The authors of this research brief were co-principal investigators on a grant awarded by the IRP RIDGE Center for National Food and Nutrition Assistance Research at the University of Wisconsin–Madison, in partnership with the Economic Research Service of the U.S. Department of Agriculture. Their project, summarized here, was one of five proposals awarded funding in a 2011 national competition for research on food assistance programs, food choices, and obesity and other health outcomes. Since the Center’s inception in 2010, it has funded 14 research projects, mentored seven visiting food assistance research scholars during one-week stays, and hosted seven seminars presenting recent innovative research. IRP RIDGE Center research comes at a time when enrollment in the nation’s principal food assistance program, the Supplemental Nutrition Assistance Program or SNAP (formerly Food Stamp Program), has more than doubled, from fewer than 19 million participants per month in 2001 to more than 47.5 million in October 2012. In recent years these increases have occurred in tandem with an unprecedented rise in the rate of food insecurity, which rose from 11.1 percent in 2007 to 14.6 percent in 2008, with the start of the Great Recession, and has remained at or near 14.6 percent since then. In their research, Taryn W. Morrissey, Alison Jacknowitz, and Katie Vinopal take a novel approach, examining how local food prices influence children’s body mass index, overweight, food insecurity, and food consumption.

March 2013

Local food prices: Effects on child eating patterns, food insecurity, and overweight

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Both under- and over-nutrition are important public health problems facing young children in the United States. In 2011, approximately 20.6 percent of U.S. households with children were food insecure, defined as “having limited or uncertain availability of food, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.”

More than 26 percent of two- to five-year-old children were considered overweight (defined as having a body mass index [BMI] above the 85th percentile by age and gender) in 2009–2010, up from 21 percent in 1999 to 2000. Being food insecure and being overweight during early childhood both have negative effects on children’s short- and long-term health, social, and economic outcomes.

A lack of affordable, nutritious foods is one of the neighborhood factors presumed to underlie both food insecurity and obesity among children. While general food prices (i.e., price per calorie) trended downward in recent decades, particularly the prices of snacks and sugar-sweetened beverages, the real prices of restaurant meals and fruits and vegetables increased, with fruit and vegetable prices increasing by 17 percent between 1997 and 2003 alone. Experimental work has found that children decrease their consumption of certain foods when the price is increased. Living in areas with higher-priced fast foods and soda is associated with lower body weight and BMI, while higher fruit and vegetable prices demonstrate the opposite association.

These relationships appear to be larger among low-income children as compared to their higher-income counterparts, presumably because their families have less disposable income with which to adapt to a higher-price environment. With a tight budget constraint, a family may purchase more poorer-quality, energy-dense foods, which cost less per calorie than more nutritious foods, although not by weight or average portion size.

To help families purchase food, the United States spent $103.3 billion in fiscal year 2011 on domestic food and nutrition assistance programs, much of which helps families...
with children through the Supplemental Nutrition Assistance Program (SNAP; formerly known as the Food Stamp Program). SNAP serves nearly one-half of all children at some point in their lives. Research suggests that food assistance receipt increases total household food expenditures and reduces food insecurity. Evidence also exists that food assistance and subsidized meals may help combat obesity among low-income children through the provision of nutritious foods; however, one study found that SNAP, which has few nutritional restrictions, may contribute to child obesity in cities with high food prices. In these studies, addressing selection into food assistance programs is difficult.

Despite the importance of adequate nutrition during early childhood, to date, little research has examined how food prices relate to weight and food insecurity outcomes during early childhood, and, with few exceptions, most studies have estimated cross-sectional associations between food prices and child outcomes. Further, previous research has not isolated fresh fruits and vegetables, whose prices vary more than frozen and canned options. Moreover, despite findings that sugar-sweetened beverages account for nearly 15 percent of children’s daily caloric intake and soft drinks can have negative impacts on children’s health, little research has investigated associations between soft drink prices and children’s weight, with the exception finding higher-priced soft drinks associated with lower BMIs among school-age children.

We address these gaps in the literature by estimating how local food prices (overall fruits and vegetables, fresh fruits and vegetables, frozen and canned fruits and vegetables, fast food, and soda) influence the weight outcomes, food insecurity, and food consumption of children from infancy to 5 years of age.

