Exploring Health Disparities in Integrated Communities: Overview of the EHDIC Study

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ABSTRACT *Progress in understanding the nature of health disparities requires data that are race-comparative while overcoming confounding between race, socioeconomic status, and segregation. The Exploring Health Disparities in Integrated Communities (EHDIC) study is a multisite cohort study that will address these confounders by examining the nature of health disparities within racially integrated communities without racial disparities in socioeconomic status. Data consisted of a structured questionnaire and blood pressure measurements collected from a sample of the adult population (age 18 and older) of two racially integrated contiguous census tracts. This manuscript reports on baseline results from the first EHDIC site, a low-income urban community in southwest Baltimore, Maryland (EHDIC-SWB). In the adjusted models, African Americans had lower rates of smoking and fair or poor self-rated health than whites, but no race differences in obesity, drinking, or physical inactivity. Our findings indicate that accounting for race differences in exposure to social conditions reduces or eliminates some health-related disparities. Moreover, these findings suggest that solutions to the seemingly intractable health disparities problem that target social determinants may be effective, especially those factors that are confounded with racial segregation. Future research in the area of health disparities should seek ways to account for confounding from SES and segregation.*

KEYWORDS *Health disparities, Confounding, Race, Socioeconomic status, Segregation, Integration, Urban, Community*

INTRODUCTION

Overwhelming evidence from cross-sectional studies and nationally representative follow-ups have definitively demonstrated persistent disparities among African Americans and other minority groups compared to whites in morbidity¹⁻⁸ and mortality.⁹⁻¹⁵ Much of this literature is descriptive, but of late the health disparities research literature has begun to shift from merely describing disparities to seeking to explain them.^{5,15-20} However, efforts to understand the etiology of racial/ethnic disparities have been hampered by the lack of available data sources capable of supporting truly comparative analysis.^{17,21} Much of the research on race disparities are likely substantially confounded with socioeconomic status,¹⁸ and racial segregation.^{22,23}

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Many previously published studies have commented on confounding of race with socioeconomic status.^{13,17,18,22,24,25} In short, health status varies by race. Health status varies by socioeconomic status. Racial minorities are more likely to have low socioeconomic status compared with whites. Consequently, the overlap between race and socioeconomic status complicates efforts to determine whether it is “race and class” or “race or class” that produces disparities in health status.^{17,18,24,26,27}

In a previous set of analysis, we have demonstrated that the typical approach to dealing with race/SES confounding may not be adequate.²² That is, simply adjusting for socioeconomic status in multivariate models may not be sufficient to produce truly comparable samples across race groups. After multivariate adjustment, there remains unmeasured heterogeneity associated with extreme differences in the historical and social contexts of various race groups in the United States. Multivariate modeling may not be adequate to account for these sources of heterogeneity.^{17,24,28}

In addition to race/SES confounding, much of the health disparities research literature is likely biased because of racial segregation.^{17,29–31} The U.S. is a highly racially segregated society, whereby African Americans and whites have quite different health risk exposures. For example, Morland et al.³² found that compared with predominantly African-American neighborhoods, supermarkets were 2.9 times more likely to be located in racially integrated neighborhoods and 4.3 times more likely to be located in predominantly white neighborhoods. Full-service restaurants were 3.4 times more prevalent in integrated neighborhoods and 2.4 times more prevalent in predominately white neighborhoods. LaVeist and Wallace³³ found that low-income segregated African-American communities in Baltimore, Maryland had about eight times as many liquor stores per capita compared with other neighborhoods. Lillie-Blanton et al.³⁴ found that race differences in rates of utilization of crack cocaine were a function of greater availability in African-American communities. Morrison et al.³⁵ conducted a survey of pharmacies in New York City and determined that the availability of pain medications (opioid) reduced as the proportion of racial/ethnic minorities increased. And, several studies have demonstrated that African-American communities were more likely to be targeted for tobacco consumption compared to white communities.^{36,37} Other studies have demonstrated a link between segregation and health disparities across a variety of unrelated health outcomes, such as infant mortality,^{29,39,40} adult mortality,^{30,41–43} tuberculosis,^{38,44} and hospital admissions.⁴⁵

However, segregation has not been well studied as a potential source of confounding, but it is potentially a substantial problem, which can lead to erroneous conclusions about the etiology of racial disparities in health.²² As a result, it is not known to what extent race disparities in health status are manifestations of race differences in socioenvironmental exposures rather than characteristics commonly ascribed to racial status (such as biological or even behavioral differences among race groups). Would we find the same pattern of racial disparities in health status typically reported in national statistics if American racial/ethnic groups lived under similar socioenvironmental conditions and their attending health risks, and had similar socioeconomic status?

