Published in final edited form as:

Sociol Perspect. 2013 January 1; 56(4): 547–567.

Reconceptualizing the Association between Food Insufficiency and Body Weight: Distinguishing Hunger from Economic Hardship

Catherine E. Ross and
University of Texas

Terrence D. Hill
University of Utah

Abstract

What is the association between food insufficiency and body weight? Although common sense would suggest a negative association, research often finds the opposite. We contrast commodity theories of material privation with stress theories, proposing that the seemingly counterintuitive association results from the confounding influence of economic hardship. Because it is a chronic stressor, economic hardship may contribute to overweight. Data from the WCF project of 2,402 disadvantaged women in Chicago, Boston, and San Antonio show that people who experience economic hardship weigh more; and that the true negative association between body weight and food insufficiency—especially going hungry because one cannot afford food—is revealed only after adjustment for economic hardship.

Keywords

food insufficiency; economic hardship; body weight

INTRODUCTION

What is the association between food insufficiency and body weight? Although common sense would suggest a negative association, research often finds the opposite. Contrary to expectations, Americans who report that they do not have enough food to eat because they can't afford to buy food, weigh more, not less, than people who report that they always have enough money for food (Adams, Grummer-Strawn, and Chavez. 2003; Basiotis and Lino 2002; Dubois et al. 2006; Hanson, Sobal, and Frongillo 2007; Lyons, Park, and Nelson 2008; Martin and Ferris 2007; Olson 1999; Rose 1999; Townsend et al. 2001). Sometimes this association is significant and sometimes it is not (Gundersen et al. 2009). To our knowledge, only one study—of the elderly—finds that food insufficiency is associated with lower weight (Sahyoun and Basiotis 2000). Food, of course, provides the calories necessary for life. In the extreme, people who are starving because they do not have enough food get thinner and thinner, losing fat and then muscle. One might think that reports of eating less because one cannot afford to buy food would be associated with lower weight. In order to understand why researchers often find that people in the U.S. who report that they do not have enough money for food or sometimes skip a meal because they cannot afford the food,

weigh more than people who always have enough money for food, we propose a reconceptualization of food insufficiency.

Food insufficiency is defined here as not having enough money for food, which is consistent with the definition “an inadequate amount of food due to lack of resources” (Briefel and Wotecki 1992).¹ People who do not have enough money for food sometimes skip meals, don’t eat for a whole day, or go hungry (Campbell 1991). In the sections that follow, we discuss how the concept of food insufficiency is related to concepts of economic hardship and poverty. A reconceptualization of food insufficiency is the first step toward understanding how it could be associated with excess weight.

CONCEPTUAL ROOTS OF ECONOMIC HARDSHIP AND POVERTY

Food, clothing, and shelter are necessary for survival. People who cannot afford food are likely facing a situation of extreme material privation or poverty. Poverty is a situation in which people lack material resources. They do not have the money to buy necessities. In order to understand where food insufficiency fits into the larger issues of poverty, privation, and hardship, we first review the concept of economic hardship and its relationship to the concept of poverty.

Economic hardship is a lack of the money necessary to meet family needs for food, clothing, shelter, and medical care. Lack of money to buy food is usually a component of the more general concept of economic hardship. Interest in economic hardship arises from two research traditions. First, a number of scholars question the official poverty rate as a measure of material hardship (Citro and Michael 1995; Colasanto, Kapteyn, and Van Der Gaag 1984; Hauser and Carr 1995; Jencks and Torrey 1988; Mayer and Jencks 1989), suggesting that measuring economic hardship directly is the best way to assess the concept of being without means of providing for material needs (Heflin, Sandberg, and Rafail 2009; Mirowsky and Ross 1999). Second, economic hardship is a chronic stressor, associated with depression, anxiety, anger, and heavy drinking (Bickel et al. 2000; Hill and Angel 2005; Hill, Burdette, and Hale 2009; Hill, Mossakowski, and Angel 2007; Keith 1993; Mirowsky and Ross 2001; Pearlin et al. 1981; Ross and Huber 1985; Siefert et al. 2004; Heflin, Sandberg, and Rafail 2009). The two research streams share a common interest in the suffering caused by privation—by the lack of the basic necessities or comforts of life.. Clearly the concept of economic hardship lies close to that of poverty. Furthermore, poverty, as officially defined, has its roots in food sufficiency.

Hardship reflects needs in relation to resources, and things other than income may act as resources (Mirowsky and Ross 1999; Huang, Guo, and Kim 2009). Many studies do not measure hardship directly. Instead they measure poverty. Measures of poverty are indirect measures which infer hardship indirectly by measuring *income* relative to *theoretical* need (Heflin, Sandberg, and Rafail 2009). The most basic theoretical need is food. During the war on poverty in the U.S., the Census Bureau and the Social Security Administration defined poverty based on judgments made by experts about nutritional requirements for health and normal function and the economic resources these requirements imply. The United States Department of Agriculture (USDA) estimated the number of calories and types of foods needed by individuals of different ages and sexes (Citro and Michael 1995; Fisher 1998; Hauser and Carr 1995; Mayer and Jencks 1989). Orshansky (1965) used the USDA nutrition budget and economy food plan to estimate the income that families of various sizes and

¹Food insufficiency measures lack of food. Food insecurity is a somewhat different concept in that it adds a component of worry or anxiety about not having enough food. People could worry about not having enough money for food, but still have enough food. We measure food insufficiency, which may reflect a more severe state of privation (www.ers.usda.gov/briefing/foodsecurity.htm).

compositions would need in order to buy the food required for an adequate diet. She calculated the cost of the necessary food, and multiplied it by the inverse of the estimated fraction of a low-income family's total income that goes to food. She then generated a table showing the poverty-level income for families of varying size and compositions. The table's values became the official U.S. government definition of poverty for statistical purposes (Office of Management and Budget 1978), and they remain so today with only a few changes.² In sum, poverty thresholds are indirect measures of economic hardship, based on the idea that people need enough money for food to meet their nutritional requirements.

WHAT DOES MONEY BUY?

Commodity or Relief from Stress?

What does money buy that could help people maintain a healthy weight and avoid excess weight? Although the specifics vary, there are two basic types of explanations, which can be called "commodity theories" and "stress theories" (Ross and Mirowsky 2010). Commodity theories propose that money buys food. Stress theories propose that money helps buy relief from economic hardship, which is stressful and thereby undermines healthy weight.

