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Household Instability, Area Poverty, and Obesity in Urban Mothers and Their Children

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Abstract: Fragile Families and Wellbeing Study (FFS) data were analyzed to examine the relationships between obesity, household instability, and area poverty in urban mothers and their children (N=1,449). The FFS was conducted in 20 U.S. cities between 2001 and 2004. *Household instability* was defined as a tenuous home environment where certain psychosocial and economic constraints are present. Area poverty was determined according to the 2000 U.S. Census. Relative weight increased with level of household instability in mothers but not in children. Mothers with the highest level of household instability within areas of low poverty (i.e., relatively little poverty) were more likely than others to be obese (Odds Ratio = 1.8, 95% CI 1.2–2.6). Household instability was not associated with overweight in children. These results suggest that home stability should be considered as a possible risk factor for obesity in mothers with infant children, particularly those residing in low poverty areas.

Key words: Urban populations, obesity, household, epidemiology, maternal and child health, poverty.

The home environment has been identified as a place where obesity-promoting behaviors may be targeted for intervention.¹⁻⁴ The home is the environment for a complex interplay of family dynamics with social and material resources, and has been the focus of many research efforts to understand individual health-related behaviors better.^{5,6} For example, research has shown that psychosocial stress,^{7,8} financial strain,⁹ and food insecurity^{1,4} are all associated with obesity risk. It is unclear, however, to what degree the risk of obesity increases with the simultaneous occurrence of these factors within the same home. The concomitant contribution of these factors is important since maintaining a healthy lifestyle may be contingent on the number of destabiliz-

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ing elements presently making healthy decisions more difficult. We know from prior research that uncertainty and disorder in the home can promote unhealthy behaviors.^{10,11} Studying this instability may yield insight regarding the difficulty that many adults have losing weight and maintaining weight loss after diet and physical activity regimens.¹² Making healthy decisions can be further impeded by neighborhood characteristics that actively promote unhealthy behaviors. Research shows the importance of social resources in promoting healthy behaviors.^{13–15} Furthermore, access to healthy food options^{16–18} and places for recreational physical activity¹⁹ are also important in promoting a healthy lifestyle.

It is not clear how the home and neighborhood environments work in concert to influence obesity risk. It may be that the relationship between household instability and risk of obesity is accentuated within neighborhoods of limited access to healthy options. The current cross sectional study used data from the Fragile Families and Child Wellbeing Study (FFS) to examine the effects of household instability, in areas of low (relatively little) and high (relatively more) poverty, on obesity in urban mothers and their children. We hypothesize that body mass index (BMI) will increase with increasing levels of household instability and that the risk of obesity associated with high household instability will be largest among those living in poverty stricken areas.

Methods

Fragile Families Study (FFS) design. The FFS was a longitudinal national survey of 4,898 children born in 20 large U.S. cities between 1998 and 2000.²⁰ These cities were selected using a stratified random sample of U.S. cities with populations of 200,000 or more and were grouped according to their policy environments and labor market conditions. More information on the selection criteria for these cities is given elsewhere.²⁰ The FFS followed a birth cohort of new parents (most unwed) and their children, with follow-up surveys at one year, three years, and five years. The study oversampled births to unmarried couples ($n=3,712$) and African American families in large cities throughout the U.S. Mothers were considered ineligible for the study if they were younger than 18 years old, were giving the child up for adoption, or if the father was deceased or otherwise unavailable for interview. The study consists of interviews with both mothers and fathers and in-home assessments of children and their home environments at birth. The parent interviews included information on attitudes, relationships, parenting behavior, demographic characteristics, health (mental and physical), economic and employment status, neighborhood characteristics, and program participation. Mothers were invited to participate in another in-home interview 36 months after start of the study where information was collected on children's cognitive and emotional development, health, and home environment. We used data from the mothers and their children at baseline and age 3 years that completed an in-home survey. Of the 3,288 mothers who participated in the in-home module of the study, 1,449 were included in this analysis based on available information on weight and height of child and mother and complete data on all study variables. The racial/ethnic distribution differed between those who were included in this analysis and those who had missing data on a number of the study variables (non-Hispanic White, 23% vs. 22%; non-Hispanic Black, 52%

vs. 47%; Hispanic, 20% vs. 27%; Other, 5% vs. 4%; $p<.05$, χ^2 test). Maternal age, BMI, and income were similar across groups.

All protocols and consent forms were approved by all 75 participating birthing hospitals as well as the institutional review board of Princeton University.

