and one third (32.1%) of females in the highest immigrant exposure category were in the top two SES categories. U.S.-born Mexican Americans had much higher SES than immigrants; six in ten males (61.1%) and females (59.5%) were in the top two SES categories.

Table 4. Distribution of SES within Level of Exposure Categories

Level of Exposure	Adult Arrival, Recent Immigrant	Adult Arrival, Long-term Immigrant	Young Arrival, Recent Immigrant	Young Arrival, Long-term Immigrant	U.S.-born
SES					

Males					
Low	30.9	31.3	32.8	16.3	8.2
Low-Med	32.6	30.0	27.5	27.0	12.1
Medium	24.7	23.1	25.2	30.6	18.6
High-Med	8.7	7.3	7.8	12.9	20.0
High	3.2	8.2	6.6	13.2	41.1
Females					
Low	36.7	35.3	25.0	18.5	7.5
Low-Med	26.9	23.3	40.6	26.0	13.8
Medium	18.7	28.7	21.1	24.3	19.1
High-Med	10.6	6.9	8.7	14.6	26.2
High	7.0	5.8	4.6	17.5	33.3

Multivariate Results

The relationship between level of exposure to the U.S. and the odds of obesity vary somewhat between males and females (Table 5). Age at immigration predicts the odds of obesity for males but length of residence among immigrants does not. Males who immigrated as adults were only about one third as likely to be obese as native-born Mexican Americans regardless of how long they had lived in the U.S. There was no difference in these odds between younger immigrants and natives. In comparison, females immigrants with the least exposure, recent immigrants who arrived as adults, were significantly less likely to be obese than native-born females. Female immigrants with greater exposure were not less likely than natives to be obese.

Table 5. Logistic Regression Models Predicting the Odds of Obesity across Age at Immigration & Length of Residence

	Base Model		Final Model ^a	
	Males	Females	Males	Females
Adult Arrival, Recent Immigrant	0.40***	0.69*	0.37***	0.63**
Adult Arrival, Long-term Immigrant	0.50*	1.46	0.40**	1.18
Young Arrival, Recent Immigrant	0.68	0.69	0.67	0.70

Young Arrival, Long-term Immigrant	0.86	0.74	0.80	0.70
U.S.-born (ref.)	1.00	1.00	1.00	1.00
-2ll (df)	86.9 (9)		99.8 (17)	
N	2,260		2,260	

*p≤0.05; **p≤0.01; ***p≤0.001

^aNet of age, socioeconomic status, marital status

The final set of regression models examines the role of socioeconomic status, defined as a combination of education and poverty status, in predicting obesity within levels of exposure with the goal of explaining the patterns in Table 5. The interaction models were tailored to address the different results found for males and females in the first set of regression models. Since age at immigration was the key predictor of the risk of obesity for males, the next models interact age at immigration with SES to estimate the role of SES for adult immigrants, those who came as children or adolescents and natives. Female immigrants least exposed to U.S. society differed from natives in their risk of obesity while other immigrants did not. Therefore, the interaction model for females tests the role of SES for the least exposed immigrants, all other immigrants and natives.

Table 6A. Males: Logistic Regression Models Predicting the Odds of Obesity between Adult and Younger Immigrants and Natives by SES

	Adult Immigrants vs. U.S.-born		Child Immigrants vs. U.S.-born	
	Odds Ratios	%	Odds Ratios	%
Immigrant SES				
Low	0.42**	30.9	0.88	24.3
Low-Medium	0.40**	32.2	0.63*	7.3
Med	0.47*	24.4	1.31	28.0
High-Medium	0.70	8.4	1.05	10.4
High	0.73	4.0	0.26**	10.0
U.S.-born	1.00	----	1.00	----

*p≤0.05; **p≤0.01

^aNet of age, length of residence, marital status

The results for males are presented in Table 6A which presents the odds ratios from a logistic regression model predicting the odds of obesity among Mexican males. The interaction terms condition SES on age at immigration (and U.S.-born); the reference group is U.S.-born Mexican Americans. Column 1 shows that immigrants who arrived as adults and were in the low, low-medium and medium SES categories were between 40 and 47% as likely to be obese as natives. In contrast, adult immigrants in the top two SES categories do not differ from natives in their odds of being obese. As Column 2 shows, males in the bottom three SES categories account for 87.6% of all adult immigrants. It appears that the vast majority of adult immigrants who are less than half as likely to be obese than natives are responsible for the pattern seen for males in Table 6. In comparison, only 17.3% of immigrants who came before adulthood were less likely to be obese than native-born males.

