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Assessing the role of health behaviors, socioeconomic status, and cumulative stress for racial/ethnic disparities in obesity

Adolfo G. Cuevas, PhD[1], **Ruijia Chen, MS**[2], **Natalie Slopen, ScD**[3], **Katherine A Thurber, PhD**[4], **Norbert Wilson, PhD**[5], **Chris Economos, PhD**[5], **David R. Williams, MPH, PhD**[2,6]

[1]Department of Community Health, Tufts University, Medford, MA

[2]Department of Social and Behavioral Sciences, Harvard T.H. Chan School of Public Health, Boston, MA, USA

[3]Department of Epidemiology and Biostatistics, University of Maryland, College Park, MD

[4]National Centre for Epidemiology and Population Health, Research School of Population Health, Australian National University, Canberra, ACT, Australia

[5]Friedman School of Nutrition Science and Policy, Tufts University, Boston, MA

[6]Department of African and African American Studies, Harvard University, Cambridge, MA

Abstract

Objective: To examine the explanatory role of health behaviors, socioeconomic position (SEP), and psychosocial stressors on racial/ethnic obesity disparities in a multiethnic and multiracial sample of adults.

Methods: Using data from the Chicago Community Adult Health Study (2001–2003), we conducted Oaxaca-Blinder decomposition analysis to quantify the extent to which health behaviors (fruit and vegetable consumption and physical activity), SEP, and cumulative stressors (e.g., perceived discrimination, financial strain) each explained differences in obesity prevalence in Blacks, US-born Hispanics, and non-US-born Hispanics compared to non-Hispanic Whites.

Results: SEP and health behaviors did not explain obesity differences between racial/ethnic minorities and Whites. Having high-level of stress in four or more domains explained 4.46% of the differences between Blacks and Whites, whereas having high-level of stress in three domains significantly explained 14.13% of differences between US-born Hispanics and Whites. Together, the predictors explained less than 20% of differences between any racial/ethnic minority group and Whites.

Conclusions: Exposure to stressors may play a role in obesity disparities, particularly among Blacks and US-born Hispanics. Other obesity-related risk factors need to be examined to understand the underlying mechanisms explaining obesity disparities.

Correspondence concerning this article should be addressed to Adolfo G. Cuevas at Tufts University, Department of Community Health, 574 Boston Ave, Suite 208, Medford, MA 02155. Adolfo.cuevas@tufts.edu; Telephone: (617) 627-1026.

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Keywords

Race/ethnicity; obesity; socioeconomic position; health behaviors; psychosocial stress; disparities

Introduction

The obesity epidemic is a public health issue in the United States, disproportionately affecting certain racial/ethnic minority groups.[1] Non-Hispanic Blacks and Hispanics/Latinos have higher prevalence of obesity compared to non-Hispanic Whites, and also have higher levels of obesity-related diseases, such as hypertension, coronary heart disease, and stroke.[2] As obesity prevalence continues to rise,[1] it is likely that these groups will continue to experience an excessive burden of obesity-related morbidity and mortality.

Obesity-related behaviors, such as diet and physical activity, have been a major focus on obesity prevention and interventions. Individuals who engage in physically active lifestyles and consume recommended amounts of fruits and vegetables display lower adiposity relative to individuals who do not engage in these health behaviors.[3,4] Racial/ethnic minorities generally engage in less physical activity and consume fewer fruits and vegetables than Whites, with differences being more pronounced in middle-aged adults compared to older-aged adults.[5] Therefore, these lifestyle behaviors may contribute to racial/ethnic disparities in obesity.[6] Researchers suggest that racial/ethnic differences in health behaviors may largely be a function of underlying differences in socioeconomic position (SEP).[7]

