Thin men, heavy women: how gendered strategies of coping may explain sex differences in obesity in poor, urban communities

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Short Abstract

In poor, urban settings, obesity prevalence is much higher in women than men. Mechanisms underlying this gendered patterning of obesity are poorly understood, but gender differences in psychological distress stemming from neighborhood disadvantage may offer an explanation. We investigated whether Black and White men and women sharing the same disadvantaged environment report different levels of distress. We used the Exploring Health Disparities in Integrated Communities-Southwest Baltimore study (EHDIC-SWB), a 2003 population-based survey of residents in a low-income, racially integrated community with no race difference in income. We contextualized these results using the 2003 National Health Interview Survey (NHIS). In EHDIC-SWB, White women reported higher distress than White men, Black women, and Black men. In NHIS, females reported higher distress than males with no racial difference. Gendered strategies of coping with neighborhood stressors may offer an additional explanation for the association between disadvantage and increased obesity in women but not men.

Introduction

The social and economic patterning of obesity has been well documented in the U.S. and across the globe (McLaren 2007, Khlat, Jusot et al. 2009, Houle 2011). Within countries at various levels of economic development, obesity prevalence can vary considerably by gender and individual socioeconomic status (SES) (Scharoun-Lee, Kaufman et al. 2008, Sanchez-Vaznaugh, Kawachi et al. 2009, Wells, Marphatia et al. 2012). For instance, obesity prevalence is markedly higher in women than in males particularly in populations undergoing rapid socioeconomic development and "nutrition transition" (Popkin 1994, McLaren 2007, Case and Menendez 2009, Kanter and Caballero 2012). Similarly, in minority and poor communities in the U.S., women are much more likely to be obese than their male counterparts (Robinson, Gordon-Larsen et al. 2009), with obesity prevalence differing by as much as 20 percentage points among Black women and Black men (Ogden, Carroll et al. 2013). Although reasons behind these gender differences in obesity prevalence are unclear, extant research points to the built environment and neighborhood conditions as important factors for the development of obesity (Coogan, Cozier et al. 2010, Stafford, Brunner et al. 2010). However, this presents a puzzle: if men and women tend to live in similar neighborhoods, why does obesity prevalence differ so much by gender in minority and low-income communities?

There is accumulating evidence that neighborhood deprivation has different effects on obesity in men and women (Mujahid, Diez Roux et al. 2008, Chang, Hillier et al. 2009). Although a large literature has focused on the gender-specific relationship between obesity and qualities of the physical environment including the availability of healthy food and walkability, the social environment may also impact weight status in men and women. For example, in one study that used a factor-analysis approach to score communities on two dimensions—the physical versus social environment—lower scores on the *physical* environment scale were associated with increased odds of

obesity in both men and women, but the strength of the association appeared weaker in men than in women (Mujahid, Diez Roux et al. 2008). On the other hand, lower scores on the *social* environment scale were associated with decreased odds of obesity in men, but increased odds of obesity in women. Other studies investigating the relationship between neighborhood disorder (both physical and social attributes) and obesity have found similar results in women but not in men (Chang, Hillier et al. 2009). Given this limited literature, it remains unknown why the physical versus the social environment of communities may have different effects on weight status in men and women.

One mechanism through which large sex differences in obesity may emerge in disadvantaged environments is through women having more frequent exposure to stressors than men. For example, women may be more likely to assume stressful roles in disadvantaged environments due to socially constructed norms surrounding femininity, childrearing, and food allocation, including traditional expectations of "feeding the family" (DeVault 1991, Martin and Lippert 2012). These norms compel women to engage in behaviors associated with weight gain, such as food choices and preparation. In turn, these women are more likely to be exposed to food insecurity, which has shown a strong relationship with obesity in females but not in males (Martin and Lippert 2012). Another mechanism through which large sex differences in obesity may emerge is through gender-specific perceptions of stressors (Robert and Reither 2004, Stafford, Brunner et al. 2010). For instance, men tend to report fewer sources of stress and being less affected by those stressors than women. This gender difference in the influence of a stressor may be due to a lower distress-threshold for women or social norms surrounding masculinity and admissions of distress. Furthermore, men are more likely to report work-related stress and women more likely to report general life constraints and strained familial relationships as sources of stress (Block, He et al. 2009). A final, potential mechanism involves gender-specific responses to a perceived stressor (Keyes,