Stress theories propose that economic hardship is a chronic stressor (Pearlin et al. 1981; Ross and Huber 1985; Mirowsky and Ross 2001). People facing economic hardship do not have enough money for the essential material goods necessary for survival, such as food and shelter, which is stressful. Economic hardship poses a direct threat to the well-being of oneself and one's family (Wheaton 1999). Perceived threats trigger a primitive, biological, fight-or-flight response. As a result, people exposed to economic hardship probably experience frequent, intense, and prolonged activation of the physiological stress response, with consequences for their bodies (Fremont and Bird 2000; Hill, Ross, and Angel 2005; Marmot and Mustard 1994). An endless and sometimes losing struggle to pay the bills and feed and clothe the family is stressful and exacts both alarm and exhaustion. Gnawing worries make sleep restless and drain the joy from life. Susceptibility to distress increases when life becomes a relentless, unending struggle to get by, which further contributes to chronic activation of the physiological stress response (Hill, Ross, and Angel 2005; McEwen 2002, 2003, 2004).

Daily exposure to the stress and the threat of not having enough money to get by may elicit a two-stage stress response. The initial stage—the fight-or-flight response—releases adrenaline into the blood stream. In order to supply the body with a ready source of energy to fight or flee, adrenaline triggers the release of glucose from energy stores and prompts the breakdown and release of fatty acids from fat reserves. The follow-up stage of the stress response activates the hypothalamic-pituitary-adrenal (HPA) axis and releases cortisol into the circulating blood in an effort to replenish energy reserves depleted during the initial fight-or-flight response. Cortisol converts food into stored fats and acts on the brain to induce hunger and food-seeking behavior, and chronically high cortisol levels are associated with excessive amounts of energy stored as fat around the abdomen (Adam and Epel 2007; Anagnostis et al. 2009; Bjorntorp and Rosmond 2000; DeVriendt, Moreno, and DeHennauw 2009; Fraser et al. 1999; McEwen 2002, 2003, 2004), although one study found a negative association between circulating cortisol and various measures of body mass among men in the community (Travison et al. 2007), and another found that stress-induced cortisol was only associated with weight gain among women who already had high levels of central fat

²Notably, the revised values no longer penalize women for needing less food than men, although the assumption that children need less food than adults to meet nutritional requirements is still in place, as is the assumption that people over the age of 65 need less money to stave off poverty in part because they need less food and in part because a larger proportion of their resources can go toward food since they don't have the expense of children and other expenses of young adults, like mortgages.

(Epel et al. 2000). High levels of cortisol also increase hunger for foods high in sugar and fat, since stores of glucose and fat have been depleted (Burdette and Hill 2008; Dallman et al. 2003; DeVriendt, Moreno, and DeHenauw 2009; Torres, Diet, and Nowson 2007). People may use food, especially “comfort food” high in sugar and fat as a way of coping with chronic stressors in an attempt to decrease the resulting negative emotions like anxiety and depression (Dallman et al. 2003; Greenfield and Marks 2009).

Not having enough money for food is a core component of economic hardship. Economic hardship is a chronic stressor. Theory suggests a positive association between economic hardship and weight, and there is some evidence to support it (Scharoun-Lee et al. 2009). Research on other chronic stressors such as job stress among adults and exposure to violence in ones family of origin show associations with overweight (Block et al. 2009; Brunner, Chandola, and Marmot 2007; Greenfield and Marks 2009; Kouvonen et al. 2005), and research on adolescents shows associations of chronic social stressors-- including family economic hardship--with overweight (Garasky et al. 2009; Gundersen et al. 2010; DeVriendt, Moreno, and DeHenauw 2009; Lohman et al. 2009). We propose that, because it is a chronic stressor, economic hardship is positively associated with body weight. *If* economic hardship is associated with excess weight, this could help explain why previous research on food insufficiency and weight shows a counterintuitive positive association.

Alternatively, commodity theories propose that something that can be bought and sold—commodities— form the bridge between lack of material resources and weight. Since food is associated with higher weight, not lower, commodity theories often propose that money buys healthy, low calorie, food rather than fattening food (Dietz 1995; Drewnowski and Specter 2004; Drewnowski 2009). Although this is possible, it seems that the foods money buys are just as likely to be weight risks as healthy weight benefits. Healthy fruits and vegetables may be relatively expensive, but so is processed food, fast food, and restaurant food, which are high in fat. Processed food, prepared food, and fast food like hamburgers, hotdogs, soda, frozen pizza, french fries, potato chips, cookies, candy, donuts, snack pies, and so on are not cheaper than carrots, beans, broccoli, zucchini, cabbage, corn, eggs, bread, rice, apples, bananas, and skim milk. According to Rector, the idea that people who report that they don’t have enough money for food save money by buying high fat food is not supported empirically: “soft drinks are high in added sugar and are associated with weight gain, but as a source of calories they are more expensive than skim milk. Snack foods such as potato chips and donuts costs two to five times more per calorie than healthier staples such as bean, rice, and pasta. Families seeking low cost sources of energy would focus not on junk and snack foods but on traditional low-cost staples such as beans, rice, pasta, and milk. These foods are not only less expensive but have a lower potential to promote weight gain.” (2007:3). Others respond by suggesting that people with little money binge on high fat foods when they have money to make up for lack of food when the money has run out—at the end of the month, for example; or that one must add the cost (and inconvenience) of transportation to the cost of healthy fruits and vegetables, since local stores in poor neighborhoods often don’t carry fresh produce (Dietz 1995; Pample, Krueger and Denney 2010). Commodity theories propose that a lack of money is associated with eating more food, more fattening food, and more total calories, which is associated with overweight, and implies that income has an independent effect on weight, not just due to economic hardship.

Summary and Hypotheses

We suggest that food insufficiency indicates two things. First, it is a component of economic hardship, which is stressful and may predispose people to overweight. Second, it indicates a real lack of food as a consequence of not having enough money, which may lead to thinness. Thus, when weight is the outcome, food insufficiency might have counteracting effects. We hypothesize that economic hardship is associated with excess body weight. Furthermore, we

hypothesize that economic hardship acts as a suppressor of the negative association between food insufficiency and body weight: Without adjustment for economic hardship, the association between food insufficiency and body weight will be positive, but with adjustment it will be negative.

METHODS

Data

The data for this study come from the Welfare, Children, and Families (WCF) project (see <http://www.jhu.edu/~welfare/>). The WCF project is a household-based, stratified random sample of 2,402 low-income women living in low-income neighborhoods in the U.S. cities of Boston, Chicago, and San Antonio. The WCF project first sampled census blocks (or neighborhoods) with at least 20 percent of residents below the Federal Poverty line based on the 1990 census (i.e., low-income neighborhoods; the poverty threshold was \$13,359 for a family of four in 1990). Within these neighborhoods, households under 200 percent of the poverty line were sampled, with an over-sample of households below 100 percent of the poverty line. Because one of the goals of the WCF project is to assess the impact of welfare policy and work on children, households were screened for their presence. Households with at least one infant or child (aged 0 – 4) or young adolescent (aged 10 – 14) were sampled. The children's primary caregivers, all women age 18 and older, were interviewed face-to-face, in their homes. The data, collected in 1999, yielded an overall response rate of 75 percent and city-specific response rates of 74 percent (Boston), 71 percent (Chicago), and 79 percent (San Antonio). Because response rates vary by city, all analyses are weighted based on known population characteristics in order to balance the contribution of each city.

