

A Longitudinal Study of Food Insecurity on Overweight in Preschool Children

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Background

Childhood overweight and household food insecurity (HFI) represent urgent public health problems in the United States. Food insecurity is the lack of access to enough food for an active healthy life that results from the limited or uncertain access to nutritionally adequate and safe foods in socially acceptable ways. Low income households are more likely to be food insecure and paradoxically low income adults, specifically women, are more likely to be overweight. In children, however, studies of this association have yielded conflicting results; perhaps because study designs (i.e., cross-sectional versus longitudinal) and populations (i.e. ages and income levels) have varied. Additionally, most of the prior work did not examine this association in the most relevant population: low income households.

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) serves low income women and children at high nutritional risk. Anthropometric, sociodemographic and other health-related data are routinely collected. The purpose of this research is to: 1) examine the effect of WIC participation on HH food security status in women and children, and 2) assess the relationship between HFI with/without hunger in infancy and later childhood weight status in 2 to 5 year-old WIC participants. Strengths of this study lie in the use of the large and diverse WIC population on which longitudinal anthropometric and food security data are available.

Methods

This longitudinal study includes data collected from 2001-2006 on children and their mothers who participated in Massachusetts WIC. WIC data are collected every 6 months and prepared for submission to CDC for inclusion in the Pregnancy and Pediatric Surveillance Systems. The addition of household (HH) food security measures to the WIC management information system was undertaken as part of a previously CDC funded cooperative agreement granted to the Massachusetts Department of Public Health (1996-2000). Inclusion of the full length food security module was not feasible due to time constraints. For this study, a subscale to measure food security status, was used. It addressed the following areas: 1) not having enough money to buy food for a balanced meal, 2) adults cutting the size of or skipping meals, 3) frequency of cutting meal size or skipping meals, and 4) adults not eating for a whole day. HH food security status was defined by the number of positive ("yes") responses to the questions: food security = 0 positive responses; HFI without hunger = 1-2 positive responses; and, HFI with hunger = 3-4 positive responses.

HH food security status at both time points were combined to create a dynamic food security variable comprising the following categories: persistently food insecure, food insecure at first visit and secure at the second, food secure at the first visit and insecure at the second, and persistently food secure (referent). The age- and sex-specific body mass index (BMI) percentile and z-score of children was based on their directly measured height and weight relative to the CDC growth reference. At-risk for overweight and overweight were defined, as recommended, as sex specific BMI-for-age of > 85th and >95th percentiles, respectively.

Multinomial logistic regression was used to assess the relationship between duration of WIC participation and HH food security status (e.g., food secure, HFI without hunger and HFI with hunger) at the last visit for women (n=21,863) and children (57, 377) adjusting for race, maternal education, household size, and

initial HH food security status. Both general linear model and logistic regression techniques were used to examine the relationship between HH food security status at the first and last visit and child weight status. Children meeting the following criteria were included (n=25,186): 1) first visit data available, 2) first WIC visit at age < 12 months, 3) at least 4 WIC visit data available, 4) complete data on HH-food security status at first and last visit and on covariates (birth weight, age, sex, race/ethnicity, maternal education, household size and maternal weight status), 5) child of non-Hispanic White, Hispanic, Black non-Hispanic or Asian race/ethnicity, and 6) complete anthropometric data at both time points and age 24-60 months, 7) Birth weight of the child available.

Findings/Discussion

The association between duration of WIC participation and HH food security status depends on HH food security status at the initial visit. For both women and children from initially (i.e. at first WIC visit) food secure HHs there was no effect of WIC duration on later HH food security status. On the other hand, among women who were from HHs that were initially food insecure with hunger, early prenatal certification into WIC produced the greatest improvement in HH food security status by the post-partum period. Among children who were from initially food insecure HHs (with or without hunger), longer WIC participation was associated with the greatest improvements in their HH's food security status.

Preliminary results suggest that the relationship between HH food security status and children's weight status is dependent on other factors. Significant effect modification ($p < .05$) in the fully adjusted model was noted for the dynamic HFI variable and the following: maternal education, maternal pre-pregnancy weight status, and child's birth weight. Thus, analyses were adjusted or stratified by each of these variables. Stratification of the analyses by birth weight, using a median split for this sample (3,291.5 g), yielded a significant association between HH-food security status and weight status among children whose birth weight was less than the median (but not those > the median). Persistent HFI was associated with a 27% higher odds ($p < .01$) of attaining a BMI-for-age > 85th %tile and a 31% greater odds ($p < .01$) of becoming overweight by the time they were 2-5 years old compared to children whose HHs were persistently food secure. Among children whose mother's pre-pregnancy weight classified them as overweight or obese (i.e. BMI > 25), persistent HFI was associated a 22% higher odds ($p < .01$) of their children attaining a BMI-for-age > 85th %tile and a 19% greater odds ($p < .05$) of 2-5 year old children becoming overweight compared to those whose HH were persistently food secure. No association was found among those children whose mothers' pre-pregnancy weight was normal.

From a policy perspective, these findings suggest that getting mothers enrolled into WIC earlier in pregnancy could reduce later risk of overweight among their children by improving HH food security status once their child is born. The results also imply that certain sub-groups of children are particularly vulnerable to the adverse effects of HH-food insecurity on overweight risk; thus targeting these groups may be necessary.