Low socioeconomic position, commonly measured using resource-based measures of education and income, is an established risk factor for obesity.[2] Analysis of data from 23,434 adults in the National Health Interview Survey shows that a large proportion of the association between SEP and obesity is mediated through health behaviors (e.g. diet, physical activity), such that those with higher SEP engage in more healthy behaviors.[8,9] Given that racial/ethnic minorities are overrepresented in low income and education groups, racial/ethnic differences in obesity may be explained by SEP through differences in social environment and ability to acquire and maintain healthy dietary and exercise behaviors. However, researchers find that non-Hispanic Blacks and Hispanics/Latinos are more sedentary during their leisure time than are non-Hispanic Whites across different indicators of social class, such as education, family income, employment status, and marital status.[10] While educational attainment and family income are known to influence dietary intake of fruits and vegetables, racial/ethnic differences in fruit and vegetable consumption persists after adjusting for education and income.[11,12] Simple adjustment for income, education, and other SEP indicators artificially creates equality across dimensions of race/ethnicity and SEP, which can obscure mechanisms that drives racial/ethnic health inequities.[13] Studies have found that racial differences in obesity varies significantly across gradients of socioeconomic indicators, with the greatest disparities at higher levels of SEP.[14,15] For instance, in a study of 10,636 adults, researchers found that in US households with incomes 130% of the federal poverty level or below, the obesity prevalence for non-Hispanic Blacks is approximately 47% compared to 36% for non-Hispanic Whites. In contrast, in households with incomes 350% above federal poverty level, the obesity prevalence for non-Hispanic

Blacks is approximately 49% compared to 31% for non-Hispanic Whites.[14] Bell and colleagues[16] find that racial disparities in obesity between African American (n=3,950) and Non-Hispanic White (n=8,777) adults are largest in the highest income (≥$100,000) and education (college graduate or more) groups. The persistent racial/ethnic inequalities in obesity across every gradient of the SEP strata suggest that other factors contribute to the persistent racial/ethnic disparities in obesity in the US.

Psychosocial stress is increasingly being recognized as a risk factor for obesity.[17] Psychosocial stress may increase the risk of obesity through biological and/or behavioral pathways.[2] Psychosocial stress can induce chronic inflammation[18,19] that can alter insulin sensitivity. The repeated activation of inflammation substantially increases secretion of insulin and decreases the release of growth hormone all of which can lead to accumulation of visceral fat.[20] People experiencing psychological distress can experience weight loss due to a loss of appetite,[21,22] but can also gain weight through increase food consumption.[2,23] Differences may depend upon a variety of factors, including the type duration, and severity of stressors, as well as coping behaviors. Nevertheless, psychosocial stress is generally thought to weaken efforts to be physically active and induce the release of appetite hormones to increase food consumption.[23] For instance, individuals with high levels of stress tend to consume foods high in fats and sugar, as a way to activate brain reward systems and reduce stress responses.[24]

Evidence from the US indicates that a range of psychosocial stressors relate to obesity risk across racial/ethnic groups.[25] Racial/ethnic minorities report experiencing greater exposure to common stressors (e.g., financial strain, employment stress) concurrent with greater exposure to race-related stressors (e.g., racial discrimination) than their White counterparts; [26] this may contribute to their increased obesity risk. However, given that levels of psychosocial stress, on average, are higher among those with lower SEP,[27] the association between psychosocial stress and obesity risk may be confounded by SEP. While stress exposure has been found to contribute to racial/ethnic disparities in some health outcomes (such as self-rated health and chronic illness) independently of SEP,[26,28] there is insufficient evidence on the extent to exposure to psychosocial stressors explains racial/ethnic obesity disparities.

The Oaxaca-Blinder decomposition approach allows us to detect how much differencesin an outcome would be reduced if one group had the same mean levels of the measured attributes compared to another group.[29] The Oaxaca-Blinder decomposition approach can be used to quantify the individual and joint contribution of potentially correlated exposures to health outcomes as well. This method, from economics, is now being applied in health research[30] and used to assess racial/ethnic differences in BMI.[31] For instance, in a cross-sectional study of 16,741 men and women, behavioral (e.g., fruit and vegetable consumptions) and socioeconomic factors accounted for 10% racial disparities in adult body mass index.[31] However, studies to date have not assessed the contribution of psychosocial stressors to racial/ethnic differences, and they have only assessed differences between Blacks and Whites, discounting the impact social determinants may have in explaining differences between Hispanics/Latinos and Whites.

In the present study, we applied the Oaxaca-Blinder decomposition method to examine the relative contribution of health behaviors, SEP, psychosocial stressors in explaining obesity disparities among Black and Hispanic/Latino versus non-Hispanic White adults in a probability sample of adults in Chicago, IL. These findings can inform future interventions as they identify key areas that can be targeted to reduce disparities in obesity.