Grant et al. 2008, Fowler-Brown, Bennett et al. 2009). Exposure to chronic stress may trigger behavioral responses such as overeating in women (Jackson, Knight et al. 2010), while men may use other coping mechanisms such as substance abuse and smoking (Williams 2003).

Understanding these sources of psychological distress could provide insight into possible points of intervention to help curtail high female obesity in poor communities. We therefore explored whether the prevalence of psychosocial distress differs by gender among adults living in poor, urban environments. Further, we examined whether the relationship between gender and obesity persists after controlling for psychosocial distress, coping behaviors, religiosity, and spirituality. We hypothesize that the strong positive relationship between female gender and obesity will be attenuated after controlling for other covariates. We further hypothesize that positive coping behaviors to stressors (e.g., religious attendance and physical activity) will be associated with decreased odds of obesity, while negative coping behaviors (e.g., smoking and alcohol use) may also be associated with decreased odds of obesity.

The major advantage of this present study is that the parent study was designed to explore health disparities in racially integrated and balanced communities with no race difference in SES. Therefore, Blacks and Whites differ little in terms of exposure to neighborhood disadvantage. Furthermore, three validated instruments were used to measure multiple dimensions of psychosocial distress, namely current depression, perceived stress, and anxiety and insomnia (indicative of general distress). These dimensions are commonly conflated, yet they may have individually distinct relationships with obesity risk. Moreover, participants responded to questions about their religiosity and spirituality separately from religious attendance, thereby distinguishing faith and practice of worship. This paper takes advantage of these data to estimate cross-

sectional models of the relationship between gender and obesity while controlling for psychosocial distress, potential coping behaviors, and religious and spiritual orientation.

Methods

Data

The Exploring Health Disparities in Integrated Communities study (EHDIC) is a multisite study of race disparities within U.S. communities where Blacks and Whites live together and where there are no race differences in SES (as measured by median income). In the 2000 Census, less than 1% of all census tracts met the study criteria for racial integration, balance, and equality in SES. The present analysis uses cross-sectional survey data of adults living in two neighboring census tracts in southwest Baltimore, Maryland (EHDIC-SWB) that met the EHDIC eligibility criteria. Recruitment occurred through in-person, telephone-, and mail-based methods for each occupied residence with eligibility restricted to Blacks and Whites aged 18 years or older (N=1,489). Participants provided informed consent and completed a structured in-person questionnaire and health assessment modeled after the 2003 National Health Interview Survey. All data collection occurred during a 12-week period between June and August 2003.

A comparison sample was used to contextualize results from EHDIC-SWB. The 2003 National Health Interview Survey (NHIS) is a cross-sectional, multistage stratified health survey of non-institutionalized, civilian US households that is administered annually by the National Center for Health Statistics. Participants consented to a one-hour in-person interview on health status, health behaviors, and demographics. Our analysis of NHIS uses data on non-Hispanic Black and non-Hispanic White adults in the Sample Adult Core section of the 2003 NHIS (N=29,630).

Psychosocial distress

In EHDIC, psychosocial distress was evaluated using three questionnaires: the eight-item Patient Health Questionnaire (PHQ-8) depression scale (Kroenke, Strine et al. 2009), the Cohen Perceived Stress scale (PSS 10) (Cohen, Kamarck et al. 1983), and the General Health Questionnaire anxiety and insomnia subscale (Goldberg and Hillier 1979). In the PHQ-8, participants used a four-level scale from 0 (not at all) to 3 (nearly every day), with a total score ranging from 0 to 24. Current depression was ascertained using a total PHQ-8 score of at least 10 (Kroenke, Strine et al. 2009). For the PSS 10, participants reported the frequency of feelings and thoughts of stress over the previous month as 1 (never), 3 (Sometimes), and 5 (Often). The PSS-10 scores ranged from 10 to 50. For the GHQ Anxiety and Insomnia subscale, participants responded to questions concerning sleep difficulty and feelings over the previous weeks using a four-point Likert-type scale, which was recoded for scoring (0 if “not at all” or ”no more than usual”; 1 if ”rather more than usual” or “much more than usual”). The GHQ scores ranged from 0 to 7.

