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Associations between Food Insecurity, Supplemental Nutrition Assistance Program (SNAP) Benefits, and Body Mass Index among Adult Females

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ABSTRACT

Obesity disproportionately affects low-income and minority individuals and has been linked with food insecurity, particularly among women. More research is needed to examine potential mechanisms linking obesity and food insecurity. Therefore, this study's purpose was to examine cross-sectional associations between food insecurity, Supplemental Nutrition Assistance Program (SNAP) benefits per household member, perceived stress, and body mass index (BMI) among female SNAP participants in eastern North Carolina (n=202). Women were recruited from the Pitt County Department of Social Services between October 2009 and April 2010. Household food insecurity was measured using the validated US Department of Agriculture 18-item food security survey module. Perceived stress was measured using the 14-item Cohen's Perceived Stress Scale. SNAP benefits and number of children in the household were self-reported and used to calculate benefits per household member. BMI was calculated from measured height and weight (as kg/m^2). Multivariate linear regression was used to examine associations between BMI, SNAP benefits, stress, and food insecurity while adjusting for age and physical activity. In adjusted linear regression analyses, perceived stress was positively related to food insecurity ($P<0.0001$), even when SNAP benefits were included in the model. BMI was positively associated with food insecurity ($P=0.04$). Mean BMI was significantly greater among women receiving <\$150 in SNAP benefits per household member vs those receiving ≥\$150 in benefits per household member (35.8 vs 33.1; $P=0.04$). Results suggest that provision of adequate SNAP benefits per household member might partially ameliorate the negative effects of food insecurity on BMI.

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Obesity is a major public health problem (1) disproportionately affecting low-income individuals (2), racial minorities, and women (3). Food insecurity, defined as "limited or uncertain ability to procure acceptable foods in socially acceptable ways" (4), is positively associated with obesity among low-income women in cross-sectional studies (5-7). The US Food Stamp Program (now the Supplemental Nutrition Assistance Program [SNAP]) was established to alleviate food insecurity among low-income individuals (8). A recent report found that participation in SNAP was associated with less food insecurity when accounting for self-selection of participants into the program (9).

Although SNAP participation likely alleviates food insecurity, it has also been positively related to female obesity (10,11). However, one of these studies did not control for food insecurity (11), which is an important control variable, as others (5-7) have found that food insecurity is also associated with obesity in females. The association between SNAP participation and female obesity may result from the fact that energy-dense snack foods are often lower in cost than healthier foods (12). It may also be a result of the feast and famine cycle often associated with receipt of monthly SNAP benefits (13), as individuals have enough SNAP benefits to meet initial household food needs in the beginning of the month, but run out of benefits toward the end of the month and must rely on low-cost and often processed, calorie-dense foods. In a nationally representative sample of SNAP recipients, more SNAP benefits received (per household adult equivalent) was associated with lower body mass index (BMI; calculated as kg/m^2) (14). Thus, individuals who receive

inadequate SNAP benefits may resort to cyclical consumption of energy-dense, low-cost foods (12), leading to a higher BMI. Conversely, it can be assumed that when individuals receive adequate benefits to meet household food needs, they have greater ability to purchase and consume less energy dense foods.

Jones and Frongillo hypothesized that increased stress related to acquiring food was a mediator between food insecurity and obesity, with SNAP participation potentially ameliorating food-related stress (7). However, they found limited evidence to support this notion, calling for more research regarding the associations between stress, SNAP participation, and obesity (7). In a prospective cohort study, greater perceived stress at baseline was associated with higher BMI among black females (not necessarily SNAP participants) after a 13-year follow-up (15). Psychosocial stress might be associated with obesity via an effect on food choice, as females undergoing stressful circumstances are more likely to snack on calorie-dense snack items vs healthier snack foods (16,17). Stress has also been linked to overeating, particularly among women (18,19). Stress may also be positively related to obesity by reducing the time individuals are engaged in physical activity (20,21).

It might be hypothesized that increasing the available SNAP dollars per household member would result in less stress on the family food resources (7), making it easier for families to purchase healthful foods. It may be that SNAP participation offers some degree of protection against food insecurity, provided benefits received are adequate to cover household food needs. More work is needed to understand relationships between food insecurity, perceived stress, and obesity, particularly among female SNAP participants (7). Such information has policy implications for SNAP, as well as implications for topics included in nutrition education among SNAP participants. Thus, in the current study, cross-sectional associations between BMI, food security, SNAP dollars per household member, and perceived stress were examined among female SNAP participants in eastern North Carolina. It was hypothesized that SNAP dollars per household member would be inversely associated with food insecurity and food insecurity would be positively associated with perceived stress. In keeping with previous research findings (5-7), an additional hypothesis was that food insecurity would be positively associated with BMI, moderated by SNAP benefits per household member.

METHODS

Study Setting and Participants

This cross-sectional study took place in a small urban center located in Pitt County, eastern North Carolina. Pitt County (estimated population 152,129) includes one small urban center (estimated population of 72,228) where many residents in eastern North Carolina obtain goods and services (22). According to the most recent Behavioral Risk Factor Surveillance System survey, 62.2% of Pitt County residents are overweight or obese (23). In 2009, the Pitt County Department of Social Services processed 11,993 SNAP applications (24).

Two trained interviewers recruited a convenience sample of SNAP participants between October 2009 and April 2010 from the Pitt County Department of Social Services waiting area. Eligibility criteria were being female between the ages of 20 and 64 years, English-speaking, primary food shopper in the household, a current SNAP benefit recipient, planning to reside in Pitt County for the next year, and able to return to the office for follow-up 1 week later. The interviewers approached women in the waiting room and asked if they would be interested in participating in a survey and, if so, they were administered a short screening questionnaire to determine eligibility to complete the study survey and have height and weight measured. If women were eligible, the interviewer proceeded to obtain informed consent.

The study was approved by the East Carolina University Medical Center Institutional Review Board. In consideration of possible literacy issues, interviewers verbally highlighted the main points of the consent form for participants, who read the consent form silently to themselves and were given the opportunity to ask any study-related questions. Willing participants then signed the informed consent form. Interviewers verbally administered a paper survey, which included measurement of food security, perceived stress, height, and weight. Upon completion of data collection, participants were provided a $20 cash incentive.

Household Food Insecurity

Household food insecurity was measured using the validated US Department of Agriculture 18-item core food security survey module (25). Each item was coded using standard measures and a food security score was calculated (26,27). Food security scores were calculated using standard methods for women with children and those without children (26).

SNAP Benefits per Household Member

SNAP benefits per household member were measured by asking women how many children younger than 18 years of age lived in their household, and how much their household received in SNAP benefits the last time benefits were distributed. The continuous dollar amount, which indicated amount of benefits received, was divided by the number of children in the household plus 1 (to indicate the female respondent), approximating the amount of benefits per household member.

Perceived Stress

Perceived stress was measured using the 14-item Cohen's Perceived Stress Scale, with responses given the appropriate values as outlined in Cohen and colleagues (28). The developer of the Perceived Stress Scale (Sheldon Cohen) notes that it was designed to be used among individuals with at least a junior high school education and that the items are general and free of content specific to a certain subpopulation (29). The Perceived Stress Scale has an internal α reliability of .84 and adequate concurrent and predictive validity (28). Possible Perceived Stress Scale scores range from 0 to 56. A higher score indicated greater perceived stress.