Measure of household instability. Household instability was assessed by combining items on parental stress, financial stability, and food insecurity taken from the maternal interview questionnaire of the FFS at 36 months (Box 1). The items used in the household instability scale were chosen based on their capacity to characterize three major areas shown to be relevant to healthy behavioral choices (primarily physical activity and a healthful diet). There are many reports in the literature regarding the effects of stress, financial status, and food insecurity on obesity risk.^{1,9,21} The household instability scale was a summation of negative (=0) or affirmative (1) responses to the items across all 11 items. Therefore, scores can range from 0 to 11, indicating low to high household instability. The 11-item scale showed adequate internal consistency reliability with a Kuder-Richardson Formula 20 (KR20) coefficient of 0.74 (95% CI 0.72–0.74). The KR20 is analogous to the Chronbach alpha, but used for binary variables. Additional information on the analyses performed to develop this scale is available from the corresponding author.

The home instability scale was divided into three categories based on the empirical distribution of the scores: low (score = 0), moderate (up to and including 2) and high (3 or more) instability.

Box 1.
ITEMS OF INSTABILITY SCALE

Items

Parental Stress

- 1. Since having child you feel that you're almost never able to do things you like
- 2. You feel alone and without friends
- 3. You enjoy things less than you used to
- 4. You feel trapped by your responsibilities as parent

Financial Stability

- 5. In the past year, did you not pay full gas/oil/electricity bill
- 6. In the past year, did you borrow money from friends/family
- 7. In past year, did you not pay full rent or mortgage

Food Insecurity

- 8. Worried whether food would run out before got more money
- 9. Food I bought didn't last and I didn't have money for more
- 10. Couldn't afford balanced meals
- 11. Couldn't afford to feed child balanced meals

Area poverty. In this study, *area* is defined as the census tract where the mothers resided at baseline interview. *Area poverty* is defined as the percentage of the population in the area below the federal poverty level in 1999. Percentage of families below the poverty line has been shown to be strongly related to concentrated disadvantage within neighborhoods in nationally representative populations.¹³ As part of the contracted data through the FFS, information from the U.S. Bureau of Census was linked to the FFS dataset so aggregate information on population demographics could be analyzed in relation to the FFS participants. The U.S. Bureau of Census determines which families are below the poverty line by utilizing a set of money income thresholds that vary by the size and composition of the family.²² In order to have an even distribution of the population, *low area poverty* and *high area poverty* were defined by dichotomizing at the mean (=18%) for the percentage of the population below the poverty level across all 1,125 census tracts based on the mother's reported address at baseline interview.

Body size variables. During the in-home survey, mothers were given the opportunity to have their weight and height, as well as that of their child, measured by the trained interviewer. Weight and height were measured using a digital scale (Bella Digital Scale, model 840; SECA, Hanover, MD) and portable stadiometer (Road Rod Stadiometer, model 214; SECA), respectively. In mothers, the interviewer measured weight and height unless the mother was pregnant, refused to be measured or exceeded the scales capacity of 140 kg. In these cases, the body size indices were self-reported (195 mothers self-reported their weight and 122 their height). Mothers with a BMI greater than or equal to 30 kg/m² were considered obese in analyses. There were 104 mothers who reported being pregnant at time of interview (146 mothers had missing responses to this question, so pregnancy status cannot be confirmed for these women). These women self-reported their pre-pregnancy weight. When women with self-reported body size variables were removed from analysis, the results were similar; therefore, results for all women are presented. In children, age- and sex- specific body mass index (BMI) z-score was used in analysis. A BMI z-score that was equal to or greater than the 95th percentile, in terms of the age and gender adjusted Centers for Disease Control and Prevention (CDC) growth curves,²³ were classified as overweight.

Socio-demographic variables. Age, sex, and race/ethnicity were adjusted for in the analyses based on other reports that have shown these variables are potential confounders according to social and environmental studies of obesity risk. Age of mothers and children were obtained by questionnaire and measured in years and months, respectively. Mothers were asked if they considered themselves White, African American, Asian, American Indian, Hispanic, or Other. In analysis, race/ethnicity was categorized into four groups: White, non-Hispanic; Black, non-Hispanic; Hispanic; and Other. Due to the small number of individuals in the Asian and American Indian groups, these were merged into the Other group for all analyses.

