

# **The Relationship between Race/ethnicity, Education, and Obesity in U.S. Adults**

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## **Introduction**

Health disparities between racial and ethnic groups in the United States are frequently characterized by the differences that cannot be accounted for by socioeconomic status (SES). This literature has given less attention to the ways in which SES itself operates in relation to health across racial and ethnic groups. While a large body of research documents the increased health benefits that come from rising SES, recent studies have suggested that socioeconomic differentials are weak or absent for African Americans and Hispanics in the U.S. for some health outcomes and related behaviors (Goldman et al 2006; Winkleby & Cubbin 2004). In this paper, I compare the relationship between education and one health indicator, obesity, for three groups—African Americans, Mexican Americans, and non-Hispanic whites. Obesity is not only a serious health concern in the United States, given its role in chronic disease and increases in prevalence over the last three decades, but is also a major source of health disparity, with higher prevalence among African Americans and Hispanics than non-Hispanic whites (Flegal et al 2002). Differences in the relationship between education and obesity between groups may help explain racial and ethnic gaps in obesity and related health conditions. This paper also examines probable mechanisms behind the education-obesity relationship for racial and ethnic groups, including physical activity and dietary intake.

This study is guided by a conceptual framework that incorporates social stratification and acculturation theories as well as the lifecourse perspective. According to this framework, racial and ethnic disparities in health stem from several sources, particularly the complex relationship between race/ethnicity and SES. Race and ethnicity channel individuals into positions of social disadvantage (Hayward & Grady 1990; Hayward et al 2000). African Americans and Hispanics may receive a lower quality education in comparison to non-Hispanic whites with the same level of schooling due to segregation and lower allocation of resources to high-minority schools (Hayward et al 2000; Robbins et al 2001). As a consequence, differences in the relationship between SES and obesity across groups may reflect underlying disparities in the health-related skills and attitudes that accompany education. Additionally, non-Hispanic whites have higher income and wealth than minorities with similar educational attainment (Anderson & Shapiro 1996; Blau & Graham 1990; Crimmins et al 2004; Grodsky & Pager 2001; Trejo 1997). This variation in income and wealth may result in fewer health-protective resources for minorities than non-Hispanic whites at the same educational level (Hayward et al 2000). Institutional racism may devalue minority groups' SES by increasing economic uncertainty and exacerbating or constraining the effects of social conditions for these populations (Hayward et al 2000).

The life course perspective sees the environments, experiences, and exposures that are detrimental to health as cumulative over the life span (Kuh & Ben-Shlomo 1997; Pollitt et al 2007; Power & Hertzman 1997). In the context of this paper, for example, African Americans and Hispanics are more likely than non-Hispanic whites to be the first generation in their families to reach the middle class (Collins 1983). As a result, a disproportionate share of individuals from these groups likely experienced poorer living conditions in childhood in comparison to non-Hispanic whites with similar adult SES (Williams et al 1994). Such conditions may, via socialization in early life, shape attitudes towards health behaviors, ability to defer gratification, and psychological resources, all of which are important to maintaining healthy weight in adulthood (Elo & Preston 1992; Hayward et al 2000; Winkleby et al 1992).

The place where Mexican immigrants spent their childhood and adolescence (Mexico or the U.S.) may shape preferences for health behaviors related to obesity (Goldman et al 2006). Norms prevailing in Mexico may differ by social class from those in the U.S. For example, those with higher SES in Mexico may not avoid unhealthy behaviors or adopt healthier behaviors linked to obesity to the same extent as their counterparts in the U.S. If these health habits continue after immigration, they may dilute the health-protective influences of higher SES and moderate SES differences in the Mexican-born and larger Mexican-origin population in comparison to the non-Hispanic white population.