Method

We analyzed data from the Chicago Community Adult Health Study (CCAHS; 2001–2003), a cross-sectional study of 3,105 adults, aged 18 and over who lived in 343 neighborhood clusters within the city of Chicago. Face-to-face interviews with one individual per selected households were conducted between May 2001 and March 2003. Data were weighted to match the demographics of the city including age, race/ethnicity, and sex distribution based on 2000 census estimates. A more detailed description of the study design is found elsewhere.[32] In the analysis, we excluded a total of 122 (3.94%) respondents who had missing information on stressor variables required for our study. There were no significant differences in race/ethnicity, sex, education, obesity, or stress exposure between included and excluded individuals.

Dependent variable

Trained interviewers administered survey-based measures and measured the respondent's height and weight. Body Mass Index (BMI) was calculated based on measured height and weight and categorized as non-obese (<30 kg/m^2) or obese (≥30 kg/m^2).

Independent variable

The primary predictor was race/ethnicity, which was comprised of three racial/ethnic groups, Blacks, Hispanics, and Whites. We separated non-US-born and US-born Hispanics in all analyses, as stress exposure and obesity is patterned by nativity among Hispanics in the US.[33] We measured nativity with a dichotomous indicator of whether the person was born in any of the 50 states or outside of the US. While Puerto Rico is a US territory, Puerto Ricans born in the island do not consider themselves to be "US-born" and generally have different health profile than those born in mainland US.[34,35] Therefore, we considered Puerto Ricans born outside the US as "non-US-born". A total of 78 individuals identified as "other" race/ethnicity. Given that small number, we could not examine this group as a separate category. These individuals were most similar to Whites in terms of sociodemographic characteristics; therefore, we followed a previous study using CCAHS data[26] and combined the "other" category with whites to enhance available data.

Sociodemographics

We included the following socio-demographic variables in the models: age (by year), sex (male or female), marital/partner status (yes or no), and parental status (i.e., having any children, yes or no).

Health Behaviors

Both diet and physical activity are known to be associated with stress and with obesity.[23,36] Diet was assessed by asking participants how many servings of fruit or vegetables (combined) they usually eat in a day. A serving was defined as a cup of fruit or vegetable juice or a half cup of raw or cooked vegetables or fruits. This included juices and all types of raw or cooked fruits and vegetables. Responses ranged from 0–20 and were dichotomized into two categories, meeting or not meeting the recommended fruit and vegetable intake (i.e., five or more vs. less than five servings of combined fruits and vegetables).[37] Physical activity was assessed using six items from the National Health Interview Survey,[38] which captures frequency, intensity, and duration of activities. Responses were categorized as inactive (i.e., no physical activity), insufficiently active (i.e., some physical activity but not enough to meet guidelines), and active (i.e., more than 4 times a week engaging in light/moderate to vigorous leisure activities).

Socioeconomic Position

We included the following variables as indicators of SEP: education (less than high school, high school, some college, or college degree or higher), employment status (yes or no), and household income (< $10,000, $10,000–$29,999, $30,000–$49,999, $50,000 or more, or missing income). Individuals with missing income data were included in the sample as a separate category to avoid losing participants.

Psychosocial stressors

The measures of psychosocial stress used in this study have been previously used to assess the association between psychosocial stress and obesity and other health outcomes (e.g., depressive symptoms, chronic illnesses, physical limitations).[26] A more detailed description of each stressor domain can be found in a published article by Sternthal and colleagues[26]. Briefly, *childhood adversity* was assessed with eight Likert-style items that asked participants about their childhood experiences, with questions ranging from how often their parents made them feel loved to how well off their family was when they were growing up. *Acute life events* included two life event inventories that assessed acute life events over the life span (4 items); and acute life events in the past five years (11 items). *Financial strain* included two measures that evaluated self-reported financial strain (2 items) and a financial event inventory that appraised serious economic problems (7 items). *Neighborhood stressors* contained three measures that assessed community violence in the past six months (5 items), personal victimization in community (4 items), and community disorder (5 items). *Employment stressors* included six measures that assessed job dissatisfaction (1 item), job autonomy (3 items), job security (2 items), work demand (3 items), work life conflicts (2 items), and job hazards (3 items). *Job discrimination* contained two measures that assessed job harassment (2 items) and unfair treatment in the workplace (3 items). *Relationship stressors* was comprised of five measures that assessed marital problems (8 items), child-related problems (9 items), and friendship issues (2 items). *Lifetime discrimination* measured racial and nonracial discrimination using questions from an inventory of major discriminatory events (4 items) and a shortened version of the Everyday Discrimination Scale (5 items). For domains that included multiple measures, we transformed each measure

into a z-score and summed them together. We then re-standardized the sum score into a z-score to allow for comparisons across domains.[26] Following other research,[26] each stressor domain was dichotomized to contrast the top versus other quintiles. A *cumulative high-stress score* was created to identify individuals experiencing high levels of stress across multiple domains. The cumulative stress score reflects the number of domains in which the individual was in the top quintile of stress exposure. The score ranged from 0 to 8, used as a categorical variable.

