

HOUSEHOLD DENSITY AND OBESITY IN YOUNG BLACK AND WHITE ADULTS

Racial and ethnic disparities in obesity persist despite a narrowing in obesity risk associated with socioeconomic status. The household environment has been shown to be important in understanding obesity-promoting behaviors in diverse populations. Our current study was designed to examine the relationship between household density and obesity in young Black and White adults aged 18–30 years from the Coronary Artery Risk Development in Young Adults (CARDIA) cohort. All sociodemographic and leisure-time physical activity (LTPA) information for this study was collected by questionnaire between 1990–1991. Height was collected using a mounted centimeter ruler. Weight was measured on a balance beam scale. Obesity was defined as a body mass index ≥ 30 kg/m.² Household density (HD) was defined as the ratio of people to bedrooms in the home. High HD was defined as a ratio > 1 . Bivariate analysis showed that more women tend to live in high density households compared to men (45.4% vs 38.9%; $P < .01$) and more Blacks tend to live in high density households compared to Whites (53.7% vs 31.8%). Leisure-time physical activity index was lower in Blacks than in Whites (2.5% vs 2.6%; $P < .01$). Blacks had a higher prevalence of obesity than Whites (27.1% vs 11.8%; $P < .01$). Logistic regression analysis showed that Black women within high HD were at highest risk for obesity compared to White women living within low HD (OR=4.88%; 95% CI: 3.56–6.67). HD may provide an important context in understanding racial disparities in obesity-promoting behaviors. (*Etn Dis.* 2010;20:366–369)

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INTRODUCTION

US national data show that the disparity in obesity by socioeconomic status (SES) is narrowing while the disparity in obesity risk by race/ethnicity persists.¹ This highlights the importance of examining factors associated with racial and ethnic disparities in obesity that are not typically captured by standard SES indices. The home has been shown to be an environment important in obesity risk^{2,3} and may shed light on these disparities. National surveys show that Black and Hispanic households tend to have more people living within the same amount of space than White households.⁴ On this issue, household density (persons per unit of physical space) may be an important social characteristic of the home environment influencing obesity risk in racial and ethnic minorities.

Household density (HD) is often used as a proxy for crowding. The subjective perception of crowding is a combination of HD and the limits this density places on the residents of the home. Since individuals are forced to cope with the limits placed on them in crowded environments, many studies on crowding have focused on psychological stress and mental health outcomes.^{5,6} Given the role of psychological stress on obesity risk,^{7,8} there is the potential for overcrowding in households to create barriers to healthy choices. This may be of particular concern among women since they spend more time engaged in household activities (American Time Use Survey 2008, United States Department of Labor) and have a higher prevalence of obesity⁹ than men.

The current study was designed to assess the relationship between household density and obesity in young Black and White adults participating in the Coronary Artery Risk Development in Young Adults (CARDIA) study. We hypothesized that Black women in high density households would be at highest risk for obesity.

METHODS

The CARDIA study was designed to examine the development of coronary heart disease risk in Black and White adults in the United States. The detailed methods and instruments used in CARDIA are fully described elsewhere.^{10,11} Briefly, 5115 healthy participants were recruited with approximately the same number of people in subgroups of race, sex, education, and age (18–24 and 25–30) in four cities: Birmingham, Ala.; Chicago, Ill.; Minneapolis, Minn.; and Oakland, Calif. The study began in 1985 and participants were asked to enroll in follow-up examinations. The data for our cross-sectional analysis came from the wave 3 (1990–1991) limited access dataset. Wave 3 was the only wave with data to calculate household density. The retention rate for wave 3 was 81%. All sociodemographic and leisure-time physical activity (LTPA) information was collected by interviewer-administered questionnaires. LTPA index was a composite score of four items using a 5-point Likert-like scale classifying the amount of time spent walking, biking, and watching television (reverse-scored). A higher score indicated more LTPA. Household density (HD) was defined as the ratio of

Table 1. Comparison of the prevalence and means with standard deviation (SD) of demographic, anthropometric, and household density variables by sex and race subgroups

	White women	White men	Black women	Black men
	Mean (SD) or %	Mean (SD) or %	Mean (SD) or %	Mean (SD) or %
N	1,158	1,037	1,185	878
Age at baseline (yrs)*	25.5 (3.4)	25.4 (3.3)	24.4 (3.8)	24.2 (3.7)
Family income (all sources in last 12 months)†				
<\$12,000	6.82	7.23	22.87	16.74
\$12,000–\$15,999	6.30	5.11	10.21	10.14
\$16,000–\$24,999	12.69	15.14	19.32	21.07
\$25,000–\$34,999	20.29	18.61	18.48	20.16
\$35,000–\$49,999	21.93	21.50	14.35	16.06
\$50,000–\$74,999	17.10	17.65	11.31	11.62
>\$75,000	14.85	14.75	3.46	4.21
People living in home*‡	2.7 (1.3)	2.5 (1.3)	3.3 (1.4)	3.1 (1.5)
Bedrooms in home	2.5 (1.0)	2.5 (1.1)	2.5 (1.0)	2.5 (1.0)
Household density (people/bedroom)*‡	1.2 (0.5)	1.1 (0.5)	1.4 (0.6)	1.3 (0.7)
Household density > 1*‡	34.83	29.15	56.71	50.46
Television watching (hours/day)*‡	1.8 (1.5)	1.9 (1.6)	3.3 (2.3)	3.5 (2.4)
Leisure-time physical activity index *‡§	2.8 (0.6)	2.6 (0.7)	2.5 (0.7)	2.5 (0.7)
Body mass index (kg/m ²)*§	24.3 (4.9)	25.5 (3.8)	28.2 (7.3)	26.4 (4.7)
Obese (BMI ≥30 kg/m ²) *‡§	11.44	12.20	32.57	19.98