Table 6B contains the results of a logistic regression model predicting the odds of obesity among Mexican females. The interaction terms combine SES and three categories of immigrants relevant to females – immigrants with the least exposure, all other immigrants and natives. Column 1 shows that two SES categories of the least exposed immigrants – medium and high SES immigrants – were less likely to be obese than natives. These two categories accounted for one quarter (25.7%) of the immigrants with the lowest exposure levels. (The odds ratio for the high-medium category approached but did not reach statistical significance.) This pattern suggests that the difference in obesity odds between this group and the reference group of U.S. natives is due to higher SES immigrants and not to the majority (62.6%) of immigrants in the lower SES categories. In comparison, there were no differences in the odds of obesity between any SES category in other immigrants and natives.

Table 6B. Females: Logistic Regression Models Predicting the Odds of Obesity between Least Exposed and Other Immigrants and Natives by SES

	Least Exposed Immigrants vs. U.S.-born		Other Immigrants vs. U.S.-born	
	Odds Ratios	%	Odds Ratios	%
Immigrant SES				
Low	1.04	36.7	1.33	23.7
Low-Medium	0.93	26.9	0.70	30.3
Med	0.38*	18.7	0.68	24.2
High-Medium	0.58	10.6	0.84	11.1
High	0.16**	7.0	0.71	10.8
U.S.-born	1.00	----	1.00	----

* $p \leq 0.01$; ** $p \leq 0.01$

^aNet of age, marital status

SUMMARY

U.S.-born Mexican American men and women have higher obesity rates than their immigrant peers. Male immigrants who arrived as adults are only about one third as likely to be obese as natives; those who arrived before age 20 are equally as likely as natives to be obese. The difference between adult immigrants and natives is actually a difference between low to medium SES adult immigrants and natives; there was no difference between higher SES adult immigrants and natives.

Female immigrants with the least exposure to the U.S. are less likely to be obese than natives; there are no differences in those odds between other female immigrants and natives. However, immigrants with the least exposure to the U.S. were not uniformly less likely to be obese than natives. Differences were found only among medium to high SES immigrants. Lower SES women in the least exposure categories were just as likely as native-born women to be obese.

DISCUSSION

Moving to the U.S. from Mexico increases immigrants' odds of becoming obese. Most work shows that the risk of being obese rises with length of residence or level of acculturation. This pattern extends across generations. Second and higher generation members, by definition exposed to the U.S. from birth, have higher obesity rates than their immigrant counterparts. Taken as a whole, these patterns indicate that exposure to U.S. culture and society constitutes a risk factor for obesity. As immigrants' level of exposure to the U.S. increases, their odds of being obese grow. This positive relationship between exposure and obesity, in turn, means that immigrants' and their risk of morbidity and mortality grow as their exposure to the U.S. lengthens.

The level of exposure variable used in this analysis incorporates both the age at which exposure to the U.S. began and the length of that exposure. Past research has shown that younger age at immigration and thus an earlier age at exposure results in a more rapid uptake of host country culture both because younger people find it easier to learn new cultures and languages than adults and because they did not arrive in the U.S. after being raised in another country and therefore absorbing its culture and practices. In addition, the longer a person resides in a new environment, the greater the likelihood of adapting the language and other cultural features of that environment (Akresh, 2007a; Chiswick & Miller, 2001).