Progress in understanding the nature of health disparities requires data that are race-comparative while overcoming confounding between race, socioeconomic status, and segregation. Our study, Exploring Health Disparities in Integrated Communities (EHDIC), addresses confounding of race with SES and segregation by examining white and African Americans with similar socioeconomic status, living in

similar socioenvironmental conditions. In this manuscript, we describe the methods used to conduct the EHDIC study, and characterize study results across a variety of health disparities. We then address the research question, are patterns of health-related racial disparities different within an environment, which accounts for racial segregation and socioeconomic status (SES) compared with national data typically used to describe racial disparities in health? This is done by comparing results from EHDIC with the 2003 National Health Interview Survey to determine to what degree the disparities found in EHDIC deviate from those found in national samples, which do not account for segregation.

METHODS

Design

The EHDIC study is a multisite study of the nature of health disparities within racially integrated communities without racial disparities in income. We established a set of criteria to identify a racially comparable community that had the following characteristics: (1) at least 35% African American and at least 35% white residents; (2) a ratio of black to white median income between 0.85 and 1.15, and (3) a ratio of black to white percentage of high school graduates age 25 and above between 0.85 and 1.15. These criteria will afford us an opportunity to examine the nature of health disparities with a minimal amount of confounding between race and traditional SES measures (e.g., income and education).^{17,46,47}

According to the 2000 U.S. Census, of the 66,438 census tracts in the U.S., 425 met our comparability criteria. We intend to conduct surveys within several of these communities representing low-, middle-, and high-income categories of urban, suburban, and rural areas. This manuscript reports on baseline results from the first data collection located in a low-income urban community in southwest Baltimore, Maryland (EHDIC-SWB). The data collected results from a cross-sectional face-to-face survey of the adult population (age 18 and older) of two contiguous census tracts in Baltimore, Maryland. According to the 2000 U.S. Census, there were 3,555 adult residents of the two census tracts. The racial distribution was 51% African American and 44% white. The median income for the two census tracts was \$24,002, with a black/white ratio of 0.97. The percent high school graduates were 20.3 with a black/ white ratio of 1.12. The data collection period lasted 12 weeks (between June and August 2003).

We block-listed the census tracts to identify every occupied dwelling in the study area. We mailed a letter to every occupied residential dwelling notifying residents of the study. In addition to the letter, respondents were recruited and enrolled through various methods, such as door-to-door visitation, a dedicated telephone line for appointment scheduling, walk-ins at the study's administrative office (which was located in the study area), and community-based health fairs conducted as a part of the study. Each occupied address in the two census tracts was visited a minimum of five times before they were considered to be a nonresponding household. Flyers, door hangers, and T-shirts with the study's logo and web address helped advertise the study. Interviewers worked 6 days per week (excluding Sunday) and two evenings (until 8 P.M.). The study team, in conjunction with local area healthcare organizations and community-based organizations, conducted three health fairs and provided residents with health screenings, health information, and activities for children. To be enrolled in the study, respondents had to be age 18 or older, and had

to provide photo identification verifying that they lived in the study area. The interviews were conducted in the respondents' homes and a check in the amount of \$20 was mailed to their residence after completing the survey. The study was approved by the Committee on Human Research at the Johns Hopkins Bloomberg School of Public Health.

Survey

The interview process consisted of a structured questionnaire and blood pressure measurements that were administered by trained interviewers. The questionnaire included numerous psychosocial batteries, such as: racial discrimination, gender discrimination, perceived stress, social support, social health, medical mistrust, depression, anxiety, and religiosity. In addition, we replicated health status and health behavior questions from the 2003 National Health Interview Survey (NHIS) questionnaire.⁴⁸ Along with the administration of the structured questionnaire, we conducted three blood pressure measurements with respondents in the seated position, using electronic monitors before, during, and after the interview (average interview length was 45 min). The blood pressure monitors were calibrated to standard monitors in the Johns Hopkins Hospital.