Data analysis. All analyses of the mothers and children reported in this manuscript were conducted on data collected either at baseline (i.e., demographics) or the three-year follow-up (i.e., anthropometrics, household instability) of the FFS. We used SAS 9.1 (SAS Institute, Inc., Cary, North Carolina) to perform both the bivariate and multivariate analyses. Descriptive statistics were performed to show the demographic characteristics of the study population. Analysis of variance including Scheffé's test for

multiple comparisons was used to show the mean differences of the study variables by level of household instability. Logistic regression analysis was used to examine the independent effect of household instability at different levels of area poverty on obesity, adjusting for relevant covariates.

Results

The mean age of the mothers and children in this sample was 28 years and 35 months, respectively (Table 1). Approximately 40% of the children did not have a father living in the house. Forty-one percent of the mothers were obese (BMI≥30 kg/m²). The percentage of mothers who were obese increased from low to high household instability level (Table 2). Sixteen percent of children in the entire cohort were overweight (≥95th

Table 1.
DEMOGRAPHIC AND ANTHROPOMETRIC CHARACTERISTICS
FOR MOTHERS AND CHILDREN (N=1,449)

Variables	Mean ± Standard Deviation or Percentage (%)	Range
Mother		
Age (years)	28.18 ± 6.05	18 – 47
BMI (kg/m²)	29.40 ± 7.22	15.22 – 64.02
Obesity (≥30 kg/m²)	41.27	
<i>Race/Ethnicity^a</i>		
White, non-Hispanic	23	
Black, non-Hispanic	52	
Hispanic	20	
Other	5	
<i>Household Instability</i>		
High	27	
Medium	36	
Low	37	
Proportion of population below poverty level ^a	18.2 ± 14.2	0 – 73.1
Father not living in home	41.20	
Child		
Age (months)	35.10 ± 2.07	30 – 46
BMI (kg/m²)	16.71 ± 1.91	12.85 – 32.26
Overweight (≥95th perc. of BMI)	16.43	
Female	49	

^aData collected at baseline

Table 2.

PERCENT OBESE (%) AND MEAN VALUES WITH STANDARD DEVIATION OF AGE, BODY MASS INDEX (BMI) AND AREA POVERTY BY LEVEL OF HOUSEHOLD INSTABILITY (N=1,449)

	Level of household instability		
	Low (n=537)	Moderate (n=519)	High (n=393)
Maternal age	29.28 ± 6.36	27.52 ± 5.85**	27.55 ± 5.66**
Maternal BMI	28.60 ± 6.71	29.61 ± 7.32	30.21 ± 7.65**
Obese (≥30 kg/m ²) *	38.10	41.86	47.54
Child age (months)	34.97 ± 2.06	35.03 ± 1.96	35.35 ± 2.19**
Child BMI percentile ^a	62.66 ± 30.03	63.48 ± 30.58	61.94 ± 29.94
Overweight (≥95th percentile)	15.61	18.69	14.47
Area deprivation ^b	16.4 ± 14.6	18.1 ± 14.1	20.6 ± 13.5**

*p<.05 for χ -square trend test.
 **p<.05 compared with low level.
^aPercentile of BMI compared with CDC growth curves for age and sex.
^bArea poverty is defined as percentage of families within census tract below the poverty level.

percentile of BMI) based on their age and sex (Table 1). However, the percentage of children who were overweight did not differ by household instability level (Table 2).

Among mothers, BMI and the prevalence of obesity was highest among those with high levels of household instability (Table 2). High levels of household instability significantly increased the risk of being classified as obese (OR 1.8, 95% CI 1.2–2.6) among those living in low poverty areas (i.e., areas with relatively little poverty) (Figure 1). This relationship was not observed at high levels of area poverty, however. These analyses were adjusted for race of mother, age of mother, and whether the father lives in the home.

Among children, the level of household instability was not associated with an increase in BMI z-score or prevalence of overweight (Table 2) or with the odds of overweight in either low or high poverty areas (Figure 2). The pattern of association differs from the pattern among mothers. These analyses were adjusted for age and race of mother, age and sex of child, and whether the child's father lived in the home.