In NHIS, the Kessler Psychological Distress (K6) scale was administered to screen for serious mental illness (Kessler, Andrews et al. 2002). Participants responded to six questions about feeling nervous, sad, restless, hopeless, worthless, and burdened using a five-point Likert-type scale (“none of the time”, “a little of the time”, “some of the time”, “most of the time”, “all of the time”), with scores ranging from 6 to 30. Serious mental illness was defined as K6 score of at least 13 (Kessler, Barker et al. 2003).

Coping behaviors

We identified behaviors that could be characterized as forms of negative (alcohol use or smoking) or positive (physical activity or religious attendance) coping. Current alcohol use was defined as currently drinking alcoholic beverages, including a can of

beer, a glass of wine, or a shot of liquor. Binge drinking was defined as ever having 5 or more drinks in one sitting in the past month. Current smoking was defined as answering "yes" to a question on current tobacco use. Physical activity (active/inactive) was defined as engaging in at least one hour of exercise each month. Participants were asked how often they attend religious services (more than once a week, every week or more often, once or twice a month, every month or so, once or twice a year or never). Participants also responded to questions about religiosity (not religious at all, slightly religious, moderately religious, very religious) and spirituality (not spiritual at all, slightly spiritual, moderately spiritual, very spiritual).

Outcome: obesity

The outcome, obesity, was defined as body mass index (BMI) of at least 30 kg/m^2, which was calculated using self-reported height and weight.

Socio-demographic characteristics

Marital status was categorized as married/living as married, widowed, divorced/separated, or never married. Educational attainment was categorized as less than high school completed, high school graduate or equivalent degree, and more than high school completed. Gender was self-reported in NHIS and interviewer-reported in EHDIC-SWB. Non-Hispanic Black or non-Hispanic White race was self-reported by respondents in both datasets.

Analysis

In the EHDIC-SWB sample, we used logistic regression to estimate the relationships between gender and obesity and adjusted for multiple covariates. We compared results from the two datasets to assess whether gender differences in

measures of distress were greater in the low-income setting than in the national sample. Additionally, we examined whether negative and positive coping behaviors differed by sex to a greater extent in the low-income setting versus the national sample and estimated the extent to which these behaviors might account for the obesity gender difference in low-income, urban settings.

In these analyses, we direct-standardized the data to the age distribution of US adults in the 2000 Census. In NHIS, we created composite weights to obtain age- and survey-adjusted prevalence estimates that account for the survey's complex, multistage sampling by multiplying the 2000 Census age-distribution weights with the complex survey weights. All analyses were conducted in Stata 12 (StataCorp 2012).

Results

Table 1 shows the characteristics of EHDIC-SWB and NHIS participants. Overall, EHDIC-SWB participants showed more signs of disadvantage, for example higher likelihood of being unmarried and having completed less than high school education. In both EHDIC-SWB and NHIS, Black and White men were more likely to be current smokers than their female counterparts; however, among Black and White adults living in poor, urban settings, the prevalence of current smoking was much higher than among nationally representative Blacks and Whites. In EHDIC-SWB, possible coping strategies differed by sex or race. For instance, women were more likely to be physically inactive than their male counterparts. On the other hand, religious attendance differed largely by race rather than sex, with Black women much more likely to attend weekly than Black men, White women, or White men.