Characteristics of the respondent's physical environment were also evaluated. The exterior of each respondent's home was rated according to appearance, damage, and general condition (including broken windows). In addition, the respondents' street segment (the area of the street between two intersections) was rated for various neighborhood level factors, such as number of abandoned homes, vacant lots, etc. These data were then coded and merged to respondent's interview record to create a hierarchical data set with three levels of data (individual, dwelling, and street segment).

In the present study, we examined data only from the questionnaire to compare EHDIC-SWB results to the 2003 NHIS for five health-related outcomes: alcohol consumption, cigarette consumption, body mass index (BMI), physical inactivity, and self-rated health. Respondents were considered current drinkers or smokers if they reported that they used cigarettes or alcohol within the past 30 days. Obesity was measured as BMI greater than 30. The weight and height measurements were recorded as self-report, which allowed our data to be comparable with the 2003 NHIS.⁴⁹ Physical inactivity was defined as exercising less than three times per week for a minimum of 60 min, and fair or poor self-rated health was based on respondents' subjective report on their overall health status.

Matching

We matched the EHDIC-SWB data with respondents from the 2003 NHIS to test whether the EHDIC-SWB sample could be generalized to a national sample of individuals with similar socioeconomic status. The NHIS is an annual, multipurpose health survey of the civilian, noninstitutionalized, households of the U.S. conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention. A detailed description of the NHIS is described elsewhere.^{49,50}

Cases from EHDIC-SWB were matched one-to-one on gender, race, educational attainment, and income with cases from the NHIS. Educational attainment categories included: 8th grade or less, some high school, high school graduate, GED/high school equivalency, some college, college graduate, or above. Income was classified into the following categories: 0–5 K, 5–10 K, 10–15 K, 15–20 K, 20–25 K, 25–35 K, 35–45 K, 45–55 K, 55–65 K, 65–75 K, 75 K, and above. We were not able

to match on urban/rural status because the necessary NHIS data are not publicly released. We randomly selected NHIS cases to match EHDIC-SWB when the number of NHIS matches exceeded the number of EHDIC-SWB cases for a given match. We excluded 15 cases from the EHDIC-SWB sample because of missing income, missing education data, or lack of a suitable match in the NHIS data. The final matched dataset sample size was 2,948 adults (1474 EHDIC-SWB; 1474 matched NHIS).

Statistical Analysis

Percentages were calculated for demographic variables for respondents of the EHDIC-SWB and demographic characteristics of the study area of the 2000 U.S. Census. Also, percentages were calculated to describe the disposition of the structures in the EHDIC-SWB study area. Logistic regression models were conducted to obtain the unadjusted and adjusted odds ratio and 95% confidence interval (CI) for the association between being African American compared to white and having a particular health-related characteristic (i.e., current drinker, current smoker, obesity, physical inactivity, and fair or poor self-rated health) for each dataset. Adjusted models included age, gender, smoking status, BMI, education, income, and type of insurance (smoking was excluded from the model when it was the dependent variable; likewise, BMI was excluded when obesity/overweight was the outcome variable). *P* values less than 0.05 were considered statistically significant and all tests were two-sided. All analyses were performed using SPSS version 12 (SPSS Inc., Chicago, IL) and STATA 8.0.

RESULTS

In Table 1, we compared demographic characteristics of EHDIC-SWB respondents with demographic characteristics of the study area reported in the 2000 Census. Males were somewhat underrepresented in EHDIC-SWB (4.0 percentage points for African Americans, and 6.7 percentage points for whites). The median age for both

TABLE 1 Comparison of EHDIC-SWB and the 2000 U.S. Census^a

Variable	Census 2000		EHDIC-SWB (2003)	
	African American	White	African American	White
	<i>n</i> = 1672	<i>n</i> = 1694	<i>n</i> = 835	<i>n</i> = 573
Male %	49.6	49.8	45.6	43.1
Age group %				
18 to 24	15.8	10.9	19.3	12.9
25 to 34	22.7	15.1	20.7	18.5
35 to 44	23.5	23.9	28.4	23.9
45 to 54	16.9	19.3	20.6	19.7
55 to 64	6.8	14.1	7.5	12.4
65 to 74	8.1	12.4	2.3	7.0
75 to 84	5.7	2.7	0.6	4.7
85 and above	0.5	1.7	0.4	7.0
Median household income	23.5 K	24.1 K	23.4 K	24.9 K
Education (% >high school)	21.0	18.8	19.4	18.3

^aSome variables do not sum up to 100% because of rounding.