Discussion

A major strength of the FFS is the oversampling of racial/ethnic minorities and the urban focus of the study design, which allows for the examination of household instability and obesity in a diverse population, including those most at risk for adverse health events. In this study, we are interested in identifying whether families living in urban

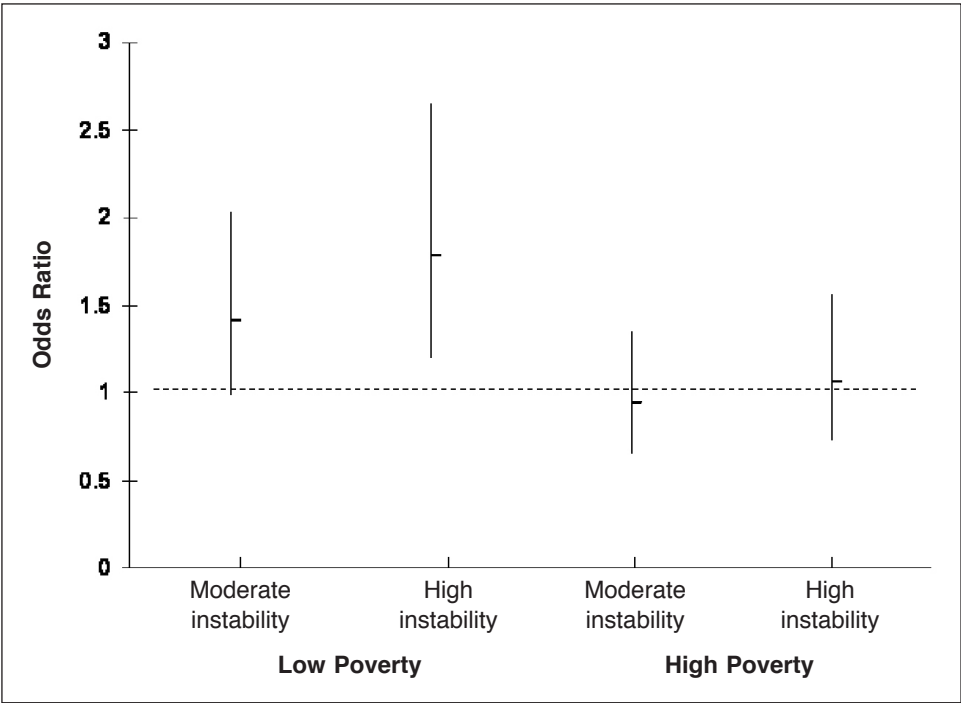


Figure 1. Odds ratios* and 95% confidence intervals for obesity (BMI $\geq$ 30 kg/m²) by level of household instability among mothers in areas of low and high poverty.

*Adjusted for age, race/ethnicity of mother, and father living in home with Low instability group as reference.

areas have an increased risk of obesity based on their level of household instability while living within areas of high and low poverty. Our main interest is to relate the home and neighboring environment with risk of obesity in an effort to gain important information regarding the intersection of these environments.

Regarding the home environment, the results show that in mothers, BMI and proportion obese are higher among those with higher household instability. This is consistent with our hypothesis and is supported by the research on household chaos and health status in adults.²⁴ The work of Wong et al.²⁴ reports an association between chaos or disorder in the home and health outcomes in adults. Wong and colleagues demonstrate that life chaos, including items assessing daily routine, ability to relax, household commotion, ability to plan and anticipate the future, and being on time or feeling rushed, is associated with compromised mental health and limited access to health care.

The research in children regarding home environment and obesity is less clear^{2,25-27} than in adults. In our study, there was no significant relationship between household instability and overweight status among children. The children in our study are young (3 years old) which may partially account for the lack of association in this group, as the negative traits of the home environment may not have had sufficient time to exert their deleterious effects on the child's weight. Therefore, the relationship between household