Hypotheses

We hypothesize that: (1) high-priced fruits and vegetables and low-priced fast food and soft drinks may contribute to a greater likelihood of being overweight, higher BMI, and less nutritious food consumption; (2) high prices for fruits and vegetables, fast food, and soda may contribute to a greater likelihood of being food insecure; and (3) the prices of fresh fruits and vegetables will more strongly influence children’s outcomes than frozen and canned fruits and vegetables.

Data

The analysis linked data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), a nationally representative study of approximately 10,700 children from birth to kindergarten entry, to city-level food price data from the ACCRA Cost-of-Living Index (COLI). The ECLS-B collected data when children were 9 months of age (2001 to 2002), 2 years of age (2003 to 2004), approximately 4 years of age (preschool: 2005 to 2006), and at two waves of kindergarten entry (2006 to 2008), approximately 11,700 observations. This study used the first four waves of data, excluding the second kindergarten entry wave. The ACCRA COLI dataset, collected by the Council for Economic Research, is the main source of cost-of-living data in the United States that includes local food prices. The ACCRA food price data were collected quarterly from more than 300 Core Based Statistical Areas (CBSA).

Children’s BMI z-scores, overweight status, food consumption, and adult-level food insecurity served as the dependent variables. Using the Centers for Disease Control and Prevention (CDC) standards, standardized BMI z-scores and measures of overweight (BMI at or above the 85th percentile) were generated from measures of children’s weight and height to allow for comparisons across age and gender. Parents’ reports of children’s consumption of several different types of foods (e.g., vegetables, sugar-sweetened beverages) over the previous 7 days were gathered at the preschool and kindergarten waves. Responses on the Core Food Security Module (CFSM) at each wave were used to create a binary measure of adult-level food insecurity, which may be more accurate than parents’ reports of their children’s experiences of food insecurity.

The independent variables included the average annual prices of the following items measured in the ACCRA data (inflation-adjusted to 2008 dollars and adjusted for the overall cost-of-living composite index): (1) six fruits and vegetables (potatoes, bananas, lettuce, canned sweet peas, canned peaches, and frozen corn); (2) three fast foods (the average price of a McDonald’s quarter-pounder with cheese, the average price of a regular cheese pizza at Pizza Hut and/or Pizza Inn, and the average price of a fried chicken drumstick and thigh at Kentucky Fried Chicken and/or Church’s Fried Chicken); and (3) a soft drink (2-liter bottle of Coca-Cola). For some analyses, fruits and vegetables were separated into: (1) fresh fruits and vegetables and (2) frozen and canned fruits and vegetables.

Methods

Using Ordinary Least Squares (OLS), linear probability, and fixed effects (FE) models, the variability in food prices over time and among children who move residences was exploited, controlling for a range of child, maternal, and household characteristics.

Findings

On average, the BMIs of children in the analysis sample were about one-half of a standard deviation above CDC recommendations. About 30 percent of children were overweight, and about 12 percent of children lived in households in which the adult respondent reported low or very low food
security. Overweight children faced higher average annual fruit and vegetable, fast food, and soft drink prices than their peers who were not overweight, but the standardized price ratios did not differ. Households with food insecure adults faced average lower fruit and vegetable prices than those with food secure adults.

Effects of local food prices

Results indicate that higher-priced fruits and vegetables are associated with higher standardized measures of children’s BMI. This relationship is driven by fresh (versus frozen or canned) fruits and vegetables. A 38-cent increase in the average annual price of fresh fruits and vegetables is linked with about one-eighth to one-seventh of a standard deviation increase in children’s BMI z-scores in the OLS and FE models. By comparison, the magnitude of this association is about two-thirds that of the association between living below the poverty line and BMI. Further, in the FE models, higher-priced soft drinks are associated with a lower likelihood of being overweight. Surprisingly, higher fast food prices are associated with a greater likelihood of being overweight in the FE models only. Food prices are largely unassociated with children’s food consumption. Analyses that include each category of food prices in separate models show similar patterns.