Measures

Body mass is assessed using self-reports of height and weight. Following guidelines set forth by the CDC, we calculated body mass index by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703 (Formula = $\text{weight (lb)} / [\text{height (in)}]^2 \times 703$).

Table 1 presents all food insufficiency items. Items 1–3 indicate adult food insufficiency, and items 4–6 indicate child food insufficiency (Campbell 1991; Gundersen et al. 2007). Original response categories for these items were coded as (1) yes and (0) no. Due to limited incidence, the final food insufficiency measures (adult and child) are coded (1) if the respondent answered “yes” to any of the items and (0) otherwise.

Economic hardship is measured as a direct assessment, with the five items shown in Table 1 (items 7–11). Original response categories for item 7 range from (0) no difficulty at all to (4) a great deal of difficulty. Responses for items 8 and 9 range from (0) never to (4) all the time. Responses for item 10 range from (0) more than enough money left over to (3) not enough to make ends meet. Finally, responses for item 11 range from (0) definitely no to (3) definitely yes. Because the hardship items were measured with mixed question formats and variable response categories (4 or 5 categories), each of these items has been standardized to account for metric differences.

In order to attempt a comprehensive adjustment for economic strains, we also include three other economic measures: household income, welfare status growing up, and current welfare status. Welfare status in one's family of origin is assessed with the following question: “[From your birth to age 16] About how much of the time was your family receiving public assistance of any kind [such as welfare, public aid, Food Stamps, WIC (Women, Infants, and Children Nutrition program) or SSI (Supplemental Security Income)]?” Response categories for this measure are coded (0) never, (1) a few years, (2) most of the time, and (3) all of the

time. Current welfare status is measured with the following question: “Are you or [your child] regularly receiving welfare benefits [same list as above] now?” This measure is coded (1) if the respondent receives public assistance now and (0) otherwise. Although not direct measures of economic hardship, inclusion of both welfare status in ones family of origin and current welfare status may indicate lifelong exposure to chronic social stressors that predispose to overweight. Household income is measured as the total *monthly* earnings of all earners in the household with missing data assigned the mean, adjusting for missing status (0/1)

Sociodemographic control variables include age (coded in years), race/ethnicity (dummy variables for white, Mexican, and other Hispanic, with black serving as the reference group), education (number of years of schooling completed), marital status (dummy variables for currently married-spouse in house and cohabiting-not married, with respondents not living with a partner serving as the reference group), number of children (coded 1 to 6 or more, top-coded continuous variable), and city of residence (dummy variables for Boston and San Antonio, with Chicago serving as the reference group).

Analytic Strategy

We begin with an exploratory factor analysis of food insufficiency and economic hardship (Table 1). Next we present descriptive statistics for the sample (Table 2). Our main analysis proceeds in three steps. Model 1 of Table 3 predicts BMI from adult food insufficiency, adjusting for sociodemographic characteristics. Model 2 adds child food insufficiency. Model 3 adds economic status, including income, economic hardship, current welfare receipt, and family of origin welfare receipt. In addition, we present a subsidiary analysis in which we substitute the single question, “in the past year, were you ever hungry because you couldn’t afford enough food” for the adult food insufficiency index because it is the only question that refers specifically to the respondent rather than other members of the family. Finally we try various categorizations of weight and compare results to the continuous BMI results.

RESULTS

Food Insufficiency and Economic Hardship

Food insufficiency has three types of referents: any adults in the household including yourself, yourself, and children in the household. Respondents were asked whether in the past year, they or other adults in the household had ever not eaten for a whole day because there wasn’t enough money for food, and whether they or other adults ever skipped or cut the size of a meal because there wasn’t enough money for food. They were also asked whether they had ever gone hungry because they couldn’t afford enough food. Respondents were also asked whether a child had ever had to skip a meal, or whether they had cut the size of a child’s meal, or whether a child was ever hungry because there was not enough money for food. A factor analysis of food insufficiency and general economic hardship shows three factors: adult food insufficiency, child food insufficiency, and general economic hardship (Table 1).

Very few Americans, even poor Americans, experience any food insufficiency. Remember to get a score of 1 on the food insufficiency scale all a respondent must have reported is that once in the past year she cut the size of a meal, or skipped a meal because she did not have enough money for food. Thirteen percent of the adults had experienced any type of food insufficiency in the past year, and 5 percent of the children had (See Table 2). When families are struggling to make ends meet and are having difficulty paying for necessities, it may be that parents make sure their children are fed first. This could explain why fewer

children ever go without food than adults. Because food insufficiency is uncommon in the U.S., this sample of poor women with children may be especially appropriate for studying it since variation in food insufficiency does exist. This population is at risk of privation. Among more affluent Americans, food insufficiency is likely so rare as to be difficult to study.

Food insufficiency is significantly correlated with economic hardship as implied by the perspective that both indicate a lack of material resources, with food being one of the core necessities. Adult food insufficiency is correlated .38 with economic hardship and child food insufficiency is correlated .27. The two types of food insufficiency, as expected, are highly correlated at .48. (See Appendix A).

Weight

The average body mass index (BMI) in this sample is 29, which is considered overweight (See Table 2). In fact, seventy percent of respondents in this sample are heavy (33% are overweight and 37% are obese, as defined below). The concept underlying BMI is weight, or heaviness. At the high end of the scale people weigh more (relative to their height) than at the low end. The high end of the scale may be called overweight, or heaviness, or high weight. At the low end of the scale, people weigh less, and at the very low end they may be underweight or relatively thin. In addition to a continuous BMI score, we also tried various categorizations of underweight (< 18.5), normal weight (18.5–24.9), overweight (25–29.9), and obese (30+); obese (30+) vs. not obese; overweight or obese (25+) vs. not; and “old” obese cut-off (27+) vs. not. All categorizations attenuated significance of results, but did not alter them substantively. We present results using the continuous BMI scale. We use the terms overweight or weight or heaviness, the concept underlying BMI, to refer to the high end of the scale. The average respondent in this sample is heavy, so we sometimes refer to the lower end of the scale as normal weight, or healthy weight. This is because only 2 percent of respondents in this sample are considered underweight.