Statistical Analysis

We used ANOVA and Chi-square tests to examine distributions of stressors, SEP, and health behaviors in the whole study sample and by race/ethnicity. We then used the Oaxaca-Blinder decomposition to assess the explanatory effects of the independent variables—sociodemographic factors (i.e., age, sex, marital status, and parental status), health behavior (i.e., fruit and vegetable consumption and physical activity) socioeconomic position (income, education, and employment status), and cumulative high-stress—on obesity disparities between racial/ethnic groups.

The Oaxaca-Blinder decomposition quantifies the proportion of racial/ethnic differences in obesity prevalence with the independent variable, which is referred to as the “explained” portion. It also produces the proportion “unexplained”, which is the differences in obesity prevalence that would remain even if the disadvantaged minority groups had the same mean levels on all the independent variable as Whites. A more detailed description of the approach is found elsewhere.[29]

Three separate analyses were conducted to estimate the associations between the independent variables and obesity status (non-obese vs. obese). The first analysis assessed obesity differences between Blacks and Whites, the second analysis assessed differences between US-born Hispanics and Whites, and the third analysis assessed differences between non-US-born Hispanics and Whites. Using the ‘oaxaca’ command and ‘logit’ option in Stata Version 14[39] to analyze absolute differences in obesity status (non-obese vs. obese), we included five categories of variables in the models: 1) age and sex; 2) marital status and parental status; 3) health behavior; 4) SEP; 5) cumulative stressors. While the Oaxaca-Blinder approach is sensitive to which category is chosen as the reference group, we have included the “pooled” option to overcome this issue.[40] All analyses adjusted for sample weights and neighborhood cluster to account for the complex survey design.

Exploratory analyses

The prevalence of different types of psychosocial stressors vary by race/ethnicity.[26] Therefore, we explored whether the different types of psychosocial stressors contribute to racial/ethnic differences in obesity. In addition, studies find racial/ethnic differences in obesity to be more pronounced among women;[1] therefore, we conducted stratified analyses using the decomposition approach.

Results

Of the 2,983 participants in the final sample, 1,802 (60.4%) were female. Mean age was 42.3 years, 34.4% were White, 39.7% were Black, 11.8% were US-born Hispanics, and 14.1% were non-US-born Hispanics. Among all the participants, 1,030 had obesity, more than half of whom (50.2%) were Blacks. Whites had significantly higher levels of household income and education than other racial/ethnic groups. Across domains, the mean stress exposure was generally higher among Blacks and US-born Hispanics than Whites and non-US-born Hispanics. The two exceptions were childhood adversities and employment stressors, where non-US-born Hispanic reported the highest levels. Blacks and US-born Hispanics also had higher prevalence of high exposure to cumulative stressors than Whites or non-US-born Hispanics. The distribution of sociodemographic variables, psychosocial stressors, health behaviors, and obesity for the overall sample and by race/ethnicity status are shown in Table 1.

Decomposition of Black-White Difference

The “explained” portions of the Oaxaca-Blinder models are presented in Table 2. There was no evidence that indicators of SEP and health behaviors explained racial differences in obesity. Notably having high stress in four or more domains explained 4.46% of differences between Blacks and Whites. The combined predictors explained 15.16% of the differences between Blacks and Whites.

Decomposition of US-born Hispanic-White Difference

None of the SEP and health behavior indicators significantly explained racial/ethnic differences in obesity. Having high stress in three domains significantly explained 14.13% of differences between US-born Hispanics and Whites. While the predictors together explained 19.53% of the differences between US-born Hispanics and Whites, there was no evidence that they explained difference at p-value < .05.

Decomposition of non-US-born Hispanic-White Difference

The indicators for SEP, cumulative stress, and health behaviors did not explain racial/ethnic differences in obesity between US-born Hispanics and Whites. Overall the predictors explained 14.30%, albeit not significant at p-value < .05.