Age at arrival functions differently for males and females as a predictor of the odds of obesity. Male immigrants who arrive as adults do not resemble natives in their odds of being obese; this result suggests that they do not adopt habits of their host country that contribute to obesity. Adult immigrants arrive in the U.S. after having been immersed in Mexican culture since birth and at an age when it is generally more difficult to adapt to change. Thus, they are more likely to prefer and maintain cultural practices brought from Mexico. These seem to

include the dietary and physical activity attitudes and practices they absorbed growing up in Mexico. The traditional Mexican diet is higher in fruits, rice and legumes and lower in processed and sugar-sweetened foods than the contemporary U.S. diet and puts people at lower risk for obesity. Less acculturated Latinos consume more protein, fruit, rice and beans, and less sugar and sugar-sweetened beverages than more their acculturated peers (Ayala, Baquero & Klinger, 2008; Duffey, Gordon-Larsen, Ayala & Popkin, 2008; Guendelman & Abrams, 1995). A preference for a traditional diet may lower the likelihood of eating fast food and other highly processed food pervasive in the U.S. diet. In contrast, immigrants who came to the U.S. as children or adolescents appear to behave in ways similar to U.S.-born Mexican Americans in areas linked to obesity. This suggests that immigrants who come to the U.S. at more impressionable ages more rapidly adopt the attitudes and behaviors surrounding eating and physical activity which then lead to higher BMIs.

Further examination of the relationships between age at arrival and the odds of obesity among immigrant Mexican men revealed that the pattern described above held only for adult immigrants in the low and medium SES categories whose risk of obesity was significantly lower than the risk experienced by U.S. natives. Poverty and lack of education may function to further isolate adult immigrants by preventing them from participating in aspects of the U.S. culture that promote weight gain including American eating habits. In addition, lower education and incomes reflect a greater likelihood of working in manual and labor-intensive jobs where they expend more calories than white collar workers do. Adult immigrants with more resources in the form of education and income may be more able and inclined to participate more fully in U.S. culture and adapt the attitudes and habits that have contributed to the rise in obesity that has taken place in this country during the last several decades.

Females.....

This higher level of adaptation for young arrivals was found for female immigrants as well. Those who came to the U.S. before age 20 were as likely to be obese as native-born Mexican-American women. However, among adult female immigrants, only the least acculturated, those who had been in the U.S. for less than twenty years, were less likely to be obese than native-born women. Women who immigrated as adults but who had been in the U.S. for at least twenty years were just as likely to be obese as those who were born here. This suggests that for women, unlike men, time in the U.S. erodes the effects of growing up in Mexico.

The final set of analyses, which addressed the third research question, examined the role of SES within level of exposure categories with the goal of shedding light on why exposure categories did or did not differ from the reference group of native-born Mexican Americans. The women in the lowest level of exposure group have lived in the U.S. for fewer than twenty years and were raised in Mexico. As a group, this combination of exposure components appears to protect them from obesity to a greater extent than is the case for immigrant women who arrived as children and/or have been in the U.S. for over two decades. However, examining this subgroup of immigrant women more closely reveals that this protection is enjoyed only by higher SES women. This finding suggests that the combination of low levels of opportunity for exposure to the U.S. and more resources with which to navigate one's host country lead to a relatively lower risk of obesity.

Level of exposure serves as a proxy for acculturation to U.S. culture and society, including its dietary patterns and levels of sedentary behavior in work and leisure time. In fact, level of exposure as measured by age of arrival and length of residence only describes the extent

of immigrants' opportunity to be influenced by the host society. Factors such as education and income may moderate immigrants' ability, desire or manner of incorporating host country influences or to retain home country attitudes, beliefs and behaviors.

Therefore, a possible explanation for this result is that higher SES women may be more able to preserve healthier aspects of their Mexican upbringing such as a traditional and healthier diet. In the U.S., processed, sweetened and junk food is cheaper and more available than fresh food and fruits and vegetables. Therefore, an affinity for a healthier Mexican diet along with the means to procure it may lead to less weight gain among higher SES immigrant women with low levels of exposure to the U.S and, presumably, strong ties to the Mexican culture and way of life. At the same time, greater income and education may give them access to healthier environments, such as safer neighborhoods and neighborhoods with well-stocked and reasonably priced grocery stores, and community or recreation centers that are less accessible to poor, uneducated recent adult immigrants.