Food Insufficiency, Economic Hardship, and Weight

Model 1 of Table 3 shows the association of adult food insufficiency and overweight with adjustment for sociodemographic precursors of age, race and ethnicity, education, marital status, children, and city of residence. Food insufficiency is positively associated with weight but is not significant. Model 2 adds child food insufficiency to the equation. Child food insufficiency is also positively, but insignificantly, associated with weight. Model 3 adds various aspects of economic difficulties, including income, growing up in a family that received welfare, being currently on welfare, and current economic hardship. Economic hardship, receiving welfare, and growing up in a family that received welfare are all significantly positively associated with body weight. Economic hardship has the largest and most significant association. Income per se is not significant. With adjustment for these indicators of economic strains, the association between adult food insufficiency and weight switches sign and becomes significant at the .05 level using a 1-tailed test. People who report that they have difficulty paying the bills, that they put off buying necessities, and often end the month without enough money to make ends meet weigh more than those who report little economic hardship. With adjustment for economic hardship, food insufficiency, which is one element of general hardship, is negatively associated with overweight, as would be expected if a person could not afford enough food. Because food insufficiency and economic hardship are positively correlated and have different associations with weight, the true negative association between food insufficiency and weight is revealed only after economic hardship is adjusted.

Hunger and Weight

Adult food insufficiency is somewhat vague as to referent since two of the questions refer to either yourself or another adult in the household. Only going hungry because you didn't have enough money for food refers only to oneself. When this item is isolated out and substituted for adult food insufficiency, the pattern described above actually becomes much stronger. In model 3 of Table 4, with adjustment for economic difficulties, going hungry is significantly and negatively associated with weight. The single item that refers only to oneself has a stronger and more significant negative association with weight than the 3-item adult food insufficiency scale. This makes sense since it is the only item that refers exclusively to oneself. With adjustment for economic hardship, people who report that they sometimes go hungry because they cannot afford food weigh less than those who never go hungry.

Other Correlates of Weight

Other than economic strains and food insufficiency, a number of sociodemographic variables are associated with weight. Older persons weigh more than younger. Mexican origin and other Hispanic Americans weigh significantly less than blacks. Non-Hispanic whites weigh less than blacks although not significantly less. People who are married and living with a spouse or living with a partner weigh more than those living without a spouse or partner, and people with more children in the household are heavier than people with fewer children in the household.

DISCUSSION

To our knowledge, this is the first study to comprehensively adjust for economic hardship when examining the association of food insufficiency with weight. In doing so, we find a negative association with weight of one's own food insufficiency, especially going hungry because one could not afford food. To our knowledge, this is the first study of young and middle-aged adults to find a significant negative association between food insufficiency and weight, even though common sense would predict one. A reconceptualization of food insufficiency may have helped explain previous counterintuitive results that food insufficiency was associated with heavier weight, not lower weight. We find that economic hardship is associated with higher weight. This relationship is large and significant, and in fact, only age shows a larger association with weight in these analyses (older people weigh more than younger).

Heflin and her colleagues suggest that hardships related to physical necessities like food are best thought of as separate from other less critical hardships (2009). When weight is the outcome it may be especially useful to distinguish various types of material hardship. This is because food insufficiency appears to have counteracting effects on weight: as a real lack of food it is associated with lower weight for the few who sometimes go without food, but as a chronic social stressor indicative of a situation of not having enough money to pay bills, rent, or buy necessities of all kinds, it is associated with higher weight. Depending on the outcome of interest it may be more or less useful to distinguish among types of hardships.

Stress not Commodity

For most Americans, the problem is too much food, not too little. Food in America is relatively cheap and plentiful; in fact the U.S. food supply provides 3,800 calories per person per day, almost twice as much as required by many adults (Blaylock et al. 1999; Nestle 2003). Food marketing promotes weight gain, and most advertising dollars promote convenience foods, prepared foods, and snacks--which tend to be high in fat--and alcohol (Blaylock et al. 1999; Nestle 2003). Programs that help people acquire food, like the Food

Stamp Program, are associated with higher levels of overweight. Poor women who participate in the Food Stamp program are more likely to be overweight than women at equivalent income levels who did not participate (Baum 2007; Nestle 2003; Wilde et al. 1999). Healthy weight is not a commodity that can be bought. If anything, “people use extra income to eat more” (Nestle 2003), and prepared foods and “food away from home” cost more, not less, than healthier foods (Blaylock 1999). Prepared foods-- with added fat, sodium, corn fractions, and other food constituents--generally cost more than their standard counterparts [compare potatoes to french fries or potato chips, for example] (Blaylock et al. 1999). Fast food and other restaurant food provides more fat and cholesterol and less fiber than food eaten at home, and it is more expensive (Blaylock 1999). Eating smaller portions, a weight loss strategy advocated by Weight Watchers, costs less than eating more. Clearly, eating less food costs less than eating more food, and most Americans eat too much food [relative to their energy expenditure] (Nestle 2003). Commodity theories that propose that it costs more to eat healthy low calorie foods may be on shaky empirical ground: In their analysis of “selected foods” Drewnowski and his colleagues (2004, 2009) single out raspberries, strawberries, mangos, and star fruit as expensive (although they do say that bananas are cheap). Healthy weight is not a commodity that can be bought with money, and, with adjustment for economic hardship, income itself does not significantly influence weight. More likely, money provides relief from chronic stress that takes its toll on the body in many ways.

Economic hardship and insufficiency are stressful in themselves, and they bring a sense of powerlessness, helplessness, and failure (Mirowsky and Ross 2003). Low income and difficulty paying bills or buying necessities like food and housing make individuals feel at the mercy of merciless forces. The sense of helplessness undermines the motivation to find and adopt healthy lifestyles, while the sense of threat and dread spawns cycles of agitation and depletion that increase circulating cortisol, increase hunger for fat and sugar, stimulate the body's storage of fat, increase atherosclerosis, compromise glucose metabolism, contribute to hyperglycemia, and increase central obesity (Burdette and Hill 2008; Freemont and Bird 2000; McEwen 2002; Taylor et al. 1997; Ross and Mirowsky 2009; Torres, Diet, and Nowson 2007).

Most Americans, even poor Americans, never go hungry. But some do. Once we separated going hungry from other aspects of food insufficiency, we found that going hungry was associated with lower weight. In fact, the original positive total association between food insufficiency and weight was not significant in all likelihood because the concept encompasses some elements that are positively associated with weight and some elements that are negatively associated with weight. The chronic stress of economic hardship is positively associated with weight. Actually going hungry because one cannot afford food is negatively associated with weight. The two components cancel each other out to a certain extent, although chronic stress appears to be the central component of the concept. This is likely the case because in the U.S. very few people go hungry, even in a sample of poor women with children. In other, less affluent places, the relative influences of the two components may differ.

The positive association between weight and food insufficiency is explained by economic hardship. Lack of money to buy food is one aspect of the more general situation of economic hardship, which is stressful, and is associated with higher weight.

