

The Unequal Impact of Food Insecurity on Cognitive and Behavioral Outcomes among 5-Year-Old Urban Children

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ABSTRACT

Objective: To examine the associations of food insecurity with children's cognitive and behavioral outcomes using quantile regression.

Design: Secondary analysis of the Fragile Families and Child Wellbeing Study dataset.

Participants: A total of 2,046 children aged 5 years.

Main Outcome Measures: Child behavioral outcomes were measured using externalizing (aggressive) and internalizing (emotional) behavior problems. Child cognitive outcomes were measured using the Peabody Vocabulary test and the Woodcock–Johnson letter–word identification test. Food insecurity was measured using the US Department of Agriculture's Food Security Module.

Analysis: Unconditional quantile regressions were employed. Statistical significance was set at $P \leq .05$.

Results: Negative associations between food insecurity and child behavior problems (externalizing and internalizing) were largest for children with the most behavior problems. For Peabody Vocabulary scores, the negative association with food insecurity was statistically significant only for children in the top half of the distribution (≥ 50 th percentile). The analysis found mixed evidence of an association between food insecurity and the Woodcock–Johnson letter–word identification test. These associations were similar for boys and girls.

Conclusions and Implications: Because children's cognitive skills and behavioral problems have long-lasting implications and effects later in life, reducing the risk of food insecurity might particularly benefit children with greater externalizing and internalizing behavior problems.

Key Words: child behavior problems, child cognitive outcomes, food insecurity, quantile regression (*J Nutr Educ Behav.* 2018;■■:■■–■■.)

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INTRODUCTION

Food security is the ability to access enough food for a healthy and active life.¹ In the US, the risk of food insecurity varies by ethnicity, race, age, and socioeconomic status.^{1–3} For example, food insecurity is more prevalent in the following households: African American, Hispanic, those with children (especially young children), those with children and a single parent, and low-income.¹ Despite record high participation in federal food assistance

programs and private charities over the past several years,^{1,3,4} food insecurity continues to be a persistent concern facing the nation. In 2016, over 41.2 million Americans lived in food-insecure households, including 12.9 million children.¹ Children represent a particularly vulnerable population because of the potential long-term negative consequences of food insecurity.^{5,6}

Theories on child physiological development suggest that food insecurity can affect child development negatively through undernutrition and

micronutrient deficiencies such as those in iron and zinc.^{7,8} These nutritional deficiencies have been found to lead to adverse development of the brain and its functioning in children.^{9–11} This can result in poor cognitive functioning (eg, practiced structural approaches)¹² and physiological (eg, anemia, low energy, and stunted growth),^{2–4} behavioral (eg, self-control),¹³ and emotional (eg, interpersonal relations) problems in children.^{14,15} However, most of the empirical evidence on the negative consequences of food insecurity used cross-sectional data and there is more limited empirical evidence on the long-term negative outcomes resulting from food insecurity.

Most studies on the consequences of food insecurity focused on the average effect, which assumes that all children are similarly affected by food insecurity. However, evidence shows that the negative impacts of food insecurity on child cognitive outcomes and social skills are larger for girls,

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which suggests that children may be affected differently by food insecurity.¹⁶ These negative impacts of food insecurity could potentially be larger for demographic groups (such as more disadvantaged children) that are at higher risk for experiencing food insecurity. For example, food insecurity could have greater adverse impacts on brain development in more disadvantaged children, leading to poorer cognitive and behavioral outcomes. A greater understanding about how food insecurity affects children differently is necessary to respond adequately to the issue. This study used data from the Fragile Families and Child Wellbeing Study (FFCWS), a sample of children born to mostly low-income urban mothers, to examine associations between food insecurity and child cognitive outcomes and behavioral problems at different score percentiles using quantile regression. The FFCWS dataset is well-suited for this because of its focus on disadvantaged families.

