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Social context explains race disparities in obesity among women

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Abstract

Background—National data do not account for race differences in health risks resulting from racial segregation or the correlation between race and socioeconomic status. Therefore, these data may inaccurately attribute differences in obesity to race rather than differing social context. The goal of this study was to investigate whether race disparities in obesity among women persist in a community of black people and white people living in the same social context with similar income.

Methods—Race disparities in obesity were examined among black women and white women living in the same social context with similar income, using the data from the Exploring Health Disparities in Integrated Communities-SWB (EHDIC-SWB) study, and these estimates were compared to national data (National Health Interview Survey) to determine if race disparities in obesity were attenuated among women in EHDIC-SWB. Obesity was based on participants' self-reported height and weight. Logistic regression was used to examine the association between race and obesity.

Results—In the national sample, black women exhibited greater odds of being obese (OR 1.99, 95% CI 1.71 to 2.32) than white women after controlling for covariates. In the EHDIC-SWB sample, black women had similar odds of being obese (OR 1.25, 95% CI 0.90 to 1.75) as compared to white women, after adjusting for covariates.

Conclusions—There are no race disparities in obesity among poor, urban women sharing the same social context. Developing policies that focus on modifying social aspects of the environment may reduce disparities in obesity among low-income women living in urban communities.

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Competing interests None.

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BACKGROUND

For the past four decades, epidemiological evidence has illustrated a persistent race disparity in obesity prevalence among women.[1–3] In the 2003–2004 National Health and Nutrition Examination Survey (NHANES), 53.9% of black non-Hispanic (hereafter referred to as black) women aged 20 and older were obese compared to 30.2% of white non-Hispanic (hereafter referred to as white) women.

Efforts to explain the disparity in obesity prevalence among women have primarily focused on individual-level factors such as sociodemographic characteristics, health status, lifestyle behaviour and relationship measures,[4,5] which only partially account for race disparities in obesity. Increasingly, researchers have looked to the 'built environment'[6] – man-made or modified aspects of our surroundings[7,8] – as potential explanations for obesity prevalence. However, no studies have focused on social context as a possible explanation for the obesity disparities among black women and white women.

The literature relating health disparities to social context posits that individuals living in dissimilar neighbourhoods experience different health risks. In particular, that race differences in health arise from race differences in social and environmental exposures driven by residential segregation[9,10] – a hypothesis supported by empirical research across a variety of health outcomes including mortality (adult and infant),[11,12] hypertension,[13] tuberculosis,[14] and low birth weight.[15] Also in support of this social context theory is recent research showing that black–white race disparities in hypertension were attenuated in a racially integrated community without race differences in income[13] - a striking finding given decades of research documenting large persistent race disparities in hypertension.[16]

There are two key challenges to studying health disparities among race groups. The first is that race and socioeconomic status (SES) are confounded. Individuals from racial minority groups are more likely to have low SES as compared to white individuals. As a result, it is difficult to determine whether it is the interaction (race and class) or the association (race or class) that creates disparities in health status.[17] The second challenge is racial segregation. Individuals from racial minority groups typically live in geographically separate communities and this segregation can lead to different environmental and social risk exposures.[18,19] These challenges to estimating race-related health disparities may bias estimates of health status from national datasets.

Using a dataset that attempts to overcome each of these challenges, the purpose of this study was to investigate whether race disparities in obesity among women persist in a community of black people and white people living in the same social context with similar income. The present definition of social context primarily refers to residential segregation. Therefore, when referring to black people and white people living in the same social context, this is to black people and white people living in integrated communities. It was hypothesised that obesity disparities among black women and white women would be reduced or eliminated in a community with similar socioenvironmental exposures as compared to national data where black Americans and white Americans tend to live in socially segregated communities. The present data offer a unique opportunity to examine race disparities in obesity among black women and white women with similar socioeconomic status who are exposed to the same social environment. Race and socioeconomic status are highly correlated,[20–22] and both are associated with obesity.[2,23] This confounding makes national data suboptimal for understanding race disparities in obesity, even after applying advanced modelling techniques.[24]

METHODS

Study population

EHDIC (Exploring Health Disparities in Integrated Communities) is an ongoing multi-site study of race disparities within communities where black people and white people live together and where there are no race differences in SES, as measured by median income. The first EHDIC study site was in Southwest Baltimore, Maryland, USA (EHDIC-SWB), a low-income urban area. Future EHDIC locations are planned in a high-income area and a rural community.