Acknowledgments

This research was funded by a grant from the National Institute on Aging: “Reconceptualizing Socioeconomic Status and Health” to Catherine E. Ross (p.i.) RO1AG035268

References

- Adams, Elizabeth; Grummer-Strawn, Laurence; Chavez, Gilberto. Food Insecurity is Associated with Increased Risk of Obesity in California Women. *The Journal of Nutrition*. 2003; 133:1070–1074. [PubMed: 12672921]
- Adam TC, Epel ES. Stress, Eating, and the Reward System. *Physiology and Behavior*. 2007; 91:449–458. [PubMed: 17543357]
- Anagnostis, Panagiotis; Athyros, Vasilios; Tziomalos, Konstantinos; Karagiannis, Asterios; Mikhailidis, Dimitri. The Pathogenetic Role of Cortisol in the Metabolic Syndrome: A Hypothesis. *The Journal of Clinical Endocrinology & Metabolism*. 2009; 94:2692–2701. [PubMed: 19470627]
- Basiotis, P.; Lino, Mark. Food Insufficiency and Prevalence of Overweight among Adult Women. Washington, DC: United States Department of Agriculture, Center for Nutrition Policy and Promotion; 2002. Nutrition Insights Report No. 26
- Baum, Charles. The Effects of Food Stamps on Obesity. United States Department of Agriculture, Economic Research Service; 2007. Contractor and Cooperator Report No. 34
- Bickel, Gary; Nord, Mark; Price, Cristofer; Hamilton, William; Cook, John. Guide to Measuring Household Food Security. Alexandria, VA: United States Department of Agriculture, Food and Nutrition Service; 2000.
- Bjorntorp, Per; Rosmond, Roland. Obesity and Cortisol. *Nutrition*. 2000; 16:924–936. [PubMed: 11054598]
- Blaylock, James; Smallwood, David; Kassel, Kathleen; Variyam, Jay; Aldrich, Lorna. Economics, Food Choices, and Nutrition. *Food Policy*. 1999; 24:269–286.
- Block, Jason; He, Yulei; Zaslavsky, Alan; Ding, Lin; Ayanian, John. Psychosocial Stress and Change in Weight among US Adults. *American Journal of Epidemiology*. 2009; 170:181–192. [PubMed: 19465744]
- Briefel, Ronette; Wotecki, C. Development of the Food Sufficiency Questions for the Third National Health and Nutrition Examination Survey. *Journal of Nutrition Education*. 1992; 24:24S–28S.
- Brunner, Eric; Chandola, Tarani; Marmot, Michael. Prospective Effect of Job Strain on General and Central Obesity in the Whitehall II Study. *American Journal of Epidemiology*. 2007; 165:828–837. [PubMed: 17244635]
- Burdette, Amy; Hill, Terrence. An Examination of Processes Linking Perceived Neighborhood Disorder and Obesity. *Social Science & Medicine*. 2008; 67:38–46. [PubMed: 18433964]
- Campbell, Cathy. Food Insecurity: A Nutritional Outcome or a Predictor Variable? *The Journal of Nutrition Reviews*. 1991; 121:408–415.
- Citro, Constance; Michael, Robert. Measuring Poverty: A New Approach. Washington, DC: National Academy of Sciences Press; 1995.
- Colasanto, Diane; Kapteyn, Arie; van der Gaag, Jacques. Two Subjective Definitions of Poverty: Results from the Wisconsin Basic Needs Study. *The Journal of Human Resources*. 1984; 19:127–138.
- Dallman MF, et al. Chronic Stress and Obesity: A New View of “Comfort Food. *Proceedings of the National Academy of Science*. 2003; 100:11696–701.
- De Vriend T, Moreno L, Henauw S. Chronic Stress and Obesity in Adolescents: Scientific Evidence and Methodological Issues for Epidemiological Research. *Nutrition, Metabolism & Cardiovascular Diseases*. 2009; 19:511–519.
- Dietz WH. Does Hunger Cause Obesity? *Pediatrics*. 1995; 95:766–767. [PubMed: 7724321]
- Drewnowski, Adam; Specter, S. Poverty and Obesity: The Role of Energy Density and Energy Costs. *American Journal of Clinical Nutrition*. 2004; 79:6–16. [PubMed: 14684391]
- Drewnowski, Adam. Obesity, Diets, and Social Inequalities. *Nutrition Reviews*. 2009; 67:S36–S39. [PubMed: 19453676]
- Dubois, Lise; Farmer, Anna; Girard, Manon; Porcherie, Marion. Family Food Insufficiency is Related to Overweight among Preschoolers. *Social Science & Medicine*. 2006; 63:1503–1516. [PubMed: 16777308]
- Epel, Elissa; McEwen, Bruce; Seeman, Teresa; Mathews, Karen; Castellazzo, Grace; Brownell, Kelly; Bell, Jennifer; Ickovics, Jeanette. Stress and Body Shape: Stress- Induced Cortisol Secretion is