Acculturation, as applied to the health context, sees the relative good health of the foreign-born as stemming from the protective effects of culture that immigrants bring with them from their countries of origin (Jasso et al 2004). As immigrants become more acculturated, they gradually lose these advantages, a pattern that becomes more pronounced in the second and later generations (Cho et al 2004). In the context of SES and obesity, the poor in Mexico may be less able to afford unhealthy habits, such as consumption of fast foods, than their American counterparts; continuation of these habits after immigration would narrow SES disparities within the Mexican-born and larger Mexican-origin population relative to non-Hispanic whites (Goldman et al 2006). Greater manual labor among those of lower SES in the Mexican-born immigrant population may have the same effect (Goldman et al 2006). From an acculturation standpoint, obesity-related health behavior and labor patterns among Mexican-origin individuals might, over time and especially in the second generation, begin to resemble those of non-Hispanic whites with similar SES through adoption of strata-specific attitudes, preferences, and behaviors. This acculturation may lead to a deterioration of the “buffering” that comes with Mexican birth on the lower end of the socioeconomic spectrum while improving obesity-related health behaviors on the higher end. This hypothesis suggests that SES differentials in obesity may widen in the second generation in the Mexican-origin population.

A weaker relationship between SES and obesity for some populations in comparison to others suggests a variation in the ability of different groups to translate increasing SES into good health. This variation may exacerbate overall disparities in obesity and related conditions between non-Hispanic white and minority populations. In addition, it may result in wider disparities as health technology improves, if non-Hispanic whites are better positioned to adopt such advancements. It may also spur greater disparity in obesity as the SES of African Americans and Hispanics improves over time (Goldman et al 2006).

This study assesses differences in the effect of one indicator of SES—education—on obesity by race and ethnicity. Educational attainment, for the most part, precedes the development of ill health for most people, which mitigates concerns about reverse causality, and is stable throughout adulthood (Kant & Graubard 2007; Krieger et al 1997). I conduct statistical assessments of education associations with obesity for African Americans and Mexican Americans in comparison to non-Hispanic whites. In addition, I compare the education-obesity association between African Americans and Mexican Americans, two groups that share similar socioeconomic profiles as well as minority status in the U.S. If both African Americans and Mexican Americans exhibit weaker relationships between education and obesity than non-Hispanic whites and similar relationships to one another, this provides evidence that this pattern is related to minority group status rather than something unique to either population. Second, I seek to explain the relationship between education and obesity in the U.S. Mexican-origin population in comparison to other racial and ethnic groups through examination of differentials by nativity. If, as suggested by the conceptual framework guiding this study, education disparities in the Mexican-born population in the U.S. are narrower than for the U.S.-born segment of the population, this

supports acculturation and lifecourse explanations for differences between Mexican Americans and non-Hispanic whites. Third, I examine potential mechanisms for differences in the effect of education on obesity across groups by determining whether any variation is mediated by physical activity and dietary intake.

### **Data and statistical methods**

This study uses data from the National Health and Nutrition Examination Survey (NHANES), a nationally representative survey designed to assess the health status of the civilian noninstitutionalized population of the United States. This study is based on surveys conducted in two-year periods from 1999 to 2004. The NHANES contains detailed interviews with demographic, socioeconomic, dietary, and health-related questions, as well as a medical examination in which height and weight were measured, which provides an advantage over the self-reported data used in many studies of obesity. This sample for this study includes adults aged 25 and older who completed both the interview and examination components of the survey. Analysis of Hispanics is restricted to those of Mexican-origin due to variations in health status among Hispanic groups; in addition, data on country of origin or ancestry is unavailable for other Hispanic groups. The sample also includes non-Hispanic whites and African Americans.

Obesity is based on participants' body mass index (BMI), with a BMI of  $30.0 \text{ kg/m}^2$  or higher classified as obese. Physical inactivity is based on a summation of responses to several questionnaire items that concern activity for transportation, errands, tasks, and leisure time as well as an additional measure of usual daily activities. Dietary variables, based on dietary intake in the 24 hours before the examination, include total caloric intake and total and saturated fat. Additional variables in the analysis include race/ethnicity, based on self-reports, age, nativity (whether born in the U.S. or Mexico), and sex.