EHDIC-SWB, is a cross-sectional face-to-face survey of the adult population (aged ≥18) of two contiguous census tracts. In addition to being economically homogenous, the study site was also racially balanced and well integrated, with almost equal proportions of black residents and white residents. In the two census tracts, the racial distribution was 51% black and 44% white, and the median income for the study area was $24 002, with no race difference. The census tracts were block listed to identify every occupied dwelling in the study area. During block listing, 2618 structures were identified. Of those, 1636 structures were determined to be occupied residential housing units (excluding commercial and vacant residential structures). After at least five attempts, contact was made with an eligible adult in 1244 occupied residential housing units. Of that number, 65.8% were enrolled in the study resulting in 1489 study participants (41.9% of the 3555 adults living in these two census tracts recorded in the 2000 Census). Because the present survey had similar coverage across each census block group included in the study area, the bias to geographic locale and its relationship with SES is minimal.[20]

Comparisons to the 2000 Census for the study area indicated that the EHDIC-SWB sample included a higher proportion of black people and women, but was otherwise similar with respect to other demographic and socioeconomic indicators.[20] For instance, the present sample was 59.3% black and 44.4% male, whereas the 2000 Census data showed the population was 51% black and 49.7% male. Age distributions in the present sample and 2000 Census data were similar, with the median age 35–44 years for both samples. The lack of race difference in median income in the census, $23 500 (black) versus $24 100 (white) was replicated in EHDIC $23 400 (black) versus $24 900 (white).

The survey was administered in person by trained interviewers and consisted of a structured questionnaire, which included demographic and socioeconomic information, self-reported height and weight, self-reported health behaviours and chronic conditions, and three blood pressure (BP) measurements. The EHDIC study has been described in greater detail elsewhere.[20] The study was approved by the Committee on Human Research at the Johns Hopkins Bloomberg School of Public Health. These analyses included 771 non-pregnant black women and non-pregnant white women from the EHDIC-SWB sample.

The National Health Interview Survey (NHIS) is an annual, multi-purpose health survey of the civilian, non-institutionalised, households of the USA conducted by the National Center for Health Statistics.[25] US Census Bureau interviewers administer the survey in the respondents' homes. Adults aged 17 and over are eligible to participate in the survey. The present analyses were restricted to data from the 'Sample Adult Core' section of the 2003 NHIS because of similarity with the data collected and age range in the EHDIC-SWB survey. The study population for the Sample Adult Core consisted of 30 852 individuals aged 18 and older who responded to questions regarding their demographic characteristics, health status and behaviours, functional limitations, AIDS, cancer screening and healthcare access and utilisation. Detailed information regarding this sample can be found elsewhere.[25]

These analyses included 16 219 non-pregnant black women and non-pregnant white women from the 2003 NHIS sample.

Items from the NHIS were replicated in the EHDIC-SWB study. Each measure included in these analyses was coded similarly in both datasets.

Measures

Based on participants' self-reports of height and weight, body mass index (BMI) was calculated by dividing each participant's body weight in kilograms by their height in metres squared. A binary variable was created to identify obese individuals (BMI≥30 kg/m^2). Race was self-reported. Only those participants who self-identified as black or white were included in both datasets.

Demographic variables included age, marital status, education level, income category and number of cardiovascular conditions. Age was specified as a continuous variable. Marital status consisted of four binary variables: married/living as married, widowed, divorced/separated and never been married. Educational level was classified into the following categories: less than high school graduate, high school graduate/GED or more than high school graduate. Five categories were used to classify household income level: <$10 000, $10 000–$19 999, $20 000– $34 999, $35 000–$54 999 and >$55 000.