Discussion

The goal of this study was to estimate how local food prices influence the weight outcomes, food insecurity, and food consumption patterns of children from infancy to 5 years of age. Our study found that children living in areas with higher-priced fruits and vegetables averaged higher measures of standardized BMI scores, compared to their peers in areas with lower-priced fruits and vegetables. Building on previous research, we find that these associations are driven by changes in the prices of fresh, rather than frozen and canned, fruits and vegetables. The magnitude of this association is considerable, when taking into account that small changes in price are associated with small but significant changes in children’s weight outcomes. A 38-cent increase in the average annual price of fresh fruits and vegetables is linked with about a one-eighth to one-seventh of a standard deviation increase in children’s BMI z-scores in our OLS and FE models. While these changes reflect relatively small increases in children’s BMI measures, the corresponding price changes are relatively small, as well. The range of food prices across geographic areas suggests that residential moves may expose children to areas with these or more substantial variation in prices.

Also consistent with hypotheses, higher soft drink prices were associated with a decrease in the likelihood of being overweight in the FE models. By contrast, surprisingly, higher fast food prices were associated with an increase in the likelihood of being overweight in the FE models, and among food assistance recipients in the linear probability models. The FE models are more limited in their sample size, and the inclusion of a more selective subsample may underlie the differences between the OLS and LPM models and the FE models. Alternatively, this may be a result of endogeneity; that is, fast food outlets may respond to increased demand or preferences for fast food with higher prices.

Indeed, previous research indicates that fast food locales have substantial independent control over their prices. Further, while the literature on the relationship between fruit and vegetable prices and child BMI is relatively consistent, the research on fast food prices and child weight outcomes is more mixed. While some studies have found a negative association between fast food prices and BMI or obesity among adolescents or adults, longitudinal analyses using fixed effects models find lower or non-significant associations.

Surprisingly, the mechanism through which food prices are expected to affect children’s weight, their food consumption, was unassociated with food prices. This was true for the composite measures of eating habits (nutritious and nonnutritious foods) and the individual measures of fruit, vegetable, and fast food consumption. The use of parents’ reports of children’s food consumption across the previous 7 days, and only at two waves (preschool and kindergarten entry) is a major limitation. Parents, particularly those who are employed, may not be aware of what their children are eating, and the recall of foods eaten over the last week is subject to memory loss. Future research could incorporate more refined measures of children’s food consumption, such as daily diaries, and test whether nutrition is a mediating factor between fruit and vegetable prices and children’s BMI and overweight.

Conclusion

This study identifies significant associations between food prices and child and family weight and food security outcomes, shedding light on promising policy initiatives. Results suggest that policies that subsidize the cost of fresh fruits and vegetables may be effective in improving the health and weight outcomes of young children. It is possible that the higher price of fruits and vegetables relative to other foods discourages households from purchasing them. SNAP is currently implementing new initiatives including financial incentives that reduce the costs of fruits and vegetables for recipients, which may better address children’s weight outcomes. More research on the interactions between food prices and public food assistance, particularly the effects of these new initiatives, is needed.

2Food insecurity measures both the quality and quantity of food based on an 18-item scale developed by the USDA. The scale captures experiences at the household level (in the last 12 months), such as running out of food,


Kimbro and Rigby, “Federal Food Policy and Childhood Obesity.”


Wendt and Todd, The Effect of Food and Beverage Prices on Children’s Weights.


Han and Powell, “Effect of Food Prices on the Prevalence of Obesity among Young Adults”; Powell, Han, and Chaloupka, “Economic Contextual Factors, Food Consumption, and Obesity among U.S. Adolescents.”


For example, in New York City, SNAP participants who shop at participating farmers markets receive an extra $2 for fruits and vegetables for every $5 of benefits used. The Healthy Incentives Pilot (HIP) in Hampden, Massachusetts, is examining whether a financial incentive (an additional 30 cents for every dollar spent on targeted fruits and vegetables) increases fruit and vegetable consumption among SNAP recipients.

Fast Focus is a single-topic brief put out several times a year and distributed electronically (only) by the

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Fast Focus is free of charge, although contributions to the UW Foundation–IRP General Fund sent to the above address in support of Fast Focus are encouraged.

Edited by Deborah Johnson.

This publication was supported by Grant Number AE00102 from the U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation (ASPE), and awarded by the Substance Abuse and Mental Health Services Administration (SAMHSA). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of ASPE or SAMHSA.

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