If this is indeed the case, these advantages are available to only a minority of recent adult immigrant women. High school graduates and women who live at more than twice the poverty line account for a relatively small portion of this immigrant subgroup. Only one third (35.7%) had at least a high school diploma; only one in six (16.8%) lived at more than twice the poverty line. It is somewhat unusual for immigrants from Mexico to have a high school education or more and to live at twice the poverty level (Camarota, 2007). Perhaps these women constitute a particularly successful and/or fortunate group who came to the U.S. with a higher level of human capital than is the norm in Mexico where only 35% of students finished high school in recent years (Santibañez, Vernez & Razquin, 2005). Since their education would have mostly taken place in Mexico, it is likely that they are from more privileged backgrounds than the majority of

Mexican immigrants. They arrived in the U.S. with the ability to lead healthy lives that included healthy diets and higher levels of physical activity.

A related explanation focuses on immigrants' behavior and experiences after immigration. Higher SES among recent, adult immigrants may signal a particularly successful immigrant subgroup who has managed in a relatively short time to establish successful lives in their new home. Higher SES women may be more likely to work outside the home and almost by definition earn higher salaries than less educated women. More educated women are also more likely to work at jobs that provide benefits, such as employer-provided health insurance, vacation and sick pay and child care assistance, which promote health and healthy lifestyles. Low SES immigrant women, particularly those with little education, are less likely to work and those who do work are more likely to hold low-wage jobs without benefits. Juggling work and family responsibilities on lower pay and without the benefits that often go with higher paid employment may lead to greater stress and less healthy habits such as relying on fast food. Lower salaries force immigrants to live in neighborhoods less likely to have grocery stores and safe places to walk or take part in recreation.

Viewed from a slightly different angle, these findings suggest that level of exposure to the U.S. or acculturation does not play an important role in predicting obesity for the majority of women from Mexico, those with relatively low educations and incomes. As shown in Table 3, there are significant bivariate differences in obesity rates by level of exposure for immigrant and native women but the pattern is not linear and, in fact, some immigrant women have higher obesity rates than their native counterparts. The bivariate pattern is quite different for males. All but the immigrants with the most exposure to the U.S. have significantly lower obesity rates than

natives and except for the most exposed immigrants, much lower rates than women in the same category.

There is additional evidence that exposure, or acculturation does not play a role in obesity for women. When multivariate analyses in Table 5 were restricted to respondents in the bottom three SES categories, the significant odds ratio for recent adult female immigrants declines to marginal significance. That is, when higher SES women were excluded from the analyses, there was very little difference in the odds of being obese between the category of immigrant women with the least exposure and native-born women. In comparison, the pattern for men did not change. Among men in the bottom three SES categories, older immigrants were still less likely to be obese than U.S.-born men while younger immigrants were equally likely to be obese.

While further research is needed to test these results, they suggest that acculturation, in the form of the level of opportunity to exposure to U.S. culture and society plays very different roles in the lives of immigrant Mexican men and women. Growing up in Mexico before immigrating appears to protect the majority of immigrant men who are relatively low SES from the habits that put people at risk of becoming obese. But immigrant women do not receive any protection from their immigrant status per se. Only a minority who enjoy the relatively rare combination of low levels of exposure and higher SES are less likely to be obese than their American-born counterparts. This study does not answer the question of why age at immigration, and exposure level in particular, along with SES, play such different roles for immigrant men and women from Mexico in terms of their chances of being obese. Analyses of data that contain more information on other facets of acculturation as well as more detail on sociodemographic and sociocultural factors may be useful in addressing this difference.

This study has interesting implications for interventions designed for immigrant populations. It suggests that interventions among men should be targeted to young immigrants and are much less necessary for adult immigrants. At the same time, no such distinction ought to be made among female immigrants. Most do not differ in their odds from U.S.-born women, half of whom are obese. If these findings stand up to future scrutiny, they would suggest that women of Mexican heritage would benefit from similar interventions regardless of their level of acculturation or generation.

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