Health-related characteristics included physical inactivity, smoking status and number of cardiovascular conditions. Respondents were asked to rate how often they 'exercise or participate in physical activity' for at least 1 h (none at all, less than once a month, once a month, once a week, three times a week or more than three times a week). Physical inactivity was coded as a binary variable indicating inactivity ('none at all'). Smoking status was classified using binary variables to create the following categories: never, former or current. The number of cardiovascular conditions was based on a count of self-reported physician diagnoses for heart disease, stroke, diabetes and hypertension. Each condition was coded as a binary variable (1=condition present; 0=condition absent) and summed to create a variable representing the total number of cardiovascular conditions.

Patients with missing BMI information were omitted from the analysis. All independent variables had less than 10% missing values.

Statistical analyses

Using χ^2 and Student t tests, the mean and proportional differences were evaluated between black women and white women for the demographic characteristics and the health-related factors in each sample. Logistic regression models were used to examine the association between race and obesity. OR and 95% CI for the association between race and obesity were estimated for each dataset and compared across samples to determine the extent to which findings from EHDIC-SWB accounting for confounding between race, SES and segregation differed from the NHIS. The percent difference in the OR for race from each sample (NHIS and EHDIC-SWB) was calculated using the formula $(OR_{NHIS}-OR_{EHDIC})/OR_{NHIS})\times 100$.[26] The analyses using the 2003 NHIS were adjusted by Taylor-linearisation procedures to account for the multi-stage sampling design. All tests were two-sided and p values <0.05 were considered statistically significant. Analyses were conducted using SAS software, V. 9.1.3.

RESULTS

Table 1 displays the demographic characteristics of women in the EHDIC-SWB and 2003 NHIS samples by race. In both datasets, white women were older, and more likely to be

married/living as married. Black women in EHDIC-SWB were more likely to have completed high school ($p<0.05$) and did not differ from white women with respect to income; whereas black women in NHIS were equally likely to have completed high school and more likely to have an income less than $35 000 and less likely to have an income greater than $55 000 ($p <0.05$).

Age-adjusted proportions of the health-related characteristics of women in EHDIC-SWB and NHIS are shown in table 2. Black women in EHDIC-SWB had a similar prevalence of obesity compared to white women, but in the national sample black women were almost twice as likely to be obese than their white counterparts ($p<0.05$). Black women in both samples were less likely than white women to be current smokers ($p<0.05$). Although black women and white women in EHDIC-SWB were equally likely to be physically inactive, black women in NHIS were more likely to be physically inactive than white women. In EHDIC-SWB, black women were similar to white women with respect to the number of cardiovascular conditions, whereas black women in the NHIS had more cardiovascular conditions than white women.

Additionally, an examination was made of the association between race and obesity among women in EHDIC-SWB and NHIS 2003. In particular, the degree to which findings from EHDIC-SWB differed from a national sample that does not account for race/SES confounding or the differential health risk exposures due to the environments in which black and white adults normally live. In NHIS, after controlling for age, income, education, marital status, smoking status, physical inactivity and number of chronic conditions, black women exhibited greater odds of obesity (OR 1.99, 95% CI 1.71 to 2.32) than white women. However, in the EHDIC-SWB sample, black women had similar odds of being obese (OR 1.25, 95% CI 0.90 to 1.75) compared to white women. The direction of the relationship between race and obesity in NHIS is consistent with EHDIC-SWB, but the magnitude of the association is considerably smaller in EHDIC-SWB with a 37% reduction in the race OR in that sample. Parallel analyses were run for black men and white men in EHDIC-SWB and NHIS (not shown). In both datasets, the difference in obesity prevalence between black men and white men was not significant.