TABLE 2 Disposition of structures in the EHDIC-SWB study area

Disposition	N	% of total (n=2618)	% of occupied residences (n=1636)	% of contacted, eligible, occupied residences (n=1244)
Total addresses	2,618	—	—	—
Occupied residential addresses	1,636	62.4	—	—
Ineligible	27	1.0	1.6	—
No contact	365	13.9	22.3	—
Refused	425	16.2	26.0	34.2
Enrolled	819	31.3	50.1	65.8

groups was 35–44 for the census and the EHDIC-SWB sample. The age distribution of EHDIC-SWB well represents the community as described by the 2000 Census; however, there are somewhat more whites in the EHDIC-SWB sample who are above age 75, and somewhat fewer African Americans in EHDIC-SWB who are above age 65. The lack of race differences in median income and percent high school graduate in the census was replicated in EHDIC-SWB.

Table 2 displays the disposition of the structures in the study area. During block listing, we identified 2,618 structures. Of those, 1,636 structures were determined to be occupied residential housing units (excluding commercial and vacant residential structures). After five or more attempts, we were unable to make contact with an adult at 22.3% of the occupied residential housing units, and 1.6% were ineligible (i.e., not white or African American). In all, we made contact with an eligible adult in 1,244 occupied residential housing units. Of that number, 65.8% were enrolled in the study, resulting in 1,489 study participants. This represents 41.9% of the 3,555 adults living in these two census tracts recorded in the 2000 Census, and 83.5% of all eligible adults we were able to contact during the field period.

In Table 3, we displayed unadjusted prevalence rates for selected health-related variables by race for the EHDIC-SWB, the matched subsample from the NHIS, and the total NHIS sample. In the EHDIC-SWB sample, African Americans had higher rates of drinking and lower rates of smoking and fair or poor self-rated health than whites. However, African Americans and whites had similar rates of obesity and physical inactivity. With the exception of African Americans having a higher rate of obesity than whites in the matched subsample, no other racial differences were

TABLE 3 Unadjusted rates for health-related outcomes, by race and dataset

Condition	EHDIC-SWB		NHIS matched subsample		Total NHIS	
	African American	White	African American	White	African American	White
Current drinker	48.7	42.9***	48.3	51.1	47.4	62.1***
Current smoker	53.9	58.8***	28.6	27.4	21.2	21.1
Obesity	60.2	57.3	68.0	60.2***	68.5	59.2***
Physical inactivity	42.1	44.7	59.8	57.9	58.1	56.3
Fair or poor overall health	28.2	37.4***	22.5	23.8	18.5	12.0***

****p*<0.05

TABLE 4 Adjusted odds ratios for the effect of race on each health-related outcome, by dataset^a

	EHDIC-SWB	NHIS matched subsample	NHIS total sample
Condition	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
Current drinker	1.19 (.94–1.49)	.78 (.62–.99)	.65 (.59–.70)
Current smoker	.71 (.56–.90)	.93 (.72–1.21)	.84 (.77–.93)
Obesity	1.13 (.90–1.43)	1.46 (1.14–1.86)	1.61 (1.47–1.76)
Physical inactivity	.98 (.78–1.23)	1.12 (.80–1.55)	1.09 (.97–1.20)
Fair or poor	.70	.97	1.29
Overall health	(.55–.91)	(.73–1.28)	(1.15–1.45)

^aOdds Ratios reported are for separate logistic regression models examining the effect of racial status (1=African American, 0=white) on each outcome. Models are adjusted for age, gender, smoking status, body mass index, education, income, and type of insurance. Smoking was excluded in the models where smoking was the dependent variable, and BMI was excluded from the models where overweight/obesity was the dependent variable.

observed with respect to the remaining health-related outcomes (i.e., drinking, smoking, physical inactivity, and fair or poor self-rated health). Examining racial differences among the prevalence rates in the NHIS total sample, African Americans have a lower prevalence of drinking and a higher prevalence rate of obesity and fair or poor self-rated health relative to their white counterparts. National estimates from the NHIS total sample showed prevalence rates of smoking, and physical inactivity were similar for whites and African Americans.

In Table 4, we displayed adjusted odds ratios for each health-related outcome. Adjusting the analysis had only a moderate effect on the results regarding disparities in EHDIC-SWB. Findings regarding disparities in EHDIC-SWB were the same in the adjusted models for four of the five outcomes. The findings for current drinking were not significant in the adjusted model in EHDIC-SWB.

