

**Social Patterning in Body Mass Index (BMI) among Contemporary Immigrant Groups:  
the Emergence of a Gradient\***

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## Abstract

Although adult body mass index (BMI) displays considerable social patterning worldwide, the direction and strength of the relationship between BMI and socioeconomic status varies cross-nationally. We examine social gradients in BMI for contemporary U.S. immigrants and evaluate whether their SES-BMI gradient patterns are shaped by underlying gradients in immigrant origin countries and whether they are further patterned by time in the U.S. Data come from the New Immigrant Survey, the only nationally representative survey of contemporary immigrants. Results indicate that the inverse SES-BMI gradients observed among this population are strongest among women originating in highly developed countries. Once in the U.S., however, inverse gradient patterns are driven largely by higher weights among low SES individuals, particularly those from less developed countries. We conclude that while certain immigrants appear to be uniquely protected from weight gain, poorer individuals from less developed countries are doubly disadvantaged; this raises concerns about worsening inequalities in both diet and behavior between the rich and poor upon arrival to the U.S.

The U.S. population has experienced dramatic increases in overweight and obesity rates over the last several decades. Overweight prevalence has nearly doubled (from 37 percent in 1976 to 62 percent in 2008) and obesity prevalence has tripled (8.7 percent in 1976 to 27.8 percent in 2008) (Singh et al. 2011). The increases have been large, monotonic and have occurred at all ages and across all segments of the population (Mokdad et al. 1999; Singh, Kogan and Yu 2009; Taubes 1998). Co-existing alongside the uniform increases, however, is substantial social differentiation in prevalence. Lower levels of education and income are associated with higher body mass index (Wang and Beydoun 2007). Labeled the socioeconomic status-body mass index (SES-BMI) *gradient* due to the graded nature of the relationship, the pattern in the U.S. is generally inverse and particularly strong for women and non-Hispanic Whites (Ogden et al. 2010).<sup>1</sup> An opposite pattern is observed in the developing world where either flat or positive gradients prevail, i.e. higher income, education and occupational prestige are associated with higher rates of overweight and obesity (McLaren 2007).

In this article we investigate SES-BMI gradients among contemporary U.S. immigrants, many of whom have migrated from countries characterized by SES-BMI gradient patterns that are different than those prevalent in the U.S. The case of contemporary U.S. immigrants raises two sets of questions. First, do immigrants, particularly those from less developed countries characterized by positive SES-BMI gradients, transfer these gradients to the U.S.? Second, do immigrants' gradients assume the inverse patterns observed among the native born U.S. population the longer they remain in the U.S.? If so, does the pattern of convergence depend on the development level of the origin country?

Our analysis speaks to two distinct issues. The first concerns the obesity epidemic and the need to gain a better understanding of the mechanisms driving the social patterning of weight gain. In the U.S., there is considerable diversity in SES-BMI gradients by race/ethnicity and

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<sup>1</sup> We use the term "gradient" in a broad sense to indicate "the SES patterning of BMI" (Sanchez-Vaznaugh et al. 2009).

nativity (Sanchez-Vaznaugh et al. 2009). One possible explanation for the existing variability is that gradient patterns in the U.S. are contingent upon underlying gradients in immigrant origin countries. An often overlooked aspect of immigrant health patterns is the role of pre-immigration environments in influencing immigrant outcomes once in the U.S. We examine whether social gradients in BMI observed among immigrants in the U.S. are related to the Human Development Index (HDI) of the origin country, a measure that previous research has linked closely to both positive and negative SES-BMI gradients (McLaren 2007).<sup>2</sup> Second, our analysis examines immigrant adaptation by evaluating whether SES-BMI gradients are patterned by time in the U.S. Depending on the U.S. social group into which they are assimilating, increased time in the U.S. may expose immigrants differentially to obesogenic environments and behaviors. In turn, the effects of these varying exposures may differ according to the development level of the origin country. In the analysis that follows we document the SES-BMI gradients in a group of contemporary immigrants and attempt to disentangle the role of home and host country contexts in influencing these patterns.

## BACKGROUND

There is considerable cross-national variability in SES-BMI gradients, largely dependent on country-specific development levels. A seminal review piece published by Sobal and Stunkard in 1989 found two distinct trends in the socioeconomic patterning of weight. Women in developed societies were consistently characterized by an *inverse* gradient with a higher likelihood of obesity for women in lower socioeconomic strata. In developing societies, a *positive* relationship was observed for all, including women, men and children. An updated review analyzing articles through 2004 found the same general pattern of increasing positive associations between SES and BMI and decreasing negative associations as one moved from countries with high levels of development to countries with lower levels of development (McLaren 2007).

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<sup>2</sup> The Human Development Index is a composite measure used by the United Nations based on national indicators of life expectancy, educational attainment, and income.

Explanations for either positive or inverse gradient patterns are linked to where countries are situated in their nutrition and epidemiological transitions (Popkin 1994, 1999, 2001). In general terms, the nutrition transition characterizes a shift towards a diet of more processed foods, more food of animal origin and more added sugar and fat. In pre-transition and transitioning societies where food is less available, the basic ability to afford sufficient food is an important factor in the socioeconomic patterning of weight. As a result, cultural values favoring larger body size produce positive BMI gradients with higher SES generally linked to higher BMIs (Monteiro et al. 2004). In developed post-transitional countries, the reverse is true. Individuals in lower socioeconomic positions tend to have higher BMIs, particularly in the case of women (McLaren 2007).