In the assessment of psychosocial stress in EHDIC-SWB, consistent patterns by race and gender emerged. For example, prevalence of current depression assessed using the PHQ-8 was lowest among Black men. Similarly, mean perceived stress

(assessed using the PSS 10) and anxiety and insomnia scores (assessed using the GHQ) were lowest among Black men than among other groups. On the other hand, White women had consistently higher psychosocial stress assessments than all other groups. For example, current depression (PHQ-8 >=10) was estimated to be 28% among White women compared with 19% of White men, 16% of Black women, and 13% of Black men. Moreover, indicators of mental health appeared to be gendered and racially patterned in a chronically stressful environment.

Table 2 summarizes the results from multiple logistic regression models. In our crude analyses (Model 1), the odds of obesity were twice as high in women than in their male counterparts (OR: 2.11; 95% CI: 1.65, 2.70). Adjustment for Black race and age in Model 2 slightly strengthened the association between gender and obesity (OR: 2.27; 95% CI: 1.77, 2.92). Additional adjustment for psychosocial distress in Model 3 using the Cohen, PHQ, and GHQ scales did not influence the association between gender and obesity (OR: 2.28; 95% CI: 1.77, 2.93). When we adjusted for coping behaviors in Model 4, the association between gender and obesity was attenuated (OR: 2.06; 95% CI: 1.58, 2.67). As expected, current smokers had lower odds of obesity compared to non-smokers (OR: 0.53; 95% CI: 0.41, 0.69), controlling for gender, race, age, psychosocial distress, and other coping behaviors. On the other hand, we found positive associations between varying frequencies of religious attendance and obesity, adjusting for other covariates. For instance, those who attend religious services once or twice per year had higher odds of obesity (OR: 1.59; 95% CI: 1.11, 2.26), compared to those who never attend religious services.

Further adjustment for religiosity and spirituality in Model 5 had little effect on other model coefficients except for religious attendance, which were attenuated. Additionally, we found that compared to those self-identifying as not religious at all, those who identified as slightly religious were much more likely to be obese (OR: 2.33;

95% CI: 1.33, 4.08). On the other hand, spirituality was associated with lower odds of obesity (OR: 0.55; 95% CI: 0.30, 1.02), adjusting for demographics, psychosocial distress, and coping behaviors.

Discussion

In a low-income, racially integrated, urban community, we found that White women report disproportionately higher levels of psychosocial stress than Black women, White men, and Black men. This finding is contrary to results from epidemiologic surveys that find Blacks reporting higher levels of psychological distress than Whites. Controlling for psychosocial stress or coping behaviors did not substantially affect the model coefficient for gender in relation to prevalence of obesity. Contrary to our hypothesis that positive coping behaviors would be associated with lower odds of obesity, we found that religious attendance was associated with increased odds of obesity. Furthermore, contrary to our expectations, religiosity was associated with higher odds of obesity, while spirituality was associated with lower odds of obesity. However, because this relationship cannot be interpreted causally, the relationship between religiosity and obesity should be explored in future studies.

Study Limitations

One limitation of the present study is that the data are cross-sectional, thereby limiting the ability to draw causal inferences of the relationship between psychosocial distress and obesity. Without temporal ordering of exposure, potential mediator, and outcome assessments, the possibility for reverse causation cannot be ruled out. For example, rather than physical inactivity causing obesity, obesity may limit one's ability to engage in physical activity (reverse causation). When physical activity and obesity are assessed contemporaneously, the association between psychosocial stress and obesity is difficult

to interpret causally. As such, we did not perform a formal (or informal) mediation analysis. Also limiting causal inference from this data is that there may be strategies to diversify coping behaviors over time that is not captured in cross-sectional data. Specifically, there may be dynamic changes in use of specific coping behaviors over time as people are desensitized to previously used strategies. Indeed, some of these observed patterns might be explained by differences in social norms for self-reporting psychosocial distress. However, this cross-sectional analysis is intended to detect patterns and generate hypotheses, rather than establish causal relationships. Another limitation of this analysis is that BMI and obesity were calculated based on self-reported height and weight. There may be gender- and race-specific differences in misreporting. For instance, women tend to underreport weight while men tend to overestimate height. A final limitation is that findings from this study cannot be generalized to rural communities or other race/ethnicities due to the restriction criteria used in the study design.