DISCUSSION

Race disparities in obesity were examined among black women and white women in a low-income, urban community with similar SES living in similar social and environmental conditions. The analysis supported the authors' hypothesis that the disparities in obesity would be reduced, if not eliminated, when comparing black women and white women in EHDIC-SWB to the NHIS 2003 sample. The finding of no race disparities in obesity among women in the EHDIC-SWB sample is contrary to a considerable body of research documenting disparities in obesity prevalence among black women and white women;[1–37] however, those prior studies did not account for race differences in social conditions. On the other hand, the present findings are consistent with research indicating the importance of racial segregation to health disparities,[910121427] and consistent with a growing body of research relating obesity prevalence to the built environment.[6]

The ability to examine black-white obesity disparities among women in a community without racial disparities in income is critical for understanding the true aetiology of obesity. National data do not account for race differences in health risks resulting from racial segregation - a known contributor to race differences in social and environmental risk exposures[910] - nor do national data fully account for the strong correlation between race and socioeconomic status,[20–22] a long vexing problem in health disparities research. Therefore,

using national data to examine race disparities and simply adjusting for SES in multivariate models may be insufficient to create truly comparable samples across race groups.[10,28,29]

As a result, researchers investigating race disparities in obesity using national data may inaccurately attribute differences in obesity to race rather than race differences in social context. For example, recent research examining neighbourhood context and ethnicity differences in BMI using national survey data (the National Health and Nutrition Examination Survey) found that neighbourhood context only accounted for a small portion of ethnic disparities in obesity and the authors concluded that research should instead focus on more proximate factors.[7] In contrast, the present analysis using EHDIC-SWB showed that the socioenvironmental context in low-income, urban neighbourhoods plays a considerable role in producing race disparities in obesity among women. By sampling communities in which individuals are exposed to similar social and environmental factors, the EHDIC studies are able to better equalise unmeasured aspects of the social context,[9,10,21] and, therefore, more precisely characterise disparities in obesity.

Accurately accounting for social and environmental exposures is particularly important for the study of obesity disparities given the growing literature linking individual body weight to a host of environmental factors, both positively (distance to fast food restaurants, presence of convenient stores, density of food outlets, and higher prices of fruits and vegetables[30–35]) and negatively (distance to the nearest recreational facility, number of recreational facilities, high walkability neighbourhoods, and mixed land use[36–40]) associated with BMI. Not surprisingly, the presence or absence of various obesity-related environmental factors is closely tied to SES and race/ethnicity, making it difficult to disentangle their association with obesity using national data.

Despite its strengths, there are several limitations of EHDIC-SWB. EHDIC-SWB does not account for race differences in work exposures, which may contribute to disparities in obesity; people in low-activity occupations have a higher likelihood of being obese than people in high-activity occupations,[41] and work stress has been positively related to obesity.[42] The EHDIC-SWB data were collected in a low-income (primarily black and white) urban population, which limits the generalisability to higher income, other minority (eg, Hispanic) or non-urban communities. In the EHDIC-SWB and NHIS, height and body weight were self-reported, which may lead to an underestimation of the obese population.[43] Research suggests that the self-reported height and body weight bias do not differ by race/ethnicity.[44] It was decided not to use the NHANES for comparison as it includes measured height and weight and would be less comparable to EHDIC-SWB. However, identical analyses were run using the NHANES data (not shown) and a similar result was obtained (available upon request). Both the EHDIC-SWB and NHIS datasets are cross-sectional, which limits the ability to make causal inferences.

To further explore this area of research, it would be useful to examine black-white differences in obesity disparities in high-and middle-income racially integrated communities. It would also be useful to replicate EHDIC-SWB among other low-income racial/ethnic groups living in the same social context. The current study and future research in this area offer a promising line of enquiry for disparities research related to obesity as well as many other adverse health conditions with documented race disparities in prevalence based on national data.