- Consistently Greater among Women with Central Fat. *Psychosomatic Medicine*. 2000; 62:623–632. [PubMed: 11020091]
- Greenfield, Emily A.; Marks, Nadine F. Violence from Parents in Childhood and Obesity in Adulthood: Using Food in Response to Stress as a Mediator of Risk. *Social Science & Medicine*. 2009; 68:791–798. [PubMed: 19185965]
- Fisher, Gordon. Setting American Standards of Poverty: A Look Back. *Focus*. 1998; 19:47–52.
- Fraser, Robert; Ingram, Mary; Anderson, Niall; Morrison, Caroline; Davies, Eleanor; Connell, John. Cortisol Effects on Body Mass, Blood Pressure, and Cholesterol in the General Population. *Hypertension*. 1999; 33:1364–1368. [PubMed: 10373217]
- Fremont, Allen; Bird, Chloe. Social and Psychological Factors, Physiological Processes, and Physical Health. In: Bird, Chloe; Conrad, Peter; Fremont, Allen, editors. *The Handbook of Medical Sociology*. 5. Upper Saddle River, NJ: Prentice Hall; 2000. p. 334–352.
- Garasky, Steven; Stewart, Susan; Gundersen, Craig; Lohman, Brenda; Eisenmann, Joey. Family Stressors and Child Obesity. *Social Science Research*. 2009; 38:755–766. [PubMed: 20645439]
- Gundersen, Craig; Lohman, Brenda; Garasky, Steven; Stewart, Susan; Eisenmann, Joey. Food Security, Maternal Stressors, and Overweight among Low-income US Children: Results from the National Health and Nutrition Examination Survey. *Pediatrics*. 2008; 122:e529–e540. [PubMed: 18762488]
- Gundersen, Craig; Lohman, Brenda; Eisenmann, Joey; Garasky, Steven; Stewart, Susan. Child-specific Food Insecurity and Overweight are not associated with in a Sample of 10-to-15-Year-Old Low-income Youth. *The Journal of Nutrition*. 2008; 138:371–378. [PubMed: 18203906]
- Gundersen, Craig; Garasky, Steven; Lohman, Brenda. Food Insecurity is not associated with Childhood Obesity as Assessed using Multiple Measures of Obesity. *The Journal of Nutrition*. 2009; 139:1173–1178. [PubMed: 19403713]
- Hanson, Karla; Sobal, Jeffery; Frongillo, Edward. Gender and Marital Status Clarify Associations between Food Insecurity and Body Weight. *The Journal of Nutrition*. 2007; 137:1460–1465. [PubMed: 17513407]
- Hauser, Robert M.; Carr, Deborah. *Measuring Poverty and Socioeconomic Status in Studies of Health and Well-Being*. Madison, WI: Center for Demography and Ecology, University of Wisconsin-Madison; 1994. Working Paper No. 94–24
- Heflin, Colleen; Iceland, John. Poverty, Material Hardship, and Depression. *Social Science Quarterly*. 2009; 90:1051–1071.
- Heflin, Colleen; Sandberg, John; Rafail, Patrick. The Structure of Material Hardship in U.S. Households: An Examination of the Coherence behind Common Measures of Well-being. *Social Problems*. 2009; 56:746–764.
- Hill, Terrence; Ross, Catherine; Angel, Ronald. Neighborhood Disorder, Psychophysiological Distress, and Health. *Journal of Health and Social Behavior*. 2005; 46:170–186. [PubMed: 16028456]
- Hill, Terrence; Angel, Ronald. Neighborhood Disorder, Psychological Distress, and Heavy Drinking. *Social Science & Medicine*. 2005; 61:965–975. [PubMed: 15955398]
- Hill, Terrence; Mossakowski, Krysia; Angel, Ronald. Relationship Violence and Psychological Distress among Low-income Urban Women. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*. 2007; 84:537–551.
- Hill, Terrence; Burdette, Amy; Hale, Lauren. Neighborhood Disorder, Sleep Quality, and Psychological Distress: Testing a Model of Structural Amplification. *Health & Place*. 2009; 15:1006–1013. [PubMed: 19447667]
- Huang, Jin; Guo, Baorong; Kim, Youngmi. Food Insecurity and Disability: Do Economic Resources Matter? *Social Science Research*. 2010; 39:111–124.
- Jencks, Christopher; Torrey, Barbara. Beyond Income and Poverty: Trends in Social Welfare among Children and the Elderly since 1960. In: Palmer, John; Smeeding, Timothy; Torrey, Barbara, editors. *The Vulnerable*. Washington, DC: Urban Institute Press; 1988. p. 229–273.
- Keith, Verna. Gender, Financial Strain, and Psychological Distress among Older Adults. *Research on Aging*. 1993; 15:123–47.

- Kouvonen, Anne; Kivimaki, Mika; Cox, Sara; Cox, Tom; Vahtera, Jussi. Relationship between Work Stress and Body Mass Index Among 45,810 Female and Male Employees. *Psychosomatic Medicine*. 2005; 67:577–583. [PubMed: 16046370]
- Lohman, Brenda; Stewart, Susan; Gundersen, Craig; Garasky, Steven; Eisenmann, Joey. Adolescent Overweight and Obesity: Links to Food Insecurity and Individual, Maternal, and Family Stressors. *Journal of Adolescent Health*. 2009; 45:230–237. [PubMed: 19699418]
- Lyons, Ariel-Ann; Park, Jungwee; Nelson, Connie. Food Insecurity and Obesity: A Comparison of Self-Reported and Measured Height and Weight. *American Journal of Public Health*. 2008; 97:751–757. [PubMed: 17666697]
- Marmot, Michael; Fraser Mustard, J. Coronary Heart Disease from a Population Perspective. In: Evans, Robert; Barer, Morris; Marmor, Theodore, editors. *Why Are Some People Healthy and Others Not?*. New York: Aldine de Gruyter; 1994. p. 189–214.
- Martin, Katie; Ferris, Ann. Food Insecurity and Gender are Risk Factors for Obesity. *Journal of Nutrition Education & Behavior*. 2007; 39:31–36. [PubMed: 17276325]
- Mayer, Susan; Jencks, Christopher. Poverty and the Distribution of Material Hardship. *Journal of Human Resources*. 1989 Winter; 88–113.
- McEwen, Bruce. *The End of Stress as We Know it*. Washington, DC: Joseph Henry Press; 2002.
- McEwen, Bruce. Mood Disorders and Allostatic Load. *Biological Psychiatry*. 2003; 54:200–207. [PubMed: 12893096]
- McEwen, Bruce. Protection and Damage from Acute and Chronic Stress: Allostasis and Allostatic Overload and Relevance to the Pathophysiology of Psychiatric Disorders. *Annals of the New York Academy of Sciences*. 2004; 1032:1–3. [PubMed: 15677391]
- Mirowsky, John; Ross, Catherine. Economic Hardship across the Life Course. *American Sociological Review*. 1999; 64:548–569.
- Mirowsky, John; Ross, Catherine. Age and the Effect of Economic Hardship on Depression. *Journal of Health and Social Behavior*. 2001; 42:132–150. [PubMed: 11467249]
- Mirowsky, John; Ross, Catherine. *Social Causes of Psychological Distress*. Hawthorne, NY: Aldine de Gruyter/Transaction; 2003.
- Nestle, Marion. The Irony of Politics of Obesity. *Science*. 2003; 299:781. [PubMed: 12574583]
- Office of Management and Budget. *Definition of Poverty for Statistical Purposes*. Washington, DC: Government Printing Office; 1978. Statistical Policy Directive No. 14
- Olson, Christine. Nutrition and Health Outcomes Associated with Food Insecurity and Hunger. *The Journal of Nutrition*. 1999; 131:521S–524S. [PubMed: 10064322]
- Orshansky, Mollie. Counting the Poor: Another Look at the Poverty Profile. *Social Security Bulletin*. 1965; 28:3–29.
- Pampel FC, Krueger PM, Denney JT. Socioeconomic Disparities in Health Behaviors. *Annual Review of Sociology*. 2010; 36:349–70.
- Pearlin, Leonard; Lieberman, Morton; Menaghan, Elizabeth; Mullan, Joseph. The Stress Process. *Journal of Health and Social Behavior*. 1981; 22:337–56. [PubMed: 7320473]
- Rector, Robert. *Hunger Hysteria: Examining Food Security and Obesity in America*. Washington, DC: The Heritage Foundation; 2007.
- Rose, Donald. Economic Determinants and Dietary Consequences of Food Insecurity. *Journal of Nutrition*. 1999; 129:517–19.
- Ross, Catherine; Huber, Joan. Hardship and Depression. *Journal of Health and Social Behavior*. 1985; 26:312–27. [PubMed: 4086755]
- Ross, Catherine; Mirowsky, John. Neighborhood Disorder, Subjective Alienation, and Distress. *Journal of Health and Social Behavior*. 2009; 50:49–64. [PubMed: 19413134]
- Ross, Catherine E.; Mirowsky, John. Why Education is Key to Socioeconomic Differentials in Health. In: Bird, Chloe E.; Conrad, Peter; Fremont, Allen M.; Timmermans, Stefan, editors. *Handbook of Medical Sociology*. 6. Nashville, TN: Vanderbilt University Press; 2010. p. 33–51.
- Sahyoun, Nadine; Basiotis, P. Washington, DC: Department of Agriculture, Center for Nutrition Policy and Promotion. 2000. *Food Insufficiency and the Nutritional Status of the Elderly Population*. Nutrition Insights Report No. 18