Exploratory analyses

We examined the effects of the individual stressors in explaining racial/ethnic obesity differences. Financial strain significantly explained 3.65% of differences in obesity between Blacks and Whites (see Supplemental Table 1). Neighborhood stress significantly explained 6.48% of differences between US-born Hispanics and Whites. No other individual stressors explained obesity differences between Blacks and Whites and US-Born and Whites. None of the individual stressors explained differences between non-US-born Hispanics and Whites.

Given the documented racial differences in obesity by sex, we conducted sex-stratified analyses. Having a college degree or more explained 24.45% of the differences between Black and White women (see Supplemental Table 2). No other predictor explained racial

differences between these groups. Having a college degree or more explained 47.26% of the differences between US-born Hispanic women and White women. Having three stressors and four or more stressors explained 23.35% and 18.72%, respectively, of the differences between US-born Hispanic women and White women. Between non-US-born Hispanic women and White women, partner status explained 18.44% of obesity differences. None of the predictors significantly explained differences in obesity between racial/ethnic minority men and White men.

Discussion

To the best of our knowledge, this is the first study to use the Oaxaca-Blinder decomposition method to examine the explanatory effects of health behaviors, SEP, and cumulative stress on racial/ethnic obesity disparities among a multiracial/ethnic probability sample of adults. Health behaviors (i.e., fruit and vegetable consumption and physical activity) and SEP did not explain racial/ethnic differences between racial/ethnic minorities and Whites. In other words, if racial/ethnic minorities and Whites consumed equal amount of fruit and vegetables, engaged in the same level of physical activity, and were equivalent in socioeconomic positioning, the differences in obesity would remain relatively unchanged. However, having high stress in four or more domains explained approximately 4% of differences between Blacks and Whites. Blacks report greater exposure to a wide range of psychosocial stressors compared to their White counterparts,[26] placing them at an increased risk for obesity.

Our findings suggest that if Blacks and Whites were equally exposed to four or more stressors, the racial difference in obesity prevalence would be reduced by 4%. While this magnitude is not substantial, it may be that other factors mitigate the obesogenic effects of psychosocial stressors. For instance, Blacks may engage in effective coping behaviors to buffer the effects of stress on obesity (e.g., religiosity). Future research using the decomposition method should consider other relevant psychosocial factors that may explain racial differences in obesity. Having high stress in three domains explained approximately 14% of differences between US-born Hispanics and Whites. That is to say, if US-born Hispanics and Whites were equally exposed to three stressors (regardless of the type of stressors), racial/ethnic differences in obesity prevalence would be reduced by 14%. Yet, we did not find evidence that psychosocial stressors play a significant role in explaining differences between non-US-born Hispanics and Whites. Previous research finds that US-born Hispanics have similar prevalence rates of stressors compared to Blacks, while non-US-born Hispanics have stress profiles similar to Whites.[26] According to Tillman and Weiss, [41] non-US-born Hispanics may appraise stressors differently compared to US-born Hispanics. While the level of exposure may be similar between US-born Hispanics and non-US-born Hispanics, the effects on health may vary.[41] Study findings need to be replicated to examine the role that stressors and stress appraisal may play in the relationship between race/ethnicity and obesity.

In our exploratory analyses to consider the explanatory effects of individual stressors, financial strain was the only stressor that significantly explained differences in obesity between Blacks and Whites, explaining 4.15% of obesity differences. Neighborhood stress

explained 7.08% of differences between US-born Hispanics and Whites. While these stressors warrant further investigation, it is important not to discount the potential adverse obesogenic effects of the other stressors as they can co-occur and accumulate to increase obesity risk.[26] Future research should examine how stressors individually and together are pathways for existing racial/ethnic disparities in obesity.

The predictors together explained less than 20% for any of the racial/ethnic differences in obesity. While health behaviors and SEP did not significantly explain racial/ethnic differences in obesity, they remain risk factors for obesity and mechanisms of persistent health inequities. For instance, education is thought to increase the risk of obesity.[42] Racial/ethnic gaps in college attendance remains large despite increases in Black and Hispanic/Latino enrollment and graduation over the last three decades.[43] In fact, when we stratified analyses by sex, we found that having a college degree or more explained a substantial proportion of obesity differences between Black and White women and US-born Hispanic women and White women. Our findings suggest that other unexamined social and psychological factors may further explain racial/ethnic differences in obesity. Our findings need to be replicated and include other obesity-related risk factors that disproportionately affect racial/ethnic minorities. We also did not examine environmental influences of obesity. For instance, residential segregation is a known social determinant of health.[44] Even after adjusting for SEP, segregation is a strong predictor of poor physical and mental health.[44] Given that Blacks and Hispanics are more residentially segregated than Whites, they are excessively exposed to limited access to health promoting resources.[27] Our operationalization of stressors does not fully capture individuals' socioenvironmental context, particularly racial segregation. Therefore, in future studies, it will be important to examine aspects of the social environment (e.g., racial density) in relation to the onset of obesity.