I employ logistic regression models for analysis of the relationship between education and obesity by race/ethnicity and nativity. The first model investigates the main effects of education and race/ethnicity on obesity, controlling for age and sex. The second model adds an interaction term for education and race/ethnicity. Model 3 adds physical activity and dietary variables to assess mediation of the primary relationships of interest. I then estimate similar models that separate the Mexican-origin population into those born in the U.S. or Mexico.

### **Preliminary results**

The extent to which education varies in its effect on obesity across racial and ethnic groups is addressed in Table 1. Model 1 indicates that education does not have a statistically significant relationship with obesity in the more constrained model. Mexican Americans are no more likely to be obese than non-Hispanic whites, controlling for education, but there is a significant difference between whites and African Americans. Model 2 exhibits the relationship between education and obesity by race/ethnicity, illustrating that as education increases, both Mexican Americans and African Americans are more likely to be obese than non-Hispanic whites. This result confirms the hypothesis that education operates differently, in respect to obesity, across racial and ethnic groups. There is no difference in the relationship for Mexican Americans in comparison to African Americans ( $B = -0.009$ ,  $p = .850$ , not shown). These results are more easily interpretable in Table 2, which presents predicted probabilities of obesity by race/ethnicity and education. As the table shows, non-Hispanic whites are less likely to be obese with increasing education. However, Mexican Americans and African Americans are *more* likely to be obese as education increases, which is the reverse of the relationship observed in the U.S. for most health outcomes.

Model 3 indicates that physical activity and dietary intake partially explain the variation in the effects of education on obesity, but only for Mexican Americans in comparison to non-Hispanic whites, as indicated by a reduction in the interaction term for Mexican Americans but not

for African Americans. One explanation for this weak mediation is that measurement of physical activity and dietary intake may be biased due to of participants' desire to provide socially acceptable responses, and thus overestimate physical activity and underestimate total caloric and fat intake. A second explanation may be that while total caloric and fat intake in the last 24 hours and physical inactivity over the last 30 days may be indicative of recent diet and activity levels, and determine obesity for less educated groups, these factors may have increased the likelihood of obesity for African Americans and Mexican Americans with higher levels of education in childhood or adolescence, or more gradually throughout adulthood; thus, obesity for such individuals would be less affected by current diet and levels of inactivity. Physical activity and diet significantly mediate the main effects of race/ethnicity on obesity (which, because of the inclusion of the interaction term, is defined as the population in each group with less than a high school education). This result, combined with the generally statistically significant relationships between physical activity, dietary intake, and obesity, suggests that general misreporting is not responsible for the weak mediation of the relationship of interest.

In order to determine if place of birth explains the relationship between education and obesity in the Mexican American population, relative to other groups, Table 3 breaks down results for Mexican Americans by nativity. Results (Model 2) indicate that both African Americans and U.S.-born Mexican Americans are more likely to be obese with increasing education than are non-Hispanic whites. However, the Mexican-born are *less* likely to be obese than non-Hispanic whites with increasing education, indicating a stronger relationship between education and obesity in this group relative to non-Hispanic whites. Additional tests (not shown) confirm that the Mexican-born are less likely to be obese with increasing education than either U.S.-born Mexican Americans ( $B = -0.466, p < .001$ ) or African Americans ( $B = -0.352, p < .001$ ). These results suggest that the weaker association between education and obesity in the overall Mexican American population relative to non-Hispanic whites seen in Table 1 is driven by the U.S.-born segment of the population. These results are more easily interpretable in Table 4, which shows a positive relationship between education and obesity for both African Americans and U.S.-born Mexican Americans, in contrast to non-Hispanic whites, who exhibit a negative relationship. The Mexican-born also have a negative association between education and obesity, and one that is stronger than non-Hispanic whites.