- Scharoun-Lee, Melissa; Adair, Linda; Kaufman, Jay; Gordon-Larson, Penny. Obesity, Race/Ethnicity and the Multiple Dimensions of Socioeconomic Status during the Transition to Adulthood: A Factor Analysis Approach. *Social Science & Medicine*. 2009; 68:708–716. [PubMed: 19136186]
- Siefert, Kristine; Heflin, Colleen; Corcoran, Mary; Williams, David. Food Insufficiency and Physical and Mental Health in a Longitudinal Survey of Welfare Recipients. *Journal of Health and Social Behavior*. 2004; 45:171–186. [PubMed: 15305758]
- Taylor, Shelley; Repetti, Rena; Seeman, Teresa. Health Psychology: What Is an Unhealthy Environment and How Does It Get Under the Skin? *Annual Review of Psychology*. 1997; 48:411–47.
- Torres, Susan; Nowson, Caryl. Relationship between Stress, Eating Behavior, and Obesity. *Nutrition*. 2007; 23:887–894. [PubMed: 17869482]
- Townsend, Marilyn; Peerson, Janet; Love, Bradley; Achterberg, Cheryl; Murphy, Suzanne. Food Insecurity is Positively Related to Overweight in Women. *The Journal of Nutrition*. 2001; 131:1738–1745. [PubMed: 11385061]
- Travison, Thomas; O'Donnell, Amy; Araujo, Andre; Matsumoto, Alvin; McKinlay, John. Cortisol Levels and Measures of Body Composition in Middle-aged and Older Men. *Clinical Endocrinology*. 2007; 67:71–77. [PubMed: 17466009]
- Wheaton, Blair. The Nature of Stressors. In: Horowitz, Allan V.; Scheid, Teresa L., editors. *A Handbook for the Study of Mental Health*. Cambridge: Cambridge University Press; 1999. p. 176-197.
- Wilde, Parke; McNamara, Paul; Ranney, Christine. The Effects of Income and Food Programs on Dietary Quality: A Seemingly Unrelated Regression Analysis with Error Components. *American Journal of Agricultural Economics*. 1999; 81:959–971.

APPENDIX A

Table 5

Bivariate Correlations

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A. BMI														
B. Adult insufficiency	.02													
C. Child insufficiency	.05 *	.48 *												
D. Economic hardship	.12 *	.38 *	.27 *											
E. Family welfare	.04	.04	-.02	.02										
F. Current welfare	.06 *	.04	.03	.08 *	.19 *									
G. Family income	-.02	-.09 *	-.08 *	-.14 *	-.09 *	-.21 *								
H. Age	.15 *	.04 *	.07 *	.12 *	-.20 *	-.05 *	.04							
I. White	-.01	.03	-.03	.04 *	.03	-.04 *	-.02	.05 *						
J. Black	.10 *	.05 *	-.01	.05 *	.24 *	.27 *	-.10 *	.07 *						
K. Mexican	-.01	-.05 *	.04	-.05 *	-.19 *	-.22 *	.03	-.13 *						
L. Other Hispanic	-.08 *	-.02	-.01	-.02	-.06 *	-.03	.09	.01						
M. Education	.00	.04	-.07 *	-.02	.08 *	-.03	.07 **	-.13 *	.05 *	.18 *	-.20 *	-.01		
N. Cohabiting	.02	.04	-.01	.00	.12 *	-.00	.07 **	-.09 *	.03	-.01	-.04 *	.05 *	.03	
O. Married, w/spouse	-.01	-.11 *	-.08 *	-.15 *	-.21 *	-.22 *	.23 *	-.03	.03	-.33 *	.36 *	-.03	-.11 *	
P. Number of children	.11 *	.05 *	-.13 *	.07 *	.03	.13 *	.04	.21 *	-.07 *	.06 *	.00	-.05 *	-.10 *	-.05 *
Q. Boston	-.07 *	.01	-.04 *	.01	-.06 *	-.06 *	.06 *	.07 *	.14 *	-.03	-.50 *	.52 *	.05 *	.05 *
R. Chicago	.03	.02	-.01	.04	.20 *	.26 *	-.06 *	.05 *	-.05 *	.49 *	-.26 *	-.26 *	.02	.01
S. San Antonio	.04	-.03	.06 *	-.05 *	-.15 *	-.21 *	.03	-.11 *	-.08 *	-.46 *	.75 *	-.26 *	-.07 *	-.06 *

* p<.05 (two-tailed tests)

Source: Welfare, Children, and Families (1999)

Notes: N = 2319. Shown are Pearson correlation coefficients.

TABLE 1

Items and Factor Loadings for Food Insufficiency and Economic Hardship

	Adult Food Insufficient	Child Food Insufficient	Economic Hardship
1. At any time in the past twelve months, did you or any other adults in your household not eat for a whole day because there wasn't enough money for food?	.84	.16	.11
2. In the past twelve months, were you ever hungry but didn't eat because you couldn't afford enough food?	.83	.22	.16
3. At any time in the past twelve months, did you or other adults in your household cut the size of your meals or skip meals because there wasn't enough money for food?	.71	.24	.26
4. At any time in the past twelve months, did [Child] skip a meal because there wasn't enough money for food?	.10	.84	.09
5. At any time in the past twelve months, did you cut the size of any of [Child]'s meals because there wasn't enough money for food?	.20	.76	.11
6. At any time in the past twelve months, was [Child] hungry but you just couldn't afford more food?	.27	.72	.08
7. During the past 12 months, how much difficulty did your household have paying bills?	.13	.11	.77
8. How often does your household put off buying something you need because you don't have money?	.11	.09	.76
9. How often does your household have to borrow money to pay bills?	.04	.11	.71
10. Thinking about the end of each month over the past 12 months, did you household generally end up with...	.13	.05	.68
11. Does your household have enough money to afford the kind of housing, food and clothing you feel you should have?	.18	.02	.58
Eigenvalues	1.75	1.06	3.88
Alpha Reliability	.78	.73	.76

Source: Welfare, Children, and Families (1999)

Notes: N = 2319. Factor loadings were estimated using principal components analysis, specifying a minimum eigenvalue of 1, with varimax rotation. Factor loadings over .50 are shaded. Items 1–3 indicate adult food privation. Items 4–6 indicate child food privation. Items 7–11 indicate financial hardship.