Limitations

The study has limitations. First, the data are cross-sectional, which prevents us from prospectively examining whether health behaviors, SEP, and stressors across the life course explains racial/ethnic weight differences overtime. The operationalization of SEP and health behaviors influence our conclusions. We used three traditional indicators of SEP (e.g., income, employment status and education), which could underestimate the contribution of SEP to observed racial and ethnic disparities in obesity as they do not comprehensively capture the socioeconomic positions of racial/ethnic groups. For instance, Blacks and Hispanics have less wealth, receive less income, and have less purchasing power compared to White at the same education levels.[44] Related, diet and physical activity are multidimensional health behaviors. We did not measure intake of fat and sugar for dietary behaviors nor did we measure work-related physical activity. Including more comprehensive measures of SEP and health behaviors can help elucidate the mechanisms underlying obesity disparities. The sample sizes for US-born and non-US-born Hispanics were small, therefore, the analyses may have been underpowered to adequately address the research questions. Moreover, we only examined a subset of potential life stressors. Acculturation stress is commonly experienced by immigrants and may influence weight gain more than other stressors for non-US-born Hispanics. Future studies should consider a wider range of

stressors in relation to obesity risk. Moreover, while non-US-born immigrants tend to have lower obesity rates compared to US-born counterparts, this advantage tend to diminish over time.[45] This may be due to cumulative stress exposure the longer individuals live in the US. We were not able to take length of residence in the US into account in our study. Future research should replicate these findings and examine the role of length of residence within the context of stress and obesity. Finally, this study was of Chicago residents and results may not generalize to the wider population.

Conclusion

Our study examined the role that health behaviors, SEP, and cumulative stress exposure in explaining racial/ethnic obesity disparities. Using Oaxaca-Blinder decomposition, we found that having high-level of stress in four or more domains explained approximately 4% of differences between Blacks and Whites and having high-level of stress in 3 domains explained around 14% of differences between US-born Hispanics and Whites. There was no evidence that SEP and health behaviors explained racial/ethnic differences in obesity prevalence. In order to advance our understanding of the social determinants affecting obesity disparities at the population-level, future research is needed to examine socioenvironmental-level and individual-level factors that are associated with elevated risk for obesity, such as racial segregation[27].

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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What is already known about this subject?

- The obesity epidemic is a public health issue in the United States, that disproportionately affects certain racial/ethnic minority groups.
- Health behaviors (e.g., diet, physical activity) and socioeconomic position are frequently proposed to account for racial/ethnic obesity disparities, though evidence suggest that other factors may play a role.
- Psychosocial stress is an obesity risk factor that may explain disparities between certain racial/ethnic minority groups and non-Hispanic Whites.

What does your study add?

- Health behaviors and socioeconomic position did not explain obesity differences between racial/ethnic minorities (i.e., non-Hispanic Blacks, US-born Hispanics, and non-US-born Hispanics) and Whites.
- Having high-level of stress in four or more domains explained 4.46% of differences between Blacks and Whites, whereas having high-level of stress in three domains significantly explained 14.13% of differences between US-born Hispanics and Whites.
- Together, health behaviors, socioeconomic position and cumulative stress only partially explain racial/ethnic disparities in obesity, suggesting that other obesity-related risk factors need to be examined to understand the underlying mechanisms explaining racial/ethnic disparities in obesity.

Table 1.