Conclusions

By using data from three validated instruments for measuring psychosocial distress along with coping behaviors and faith-based orientation, this paper has explored potential mechanisms underlying gender disparities in obesity in the US. We were able to examine whether women living in chronically stressful neighborhoods report higher stress than men regardless of race. We found no evidence of mediation of psychosocial distress, a result that may have been hampered by our study design. Future research should formally investigate the extent to which psychological distress and coping strategies account for the relationship between living in chronically stressful environments and obesity risk in men and women.

Table 1. Characteristics of EHDIC-SWB and NHIS 2003 by race and gender*

	EHDIC-SWB (N = 1408)								NHIS (N = 29 292)†							
	Black (N = 835)				White (N = 573)				Black (N = 4246)				White (N = 25 046)			
	Females		Males		Females		Males		Females		Males		Females		Males	
Variables	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Age (years, median)	37		39		42		42									
Marital status																
Married/living as married	65	(14)	62	(16)	85	(26)	62	(25)	655	(37)	691	(54)	6610	(63)	6422	(68)
Widowed	30	(7)	10	(3)	49	(15)	13	(5)	328	(11)	71	(3)	2001	(11)	461	(3)
Divorced/separated	84	(19)	66	(17)	89	(27)	62	(25)	578	(18)	313	(13)	2190	(12)	1454	(9)
Never married	275	(61)	243	(64)	102	(31)	110	(45)	866	(34)	485	(31)	2068	(15)	2525	(21)
Educational attainment																
Less than high school graduate	162	(36)	133	(35)	162	(50)	110	(45)	558	(21)	349	(21)	2446	(16)	2041	(17)
High school graduate/GED	203	(45)	173	(45)	105	(32)	91	(37)	723	(31)	494	(33)	3739	(30)	3082	(29)
More than HS	87	(19)	75	(20)	59	(18)	46	(19)	1146	(48)	700	(46)	6630	(54)	5688	(54)
Smoking status																
Current smoker	211	(46)	237	(62)	175	(54)	162	(66)	2770	(18)	2671	(26)	438	(20)	537	(24)
Former smoker	43	(9)	31	(8)	55	(17)	39	(16)	2939	(12)	2805	(19)	309	(21)	334	(27)
Never smoker	200	(44)	113	(30)	96	(29)	46	(19)	5388	(70)	8455	(55)	841	(60)	1760	(49)
Alcohol use																
Current	127	(28)	91	(24)	75	(23)	45	(18)	1036	(40)	714	(46)	7057	(54)	5730	(54)
Binge	67	(15)	112	(29)	41	(13)	84	(34)	70	(3)	159	(10)	532	(4)	1771	(15)
Never	253	(57)	177	(47)	209	(64)	117	(48)	1469	(57)	651	(44)	6126	(43)	3324	(31)
Religiosity																
Very religious	111	(25)	115	(30)	62	(19)	45	(18)								
Moderately religious	172	(38)	123	(33)	98	(30)	64	(26)								
Slightly religious	123	(27)	104	(28)	100	(31)	79	(32)								
Not religious at all	47	(10)	36	(10)	64	(20)	59	(24)								
Religious attendance																
Every week or more often	147	(33)	105	(28)	69	(21)	33	(14)								
Every month or more often	121	(27)	97	(26)	45	(14)	39	(16)								
1-2 times/year	80	(18)	80	(21)	63	(20)	46	(19)								
Never	101	(22)	98	(26)	145	(45)	126	(52)								
Physical activity (1+ hours)																
Once / month or less	159	(35)	100	(26)	121	(37)	73	(30)								
1 - 3 days / week	99	(22)	83	(22)	74	(23)	57	(23)								
>3x / week	192	(43)	198	(52)	129	(40)	117	(47)								