Significant ($P < .05$) effect of *race, †tomnibus test, ‡sex, §race-sex interaction.

people to bedrooms in the home. High HD was a ratio > 1 . This cutpoint was chosen to reflect a housing arrangement where there was the potential that at least one bedroom was shared by those in the home. Height was measured using a vertical wall mounted centimeter ruler. Weight was measured on a balance beam scale with participants wearing light clothing. Body mass index (BMI) was calculated in kilograms of weight per height in meters squared (kg/m^2). A BMI $\geq 30 \text{ kg}/\text{m}^2$ was considered obese. The study was approved by the institutional review board for each of the testing centers. Participants gave written informed consent.

Analyses

Our cross-sectional analysis included only Black and White participants in the 3rd wave of data collection. Other race/ethnic groups were removed from the analyses due to small numbers. Participants with incomplete or missing data on HD, anthropometric, or demographic information were also removed

from analyses. Of the 4352 participants included in the wave 3 follow-up, 4253 had complete data for all study variables and were included in this analysis. Analyses of the continuous study variables by race and sex were conducted using analysis of variance and categorical variables by chi-squared analyses. The race-sex interaction was also tested. Logistic regression analysis was used to determine if high HD among race and sex groups increased the risk of obesity adjusting for age, family income, and LTPA index. SPSS 17.0 for Windows and Stata v. 10.1 were used for statistical analyses.

RESULTS

Table 1 shows the means and prevalence of study variables in each sex and race subgroup. We found no differences in the mean number of bedrooms between Blacks and Whites or between men and women. Women lived in denser households than men. Blacks lived in denser households than Whites.

More than half of Blacks lived in a home where there were more people than bedrooms. Blacks had a higher prevalence of obesity, watched more TV, and engaged in less LTPA than Whites. Black women had the highest prevalence of obesity and White women the lowest.

Table 2 shows the logistic regression analysis for obesity risk in sex and race groups by level (low and high) of HD adjusting for age, family income, and LTPA. Low HD White men were the only subgroup that had no increased risk of obesity compared to White women in low HD. Black women living in high HD had the highest risk of obesity compared to White women in low HD.

DISCUSSION

Research shows that the social environment of the neighborhood is important in determining risk for obesity.^{12–14} However, the social environment of the home is rarely examined

Table 2. Adjusted* odds ratio and 95% confidence interval (95%CI) for obesity risk

	White		Black	
	Women	Men	Women	Men
High household density	1.79† (1.22–2.62)	1.54† (1.01–2.34)	4.88† (3.56–6.67)	2.23† (1.56–3.18)
Low household density	reference	1.26 (.897–1.79)	3.89† (2.86–5.41)	2.42† (1.70–3.45)

* Adjusted for age, family income, and leisure-time physical activity index.

† $P < .05$.

as part of the obesogenic environment. Household density is a characteristic of the home that may add to the risk factors for obesity. Household density increased the risk of obesity in this study. Black women in a high HD home were at the highest risk of obesity compared to low HD White women. It is unclear why high HD confers higher risk of obesity particularly among Black women. An individual's perception and expectations associated with a dense household can affect their experience of the household. Coping mechanisms to deal with crowding may explain differences in the association of HD with obesity between subgroups. Cultural characteristics such as the type of social interactions and social support may also affect this relationship^{15,16} and influence differences between race groups. In addition, there are characteristics of the home such as the food landscape³ or the design of the home^{17,18} that may influence the relationship between HD and weight-gain promoting behaviors.

While the mechanism linking HD to obesity is unclear, this study suggests that LTPA is not a significant mediator in the relationship. It may be that diet, which was not collected in this wave of CARDIA and therefore not assessed in this analysis, is a more important mechanism linking HD to obesity than physical activity. Crowded living arrangements may be an important factor in stress-induced eating and obesity. Studies^{7,19–21} have shown that stress,

both acute and chronic, can increase unhealthy eating behaviors.

There are a few limitations of this study that should be noted. The temporal relationship between HD and obesity cannot be determined with this cross-sectional study design. Furthermore, the sample consisted of young adults aged 18 to 30 years living in urban areas so the findings may not extend to older populations or residents of suburban and rural areas.

The results of this study suggest that overcrowding can be a significant risk factor for obesity.

CONCLUSION

The results of this study suggest that overcrowding can be a significant risk factor for obesity. Housing policy often reflects some balance of overcrowding with available housing resources but rarely reflects concern about chronic disease risk such as obesity. Examining ways in which housing design can influence perceptions of crowding can be an important contribution to our understanding of obesity-promoting behaviors and the role the housing

environment can play in reducing the risk of obesity.

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AUTHOR CONTRIBUTIONS

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