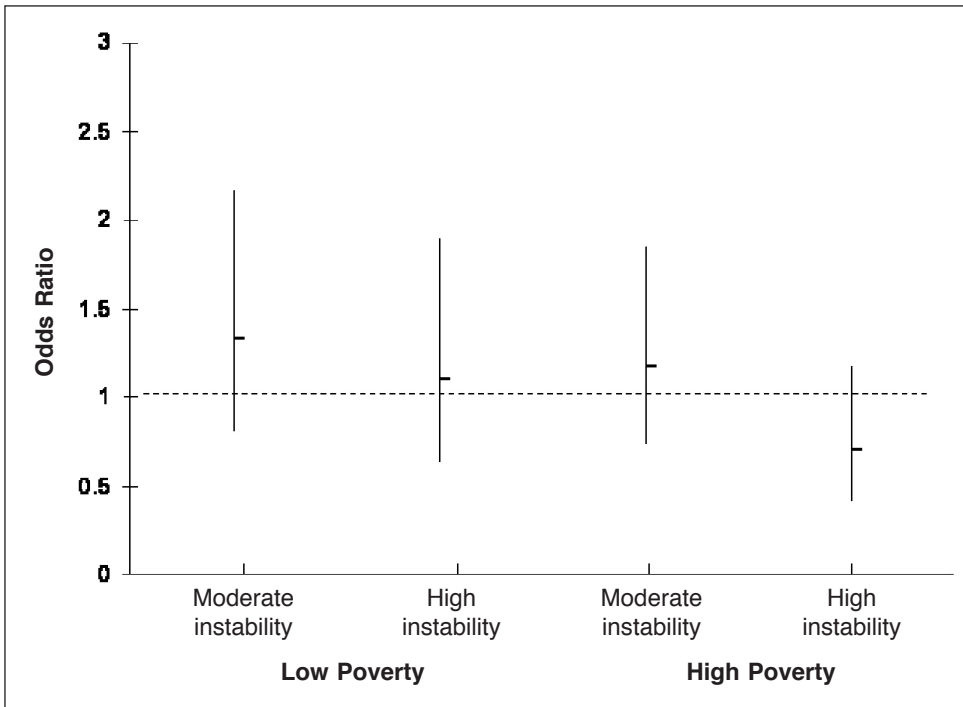


Figure 2. Odds ratios* and 95% confidence intervals for obesity (BMI $\geq$ 95th percentile) by level of household instability in children in areas of low and high poverty.

*Adjusted for age, race/ethnicity of mother, and father living in home with Low instability group as reference.

instability and body size may not be as evident at these early stages of development as in adulthood. It does appear, however, that the relationship between household instability and obesity in children has a different pattern, compared with that of the mothers, although this is not statistically significant. Research shows that when resources are limited, mothers will protect the interests of their children at the expense of their own health,^{28,29} which may explain why household instability is positively related to obesity in mothers and not in their children.

Poor neighborhoods have been shown to have less access to recreation space and healthy food options than more affluent neighborhoods.^{18,30–32} We observe a different association of household instability with obesity by area poverty in the FFS. These results demonstrate that, within low poverty areas (areas with relatively little poverty), the instability of the household is important in determining obesity risk in mothers; however, within high poverty areas, household instability has little influence on obesity risk. This is a somewhat unexpected finding as we hypothesized that individuals with high household instability living in neighborhoods with more poverty would be at the highest risk for obesity, according to a model in which risks are cumulative. A possible explanation for these results is that in areas of low poverty, where access to resources consistent with healthy living are more prevalent, individuals with higher

household instability lack the social resources (e.g., positive social networks, accordance with social norms) necessary to take advantage fully of the area resources. The social disparity in areas of low poverty between those with higher household instability and those with lower household instability may drive unhealthy behaviors and, subsequently, obesity risk in the group with greater household instability. However, in areas of high poverty where area resources are more limited and, correspondingly, less social disparity between those with high instability and those with low instability, there may be substantial social resources so that household instability does not add to the risk of obesity in this group.

Taken together, the results of our study support the idea that individual obesity-promoting behaviors may be influenced by a pushing and pulling of both the home and the area environments. We propose that the home environment is important to examine in order to explain partially why certain individuals are obese even within an area environment supportive of healthy behaviors. As obesity-reducing campaigns incorporate the surrounding environment into weight control strategies, success may depend on understanding the relevance of the home environment in the willingness of individuals to take advantage of healthy resources within the neighborhood. An understanding of this interaction may be important in increasing the effectiveness of weight control interventions.

This study has a few limitations that warrant mention. First, the cross-sectional design of the analysis does not allow for assessing the temporal relationship between household instability and risk of obesity. It is also important to note that a multilevel approach was not chosen in this analysis. A multilevel modeling approach would be required to adjust statistically for the possibility that observations of the dependent variable may be correlated among those living within the same census tract. However, since very few of the participants in this study reside within the same census tract, a multi-level modeling approach to the current data³⁶ is not appropriate, as inter-correlated observations within the same census tract cannot be assumed (1,451 participants included in analysis were spread over 1,125 census tracts). Second, the household instability score was a summation of items, giving equal weight to each variable. There are other approaches that could have been implemented to tabulate this score which may alter the magnitude of the effect observed. The weighting of items based on their contribution to the measurement tool is an approach that could have been used in this study had there been an *a priori* reason for doing so. Finally, lower rates of participation and height/weight measurement compliance in the in-home survey may introduce the possibility of selection bias. It may be that individuals most at risk for obesity were less likely to have complete data available for analysis, thus biasing our results toward the null hypothesis. Although the results from the performed analyses were similar with and without the inclusion of mothers self-reporting of height and weight, there is always the possibility of misclassification bias regarding this recording method.

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