METHODS

Participants

The FFCWS, a longitudinal study, sampled about 5,000 couples and their children born between 1998 and 2000 in 20 large urban cities with a population > 200,000 in the US. By design, the study oversampled unmarried mothers because they are at higher risk for living in poverty and later facing potential separation from the father than are mothers from more traditional families.¹⁷ Review by the institutional review board was not required for this secondary analysis of the FFCWS dataset.¹⁸

Over the course of the study, both parents were interviewed at regular intervals. This study used data from the fourth wave of interviews (when the child was about age 5 years); the caregiver (usually the mother) also participated in an in-home survey that collected information on the child's cognitive and emotional development and overall health, the home environment, food insecurity, and the child's behaviors, among other data.

Survey Instruments

The FFCWS researchers measured children's cognitive outcomes using 2

instruments: the Peabody Picture Vocabulary Test–Revised, a measurement of children's receptive vocabulary capabilities for standard English and academic readiness¹⁹; and the Woodcock–Johnson Test of Achievement letter–word identification subtest, a measure of cognitive development.²⁰

Children's behavioral outcomes were measured using the Child Behavior Checklist for Ages 1.5–5.²¹ This checklist is a widely used instrument to assess children's behavioral and emotional (externalizing and internalizing) behaviors. For each item, mothers reported how often a specific behavior of the child was true (0 = not true, 1 = sometimes true, and 2 = often or very true). Externalizing behaviors are directed toward others (eg, aggressive behaviors) and internalizing behaviors are negative emotions directed toward the self.²² The externalizing behaviors measure included 25 items (Cronbach $\alpha = .85$) and the internalizing behaviors measure included 17 items ($\alpha = .73$). Examples of items included in the externalizing behavior scale were whether the child argued a lot, bullied, was disobedient, or destroyed things. Examples of items included in the internalizing behavior scale were whether the child worried, sulked a lot, was shy, or refused to talk.²¹ These cognitive outcomes and behavioral problems measures were standardized with a mean of 0 and SD of 1 to simplify the interpretation of associations.

Food insecurity was assessed at the household level using an 18-item scale instrument from the US Department of Agriculture.²³ The survey asked questions by order of severity of food insecurity; households that responded affirmatively to ≥ 3 items were classified as food insecure.²³

Control Variables

Several control variables were included in this study that could potentially confound associations between food insecurity and child academic outcomes. Binary variables were constructed to indicate the mother's race/ethnicity (white, black, Hispanic, or other race), low birth weight, maternal education (less than high school, high school, some college,

or college graduate and beyond), the mother's relationship with the father (married, cohabitating, nonresident, or separated), whether the mother had a new romantic partner, the mother's employment status (employed or not), whether the mother smoked during pregnancy, parental history of drug and alcohol abuse, whether the mother was an immigrant, and whether the mother received benefits from the *Supplemental Nutrition Assistance Program* at the time of the interview. Although the researchers controlled for the mother's race/ethnicity and had information on the father's race/ethnicity, there was no direct information on the race/ethnicity of the child. It is possible for some children that their race differed from the mother's and/or father's. Additional control variables included household income as a proportion of the federal poverty guidelines, mother's age when the child was born, the number of children in the home, whether the child was in poor or fair health, and whether the child had asthma.

A measure of maternal depression using the Composite Diagnostic Interview–Short Form was included.²⁴ Mothers were considered to be depressed if they reported feeling depressed or unable to enjoy normally pleasurable activities and had ≥ 3 of 7 additional symptoms, such as having trouble sleeping or feeling worthless. The analysis also controlled for social support, material hardship, parenting stress, and parents' relationship quality. For social support, mothers reported whether they could count on someone to: loan them \$200, loan them \$1,000, provide a temporary place to live, and help with emergency child care. The material hardship measure counted the number of financial hardships experienced by the mother, such as falling behind on rent or mortgage payments, or whether the electricity was turned off because of missed payments.^{25,26} Parenting stress was an average of 4 statements ranging from 1 to 4 (strongly disagree to strongly agree): (1) *Being a parent is harder than I thought it would be*, (2) *I feel trapped by my responsibilities as a parent*, (3) *Taking care of my child is more work than pleasure*, and (4) *I often feel tired from raising a family*.^{27,28} Parents'

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