Sample characteristics

	Full Sample	Stratified by Race/Ethnicity Status								
	N = 2,983	Non-Hispanic White (N =1027)		Non-Hispanic Black (N=1184)		US-born Hispanics (N =353)		Non-US-born Hispanics (N=419)		
	Mean	Mean	SE	Mean	SE	Mean	SE	Mean	SE	p-value
Age (years)	42.28	43.65	0.66	44.02	0.64	35.89	1.15	39.54	0.89	<0.001
Stress exposure										
Childhood adversities	−0.02	−0.12	0.03	−0.08	0.03	0.1	0.07	0.3	0.06	<0.001
Acute life events	−0.07	−0.22	0.03	0.22	0.04	0.08	0.07	−0.44	0.04	<0.001
Financial	−0.11	−0.28	0.03	0.1	0.04	−0.02	0.06	−0.15	0.04	<0.001
Life discrimination	−0.02	−0.21	0.03	0.36	0.04	0.23	0.07	−0.55	0.03	0.001
Neighborhood	−0.12	−0.36	0.03	0.22	0.03	0.03	0.07	−0.3	0.05	0.001
Job discrimination	0	−0.02	0.04	0.05	0.04	0.2	0.08	−0.2	0.05	0.001
Employment	0.02	0.07	0.04	−0.09	0.04	−0.01	0.07	0.18	0.06	<0.001
Relationship	−0.01	−0.27	0.03	0.22	0.04	0.11	0.06	0.14	0.06	<0.001
Diet										
Servings of fruit & vegetables	2.3	2.6	0.05	2.09	0.05	2.1	0.08	2.07	0.07	<0.001
	n	n	%	n	%	n	%	n	%	
Gender										
Male	1181	452	44.01	398	33.61	142	40.23	189	45.11	
Female	1802	575	55.99	786	66.39	211	59.77	230	54.89	0.05
Education										
Less than high school	753	120	11.68	282	23.82	115	32.58	236	56.32	
High school	729	205	19.96	339	28.63	100	28.33	85	20.29	
Some college	790	248	24.15	384	32.43	94	26.63	64	15.27	
College degree and above	711	454	44.21	179	15.12	44	12.46	34	8.11	<0.001
Income										
Less than $10000	345	59	5.74	209	17.65	47	13.31	30	7.16	
$10,000 through $29,999	843	201	19.57	382	32.26	110	31.16	150	35.80	

	Full Sample	Stratified by Race/Ethnicity Status								
	N = 2,983	Non-Hispanic White (N =1027)		Non-Hispanic Black (N=1184)		US-born Hispanics (N =353)		Non-US-born Hispanics (N=419)		
	Mean	Mean	SE	Mean	SE	Mean	SE	Mean	SE	p-value
$30,000 through $49,999	563	188	18.31	214	18.07	69	19.55	92	21.96	
$50,000 or more	689	360	35.05	190	16.05	73	20.68	66	15.75	
Missing	543	219	21.32	189	15.96	54	15.30	81	19.33	<0.001
Employment status										
Has a job	1789	649	63.19	649	54.81	207	58.64	284	67.78	
Does not have a job	1194	378	36.81	535	45.19	146	41.36	135	32.22	<0.01
Marital status										
Single/Never Married	1129	406	39.53	473	39.95	160	45.33	90	21.48	
Currently Married	1050	396	38.56	279	23.56	111	31.44	264	63.01	
Formerly married	804	225	21.91	432	36.49	82	23.23	65	15.51	<0.001
Parental status										
Has child(ren)	2027	510	49.66	928	78.38	238	67.42	351	83.77	
Does not have children	956	517	50.34	256	21.62	115	32.58	68	16.23	<0.001
Physical Activity										
Inactive	611	193	18.79	263	22.21	55	15.58	100	23.87	
Insufficiently active	1905	688	66.99	735	62.08	235	66.57	247	58.95	
Meet guideline	467	146	14.22	186	15.71	63	17.85	72	17.18	0.06
Number of domains of high stress exposure (cumulative stress)										
0	851	383	37.29	267	22.55	76	21.53	125	29.83	
1	847	316	30.77	301	25.42	91	25.78	139	33.17	
2	542	236	22.98	157	13.26	67	18.98	82	19.57	
3	375	82	7.98	185	15.63	65	18.41	43	10.26	
4+	368	89	8.67	195	16.47	54	15.30	30	7.16	<0.001
Obesity										
Obese	1030	225	21.91	517	43.67	139	39.38	149	35.56	
Non-obese	1953	802	78.09	667	56.33	214	60.62	270	64.44	<0.001

Table 2.