Despite the continued relevance of a country's level of development in determining the direction of SES-BMI gradients, the strength of these contrasts appears to have weakened over time. The most recent large-scale review of nearly 2,000 cross sectional associations between BMI gradients and country development level found that both positive and negative associations have become less pronounced largely due to "large-scale societal and nutritional change having to do with economic growth, modernization, and globalization of food markets" which has attenuated variation in obesity promoting exposures (McLaren 2007). This is true in developing countries where the aforementioned forces, including the popularity and prestige of imported processed foods, have begun to shift the burden of obesity onto the poor. Convergence towards lower quality diets and changes in aspirations towards thinness among the upper classes also have the potential to weaken historically positive social gradients in weight in developing countries. Likewise, in the case of developed countries, recent evidence suggests that inverse SES-BMI gradients in the U.S. are beginning to flatten as higher SES individuals become more obese (Singh et al. 2011).

The contemporary immigrant population in the U.S. provides a unique opportunity to evaluate what happens to social gradients in BMI when individuals move between countries characterized by different levels of development and whether changes are mitigated by general

increases in obesogenic environments worldwide. Although no previous study has evaluated social gradients in BMI for a nationally representative group of contemporary immigrants, several studies have examined how social gradients in weight status vary across particular racial/ethnic groups in the U.S. (Braveman et al. 2010; Chang and Lauderdale 2005; Sanchez-Vaznaugh et al. 2009; Singh et al. 2011). In contrast to other social gradients in health that are more uniformly positive, social gradients in weight in the U.S. are highly dependent on sex and race (Kimbrow et al. 2008). Non-Hispanic White women consistently display the clearest inverse gradient patterns, across time and regardless of the SES measure used (Chang and Lauderdale 2005; Singh et al. 2011). The patterns for men and other race/ethnic/nativity groups are largely inconsistent, with the direction and strength of the gradient dependent on the data source, the measure of SES selected, and the groups examined. A study using NHANES data found that Mexican-American men exhibit positive education-BMI gradients whereas Mexican-American women displayed weaker inverse patterns (Chang and Lauderdale 2005). Another study of data from California found the opposite when all Hispanic men and women were considered, with negative BMI gradients documented for income and education (Sanchez-Vaznaugh et al. 2009). In the case of Asian men, a quadratic pattern was observed with BMI increasing with education until it peaked at some college education and then declined with increasing education (Sanchez-Vaznaugh et al. 2009). Another study also found a non-linear relationship in the case of the BMI-education gradient for recent Mexican immigrant women, with a significantly positive relationship between more schooling and obesity after the completion of high school (Buttenheim et al. 2010).

Despite inconsistent, and in some cases contradictory, results regarding the strength and direction of BMI gradients across U.S. population groups, the literature is clear on one point-- social gradients in BMI (and a host of other outcomes) are consistently more pronounced in the native-born U.S. population as compared to the foreign-born population (Singh et al. 2011). According to a study by Goldman et al. (2006) on the Mexican-origin population, explanations for flatter gradients among immigrants are three-fold: 1) there are flatter social gradients in

health in Mexico that are imported to the U.S. 2) health selection effects operate such that healthier migrants of all social strata are more likely to migrate thus diluting pre-existing social gradients 3) patterns of integration may predispose native-born descendants of immigrants towards unhealthy behaviors and sharpen social gradients in health as compared to their immigrant counterparts (Goldman et al. 2006). To our knowledge no existing study has simultaneously evaluated these three explanations for SES-BMI gradients across a wide range of contemporary immigrant groups. One pre-existing study which addresses only the first explanation does so only in the case of the Mexican-origin population (Buttenheim et al. 2010). Comparing social gradients in smoking and obesity between Mexican immigrants in the U.S. and non-migrants in Mexico, the authors find partial support for the “imported gradient” hypothesis for smoking but less clear results in the case of obesity. For obesity, Mexican men display minor positive gradients that are either absent or less strong among Mexican immigrants in the U.S. In the case of women in Mexico, the authors find small negative gradients in obesity that differ from the curvilinear pattern observed among recent Mexican immigrant women in the U.S. The authors conclude that recently arrived highly educated Mexican women “do not resemble” their counterparts who remain in Mexico, a finding they attribute to selective migration and/or changes in diet and physical activity after their arrival to the U.S. (Buttenheim et al. 2010). Thus far, which of these processes may explain the different gradient patterns observed among the immigrant population awaits further testing.

The present study takes up the question of how social gradients in BMI are patterned among contemporary immigrants and links it to a larger literature on the worldwide social patterning of weight according to country development level. Do immigrants from developing countries import positive SES-BMI gradients when they move? Does health selection play a role in muting pre-existing gradients? Are differences across immigrant groups from different development contexts muted due to global increases in obesogenic environments? A further question is what happens over time in the U.S.: is there variability in terms of the effect of U.S. tenure on gradients? Do negative gradients become more pronounced over time, i.e. do

immigrants, regardless of their origin country, take on the negative gradients characterizing the U.S.? Or does this process depend on the type of country immigrants originate from?