## **Discussion**

While the majority of research on education and health in the U.S. and other developed countries has found an inverse relationship, this paper provides evidence that education operates differently for one health indicator, obesity, for various racial and ethnic groups. Specifically, the relationship between education and obesity is reversed for African Americans and U.S.-born Mexican Americans in comparison to non-Hispanic whites, with increasing education leading to a greater likelihood of obesity for these groups. Given that both groups exhibit weaker relationships between education and obesity than non-Hispanic whites and that this pattern is not observed in the Mexican-born, findings suggests that this pattern is related to minority group status rather than something unique to either population. Variation in experiences and exposures over the lifecourse, due to the forces of social stratification and institutional discrimination, may account for these patterns in African Americans and U.S.-born Mexican Americans. These findings may help to explain broader racial and ethnic disparities in obesity and related health conditions.

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**Table 1. Logistic Regression Coefficients for Obesity by Education and Race/Ethnicity: National Health and Nutrition Examination Survey (NHANES: 1999-2004), (N=9,896).**

	Model 1	Model 2	Model 3
Sex (ref: female)	-0.394***	-0.392***	-0.339***
Age	-0.004***	-0.004***	-0.006***
Education	-0.016	-0.105***	-0.102***
Race/ethnicity (ref: non-Hisp. White)			
Mex. Am.	0.057	-0.273***	-0.183**
Afr. Am.	0.571***	0.191*	0.154*
Race/ethnicity x education (ref: non-Hisp. White)			
Mex. Am. x education		0.163*	0.135*
Afr. Am. x education		0.173***	0.179***
No physical activity			0.083
Average daily activity			-0.203***
Total calories			-0.0003*
Total fat (g)			0.007***
Saturated fat (g)			0.004
Constant	-0.238	-0.036	0.246
Wald tests		$\chi^2$	$\chi^2$
Set of race/ethnicity x education interactions (2 d.f.)		59.75***	63.69***

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

**Table 2. Predicted Probability Distributions for Obesity by Education and Race/Ethnicity**

Education	non-Hispanic White	Mexican American	African American
Less than HS	.33	.34	.41
HS graduate	.31	.35	.44
More than HS	.29	.36	.46

**Table 3. Logistic Regression Coefficients for Obesity by Education, Race/Ethnicity, and Nativity: National Health and Nutrition Examination Survey (NHANES: 1999-2004), (N=9,896).**

	Model 1	Model 2	Model 3
Sex (ref: female)	-0.393***	-0.393***	-0.341***
Age	-0.004***	-0.004***	-0.006***
Education	-0.040	-0.109***	-0.103***
Race/ethnicity (ref: non-Hisp. White)			
Afr. Am.	0.556***	0.185*	0.148*
Mex. Am (US-born)	0.240*	-0.336***	-0.314***
Mex. Am. (MX-born)	-0.133	0.033	0.126
Race/ethnicity x education (ref: non-Hisp. White)			
Afr. Am. x education		0.173***	0.180***
Mex. Am (US-born) x education		0.287***	0.272***
Mex. Am. (MX-born) x education		-0.179**	-0.187**
No physical activity			0.097
Average daily activity			-0.198***
Total calories			-0.0003*
Total fat (g)			0.006***
Saturated fat (g)			0.004
Constant	-0.153	-0.004	0.257
Wald tests		$\chi^2$	$\chi^2$
Set of race/ethnicity x education interactions (2 d.f.)		43.30***	220.50***

\* $p < .05$  \*\* $p < .01$  \*\*\*  $p < .001$

**Table 4. Predicted Probability Distributions for Obesity by Education, Race/Ethnicity, and Nativity**

Education	non-Hispanic White	African American	U.S.-born Mexican American	Mexico-born Mexican American
Less than HS	.33	.41	.35	.33
HS graduate	.31	.44	.39	.27
More than HS	.29	.46	.43	.22