Proportion of racial differences in obesity attributable to age and sex, marital status/parental status, health behaviors, socioeconomic status, and cumulative stressors

Predictors	Black vs. White	Percent explained	US-born Hispanic vs. White	Percent explained	Non-US-born Hispanic vs. White	Percent explained
	Coeff (95% CI)		Coeff (95% CI)		Coeff (95% CT)	
Age	0.001 (−0.005, 0.008)	.59%	−0.03 (−0.05, −0.005) *	−13.37%	−0.01 (−0.02, −0.003) *	−7.76%
Sex						
Male (Reference)						
Female	0.006(0.00002,0.01) *	2.73%	−0.0001 (−0.003, 0.002)	−.06%	0.00005 (−0.002, 0.002)	.03%
Marital status						
Not Married (Reference)						
Married	−0.006 (−0.01, 0.001)	−3.01%	−0.002 (−0.01, 0.007)	−1.16%	0.02 (−0.003, 0.04)	9.81%
Parental status						
Does not have children (Reference)						
Has child(ren)	0.01 (−0.005,0.03)	6.21%	0.009 (−0.005, 0.02)	4.39%	0.01 (−0.01,0.04)	8.13%
Physical Activity						
No activity (Reference)						
Insufficient activity	−0.002 (−0.006, 0.002)	−.94%	−0.00002 (−0.0007, 0.0007)	−.01%	0.0005 (−0.005, 0.006)	.27%
Meeting recommended physical activity	0.0002 (−0.001, 0.002)	.11%	−0.002 (−0.006, 0.003)	−.80%	−0.00008 (−0.0009, 0.0008)	−.05%
Diet						
Not meeting recommended fruit and vegetables intake (Reference)						
Meeting recommended fruit and vegetables intake	−0.002 (−0.007, 0.003)	−1.03%	−0.006 (−0.01, 0.001)	−2.82%	−0.006 (−0.01, 0.002)	−3.66%
Education						
Less than high school (Reference)						
High school	0.002 (−0.005, 0.009)	.93%	0.001 (−0.01,0.01)	.62%	0.0006 (−0.003, 0.004)	.37%
Some college	−0.002 (−0.008, 0.004)	−.83%	−0.0008 (−0.006, 0.005)	−.39%	−0.002 (−0.008, 0.005)	−.88%
College degree and above	0.01 (−0.01,0.04)	6.48%	0.01 (−0.03,0.05)	5.67%	0.005 (−0.03, 0.04)	2.67%

Predictors	Black vs. White	Percent explained	US-born Hispanic vs. White	Percent explained	Non-US-born Hispanic vs. White	Percent explained
	Coeff (95% CI)		Coeff (95% CI)		Coeff (95% CT)	
Income						
Less than $10000 (Reference)						
$10,000 through $29,999	−0.001 (−0.01,0.01)	−.54%	0.01 (−0.002,0.02)	4.75%	0.002 (−0.003, 0.007)	1.21%
$30,000 through $49,999	−0.002 (−0.01, 0.01)	−.83%	0.01 (−0.004,0.03)	5.69%	−0.001 (−0.01,0.01)	−.80%
$50,000 or more	−0.0005 (−0.003, 0.002)	−.22%	0.0006 (−0.004, 0.005)	.31%	−0.001 (−0.006, 0.004)	−.59%
Missing	0.002 (−0.01, 0.02)	.86%	−0.002 (−0.02, 0.01)	−.80%	0.005 (−0.01, 0.02)	3.04%
Employment status						
Does not have a job (Reference)						
Has a job	−0.004 (−0.01, 0.003)	−1.69%	−0.001 (−0.005, 0.003)	−.48%	−0.0005 (−0.004, 0.003)	−.32%
Number of domains of high stress exposure (cumulative stress)						
0 (Reference)						
1	−0.002 (−0.007, 0.002)	−1.01%	−0.005 (−0.01, 0.002)	−2.27%	0.001 (−0.002,0.005)	.80%
2	0.002 (−0.002, 0.006)	1.02%	0.005 (−0.003,0.01)	2.71%	0.0007 (−0.002, 0.004)	.43%
3	0.004 (−0.005, 0.01)	1.88%	0.03 (0.008, 0.05) *	14.13%	0.003 (−0.002, 0.008)	1.80%
4+	0.01 (0.001,0.02) *	4.46%	0.007 (−0.002, 0.02)	3.42%	−0.0004 (−0.004, 0.004)	−.21%
Explained total	0.03 (0.001,0.06) *	15.16%	0.04 (−0.01, 0.09)	19.53%	0.02 (−0.03, 0.08)	14.30%
Unexplained	0.18 (0.12,0.24) **	84.84%	0.16(0.08,0.24) **	80.47%	0.15(0.07,0.22) **	85.70%
Total predicted gap	0.21 (0.17,0.26) **		0.20(0.13,0.27) **		0.17(0.11,0.23) **	

All results are weighted.

** P <0.01;

* P < 0.05

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