Table 1. continued

	EHDIC-SWB (N = 1408)								NHIS (N = 29 292)†							
	Black (N = 835)				White (N = 573)				Black (N = 4246)				White (N = 25 046)			
	Females		Males		Females		Males		Females		Males		Females		Males	
Variables	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Psychosocial factors																
Depression/anxiety diagnosis in past 5 years (%)	112	(26)	58	(16)	120	(38)	67	(28)								
Depression score (PHQ 8, mean (SE))	4.62	(0.25)	4.09	(0.27)	6.55	(0.38)	5.36	(0.40)								
Current depression (%, PHQ score >= 10)	69	(16)	45	(13)	86	(28)	45	(19)								
Cohen Perceived Stress Scale (PSS 10, mean (SE))	26.59	(0.35)	24.76	(0.37)	27.61	(0.49)	26.14	(0.58)								
Goldberg General Health Questionnaire																
Anxiety & Insomnia subscale (mean (SE))	1.38	(0.10)	1.09	(0.10)	1.99	(0.14)	1.40	(0.13)								
Kessler psychological distress screener (K6)									8.86	(0.11)	7.90	(0.10)	8.63	(0.05)	7.91	(0.04)
Serious mental illness (K6 score >=13 (%))									413	(15)	178	(10)	1886	(13)	1048	(9)

*EHDIC-SWB, Exploring Health Disparities in Integrated Communities Southwest Baltimore

Table 2. Association between gender and obesity with and without adjustment for psychosocial distress and coping, EHDIC-SWB, Baltimore, MD.

	EHDIC-SWB (N = 1291)				
Covariates	**Crude association (Model 1) OR (95% CL)**	**Adjustment for age and race (Model 2) OR (95% CL)**	**Adjustment for psychosocial distress (Model 3) OR (95% CL)**	**Adjustment for psychosocial distress and coping (Model 4) OR (95% CL)**	**Adjustment for religion and spirituality (Model 5) OR (95% CL)**
Gender					
Male	1.00	1.00	1.00	1.00	1.00
Female	2.11 (1.65, 2.70)	2.27 (1.77, 2.92)	2.28 (1.77, 2.93)	2.06 (1.58, 2.67)	2.08 (1.59, 2.71)
Black race		1.19 (0.92, 1.53)	1.21 (0.94, 1.55)	1.08 (0.83, 1.42)	1.11 (0.85, 1.46)
Age		1.08 (1.04, 1.13)	1.08 (1.04, 1.13)	1.11 (1.06, 1.16)	1.10 (1.05, 1.16)
Age^2		1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
Cohen - perceived stress			0.99 (0.97, 1.01)	0.99 (0.97, 1.01)	0.99 (0.97, 1.01)
PHQ-8 - depression			1.01 (0.98, 1.04)	1.02 (0.98, 1.05)	1.02 (0.99, 1.05)
GHQ - anxiety/insomnia			1.02 (0.94, 1.11)	1.05 (0.96, 1.14)	1.05 (0.96, 1.14)
Coping behaviors					
Current smoking				0.53 (0.41, 0.69)	0.52 (0.40, 0.68)
Alcohol use					
Current use				0.89 (0.66, 1.20)	0.88 (0.65, 1.20)
Binge drinking				0.97 (0.69, 1.36)	0.94 (0.67, 1.32)
Physical activity				0.78 (0.59, 1.03)	0.78 (0.59, 1.04)
Religious attendance					
1-2x/year				1.59 (1.11, 2.26)	1.46 (1.01, 2.12)
Once/ month				1.52 (1.07, 2.17)	1.38 (0.94, 2.04)
Once/ week				1.37 (0.97, 1.93)	1.26 (0.86, 1.86)
Religiosity					
Slightly religious					2.33 (1.33, 4.08)
Moderately religious					1.67 (0.94, 3.00)
Very religious					1.70 (0.92, 3.15)
Spirituality					
Slightly spiritual					0.55 (0.30, 1.02)
Moderately spiritual					0.80 (0.43, 1.47)
Very spiritual					0.69 (0.37, 1.28)

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