The finding that there are no race disparities in obesity among poor, urban women sharing the same social context, may pave the way for creative policy solutions. In the EHDIC-SWB sample, race disparities in obesity among women were eliminated because of higher prevalence among white women resulting from challenging social conditions. Certainly, it is

not desirable for race disparities in obesity to be eliminated among women as a result of worsening health of white women. Rather, it would be desirable to see obesity prevalence decline in both groups. Developing policies that focus on modifying social aspects of the environment may reduce disparities in obesity among low-income women living in urban communities. Because the environment can be modified through a variety of policy levers, unlike many individual characteristics that are immutable (eg, race), the results from this study may contribute to the development of effective antiobesity policies. Moreover, environmental solutions to reduce obesity disparities among women may have the added benefit of reducing obesity prevalence among men and children/adolescents - efforts that would be consistent with current federal priorities to reduce, and eventually eliminate race disparities as well as obesity.[45]

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Table 1

Distribution of demographic variables of the EHDIC-SWB and NHIS 2003 women by race

	EHDIC-SWB		NHIS 2003	
	Black women (n=449)	White non-Hispanic women (n=322)	Black women (n=2538)	White non-Hispanic women (n=13681)
Age (years, mean ± SE)	37.7 ± 0.6	44.6 ± 0.9*	33.8± 0.3	34.4± 0.1*
Marital status (%)				
Married/living as married	14.5	26.2*	31.8	58.3*
Widowed	6.7	15.3*	11.0	10.9*
Divorced/separated	18.7	27.7*	20.0	13.1*
Never married	60.1	30.8*	37.2	17.7*
Education (%)				
Less than high school graduate	35.6	50.0*	21.1	15.9*
High school graduate/GED	45.2	32.0*	30.7	30.5
More than high school graduate	19.2	18.0	48.2	53.6*
Income (%)				
<$10000	30.7	24.8	42.2	35.6*
$10000–$19999	34.7	37.3	13.7	8.8*
$20000–$34999	18.5	19.9	16.1	14.7*
$35000–$54999	9.1	9.9	13.4	15.4
>$55000	6.9	8.1	14.6	25.5*

EHDIC-SWB, Exploring Health Disparities in Integrated Communities-Southwest Baltimore; GED, General Equivalency Diploma; NHIS, National Health Interview Study.

EHDIC-SWB data were collected in a low-income urban community in Southwest Baltimore between June and August 2003. NHIS data were collected from a nationally representative sample in 2003. All estimates using NHIS 2003 data account for the complex sampling design by applying the appropriate weight, cluster and strata variables.

*$p<0.05$.

†Tests of significance are for differences in means for continuous variables (Student t test) and differences in proportions (χ^2 test) by race. (Ashenfelter L, Levine PB, and Zimmerman DJ, Statistics and Econometrics: Methods and Applications. 2003, New York, NY: John Wiley & Sons Inc.)

Table 2

Age-adjusted distribution of health-related characteristics of EHDIC-SWB and NHIS 2003 women by race

	EHDIC-SWB		NHIS 2003	
Variable	**Black women (n=449)**	**White non-Hispanic women (n=322)**	**Black women (n=2538)**	**White non-Hispanic women (n=13681)**
Obesity (%)	39.5	35.0	33.4	18.3*
Smoking status (%)				
Never	43.1	30.0*	71.6	61.2*
Former	11.2	14.6	7.4	15.1*
Current	45.6	55.5*	21.0	23.7*
Physical inactivity (%)	24.6	27.0	45.5	31.8*
Number of cardiovascular conditions (mean ± SE)	0.6 ±0.04	0.5 ±0.06	0.4 ±0.02	0.2 ± 0.01*

EHDIC-SWB, Exploring Health Disparities in Integrated Communities-Southwest Baltimore; NHIS, National Health Interview Study.

EHDIC-SWB data were collected in a low-income urban community in Southwest Baltimore between June and August 2003. NHIS data were collected from a nationally representative sample in 2003. Number of cardiovascular conditions consists of a count of four binary variables: heart condition, hypertension, diabetes and stroke. All estimates using NHIS 2003 data account for the complex sampling design by applying the appropriate weight, cluster and strata variables.

*$p<0.05$.

†Tests of significance are for differences in means for continuous variables (Student t test) and differences in proportions (χ^2 test) by race. (Ashenfelter L, Levine PB, and Zimmerman DJ, Statistics and Econometrics: Methods and Applications. 2003, New York, NY: John Wiley & Sons Inc.)