TABLE 2

Weighted Descriptive Statistics

	Range	Mean	SD
Body Mass Index	14.52–65.22	29.08	6.80
Food Insufficiency			
Adult	0–1	.13	
Adult Hungry	0–1	.05	
Child	0–1	.05	
Economic Strain			
Family origin welfare receipt	0–3	.72	.98
Current welfare receipt	0–1	.29	
Economic hardship	–1.53–1.89	–.12	.65
Family income	12–7,200	1,291	646
Family income missing	0–1	.46	
Sociodemographics			
Age	18–74	32.82	9.70
Non-Hispanic White	0–1	.04	
Black	0–1	.42	
Mexican	0–1	.34	
Other Hispanic	0–1	.20	
Education	0–14	10.57	2.37
Cohabiting, not married	0–1	.07	
Married, spouse in house	0–1	.31	
Married, no spouse in house	0–1	.09	
Single	0–1	.53	
Number of children	1–6	2.72	1.41
Boston	0–1	.32	
Chicago	0–1	.34	
San Antonio	0–1	.34	

Source: Welfare, Children, and Families (1999)

Notes: N = 2,319.

TABLE 3
OLS Regression of Body Mass on Food Insufficiency, Economic Strain, and Sociodemographics

	Model 1		Model 2		Model 3	
	b		b		b	
Food Insufficiency						
Adult	.15 (.42)	.01	-.07 (.46)	-.00	-.81 (.67)	-.05+
Child			.86 (.75)	.03	.37 (.75)	.01
Economic Strain						
Family origin welfare receipt					.36 (.15)	.05*
Current welfare receipt					.57 (.34)	.04+
Economic hardship					1.1 (.23)	.11***
Family income					.00 (.00)	.00
Family income missing					.37 (.30)	.03
Sociodemographics						
Age	.10 (.01)	.15***	.10 (.01)	.15***	.11 (.02)	.15***
Non-Hispanic White ^a	-.98 (.74)	-.03	-.95 (.73)	-.03	-1.1 (.73)	-.03
Mexican ^a	-1.7 (.50)	-.12**	-1.7 (.50)	-.12**	-1.4 (.51)	-.10**
Other Hispanic ^a	-1.3 (.43)	-.08**	-1.3 (.43)	-.08**	-1.2 (.43)	-.07**
Education	.03 (.06)	.01	.04 (.06)	.01	.07 (.06)	.02
Cohabiting, not married ^b	1.3 (.57)	.05*	1.3 (.57)	.05*	1.4 (.58)	.05*
Married, spouse in house ^b	.23 (.33)	.02	.25 (.33)	.02	.74 (.35)	.05*
Number of children	.32 (.10)	.07**	.31 (.10)	.06**	.27 (.10)	.05*
Boston ^c	-.59 (.40)	-.04	-.58 (.40)	-.04	-.32 (.40)	-.02
San Antonio ^c	1.4 (.46)	.10**	1.4 (.46)	.09**	1.6 (.46)	.11**
Model Statistics						
Model F		9.88***		9.17***		8.79***
Nested F				1.30		7.57***
R-squared		.04		.05		.06

+ p<.05, p<.025, p<.005, *** p<.0005 (one-tailed tests) + p<.10, * p<.05, ** p<.01, *** p<.001 (two-tailed tests)

Source: Welfare, Children, and Families (1999)

Notes: N = 2,319. Shown are unstandardized (b) and standardized () coefficients with standard errors in parentheses.

^a Compared with Black respondents.

^b Compared with married (no spouse in house) and single respondents.

^c Compared with Chicago residents.

TABLE 4
 OLS Regression of Body Mass on Food Insufficiency, Economic Strain, and Sociodemographics

	Model 1		Model 2		Model 3	
	b		b		b	
Food Insufficiency						
Adult hungry	-.37 (.61)	-.01	-.73 (.66)	-.02	-1.5 (.67)	-.05*
Child			1.1 (.73)	.03	.43 (.74)	.01
Economic Strain						
Family origin welfare receipt					.37 (.15)	.05*
Current welfare receipt					.56 (.34)	.04+
Economic hardship					1.1 (.23)	.11***
Family income					.00 (.00)	.00
Family income missing					.39 (.30)	.03
Sociodemographics						
Age	.10 (.01)	.15***	.10 (.02)	.15***	.11 (.02)	.16***
Non-Hispanic White ^a	-.96 (.73)	-.03	-.95 (.73)	-.03	-1.2 (.73)	-.03
Mexican ^a	-1.7 (.50)	-.12**	-1.7 (.50)	-.12**	-1.4 (.50)	-.10**
Other Hispanic ^a	-1.3 (.43)	-.08**	-1.3 (.43)	-.08***	-1.2 (.43)	-.07**
Education	.04 (.06)	.01	.04 (.06)	.01	.07 (.06)	.03
Cohabiting, not married ^b	1.3 (.57)	.05*	1.3 (.57)	.05*	1.4 (.58)	.05*
Married, spouse in house ^b	.20 (.33)	.01	.23 (.33)	.02	.72 (.35)	.05*
Number of children	.33 (.10)	.07**	.31 (.10)	.06**	.24 (.10)	.05*
Boston ^c	-.60 (.40)	-.04	-.60 (.40)	-.04	-.35 (.40)	-.02
San Antonio ^c	1.4 (.46)	.10**	1.3 (.46)	.09**	1.5 (.46)	.11**
Model Statistics						
Model F		9.90***		9.27***		8.93***
Nested F				2.29		7.80***
R-squared		.04		.05		.06

+ p<.05, * p<.025, ** p<.005, *** p<.0005 (one-tailed tests) +p<.10, * p<.05, ** p<.01, *** p<.001 (two-tailed tests)

Source: Welfare, Children, and Families (1999)

Notes: N = 2,319. Shown are unstandardized (b) and standardized () coefficients with standard errors in parentheses.

^a Compared with Black respondents.

^b Compared with married (no spouse in house) and single respondents.

^c Compared with Chicago residents.