In the matched subsample, African Americans had lower odds of alcohol consumption and higher odds of obesity than whites. No differences were observed between African Americans and whites regarding the odds of smoking, physical inactivity, and fair or poor self-rated health.

With the exception of physical inactivity, disparities exist for all of our health related outcomes in the NHIS total sample. African Americans had lower odds of alcohol and cigarette consumption and greater odds of obesity and fair or poor self-rated health compared to whites.

DISCUSSION

In this study, we employed a novel dataset to examine the nature of race disparities in several health-related outcomes within a context where white and African Americans live under similar socioenvironmental conditions and have similar socioeconomic status. In general, comparisons of prevalence rates for EHDIC-SWB respondents and the NHIS-matched sample yielded similar findings (with the notable exceptions of drinking for whites and smoking for both groups). This

suggests that EHDIC-SWB respondents are not substantially different from low-income persons nationally.

Comparisons of EHDIC-SWB and the NHIS-matched sample probably reflected the impact of racial segregation. These sets of comparisons examine the nature of race disparities where there are no race differences in income and white and African Americans live in similar social conditions. These comparisons showed that the results differed from the findings reported in Table 3 in four of five models. African Americans had significantly lower odds of being a current drinker and significantly higher odds of obesity in the NHIS-matched sample, but there was no significant race difference in EHDIC-SWB. Although no race differences were evident in the NHIS-matched sample regarding being a current smoker or reporting fair or poor self-rated health, African Americans in the EHDIC-SWB had significantly lower odds of being a current smoker and self-rating their health as fair or poor. No race differences in physical inactivity were evident in either the EHDIC-SWB or the NHIS-matched sample.

Our findings indicate that accounting for race differences in exposure to social conditions reduces some health-related disparities and suggests that solutions to the seemingly intractable health disparities problem that target social determinants may be effective, especially those factors that are confounded with segregation. The fact that the U.S. is highly racially segregated facilitates race differences in social and environmental health-risk exposures, and an infrastructure supportive of a healthy lifestyle. This likely includes such health-risk exposures as availability of alcohol³³ and exposure to other environmental hazards.⁵¹ Segregation also leads to race differences in availability of resources necessary for a healthy lifestyle such as supermarkets³² and pharmacy services.³⁵

Racial segregation is an important confounder in nationally representative samples, which may make such data suboptimal for studying racial disparities in health. Only a small number of health disparities studies have attempted to account for segregation. Yet, it may be that some patterns of disparities may be a function of different risk exposures facilitated by segregation. Not accounting for segregation can lead to erroneous conclusions and ineffective public policy. For example, reports from the National Household Survey of Drug Abuse (NHSDA) concluded that African Americans were more likely to use crack cocaine compared to whites.⁵² However, a reanalysis of the NHSDA accounting for race differences in availability of crack cocaine demonstrated that African Americans did not have a higher prevalence of crack cocaine use.³⁴

Reducing the SES similarities between blacks and whites did not eliminate the observed disparities in the NHIS sample. This suggests that similarities in SES between black and whites may translate into different opportunities for each of these racial groups.^{53–55} Similar educational outcomes may not translate into similar occupational outcomes or similar incomes. Thus, the design of the EHDIC studies likely control as much race difference in socioeconomic status as is possible in a naturally occurring environment, but there likely remains additional unmeasured heterogeneity between the race groups.

Whereas EHDIC-SWB is an important new resource to advance knowledge of health disparities, this study was conducted in only two census tracts in an urban population, limiting the external validity of our results. Findings may differ in communities with higher SES or in non-urban environments. Such communities will be assessed in future EHDIC studies. Another limitation is that EHDIC-SWB cannot account for health-risk exposures at work or elsewhere. Moreover, we could not

match EHDIC-SWB and NHIS on urban status. A further limitation is that our primary outcome variables were self-report and are subject to recall and response bias, although we have no reason to believe that there are race differences in recall or response bias.

In most cases, disparities were reduced or eliminated because of higher prevalence rates for whites. It would not be desirable to eliminate race disparities by worsening the health of whites. However, our findings suggest that when exposed to similar challenging social conditions, whites have negative health outcomes akin to African Americans. Future research in the area of health disparities should seek ways to account for confounding from SES and segregation.

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