

# Metropolitan Area Food Prices and Children's Weight Gain

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## Abstract

Overweight among children has increased rapidly over the past two decades. According to growth charts of the Center for Disease Control, the average weight gain of children throughout the United States now exceeds the desirable norm. The trend has raised concerns about children's diets and physical activity. A prevalent belief is that characteristics of the local food supply, such as the affordability of fresh produce and the density of food markets and restaurants, are associated with children's diet and weight gain. However, there has been little empirical evidence. This study investigates these issues and finds an association between the relative cost of fruits and vegetables and excessive weight gain by elementary-age children.

This is a summary of an article by R. Sturm and A. Datar, "Body Mass Index in Elementary School Children, Metropolitan Area Food Prices and Food Outlet Density," *Public Health*, September 2, 2005.

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## What Is the Issue?

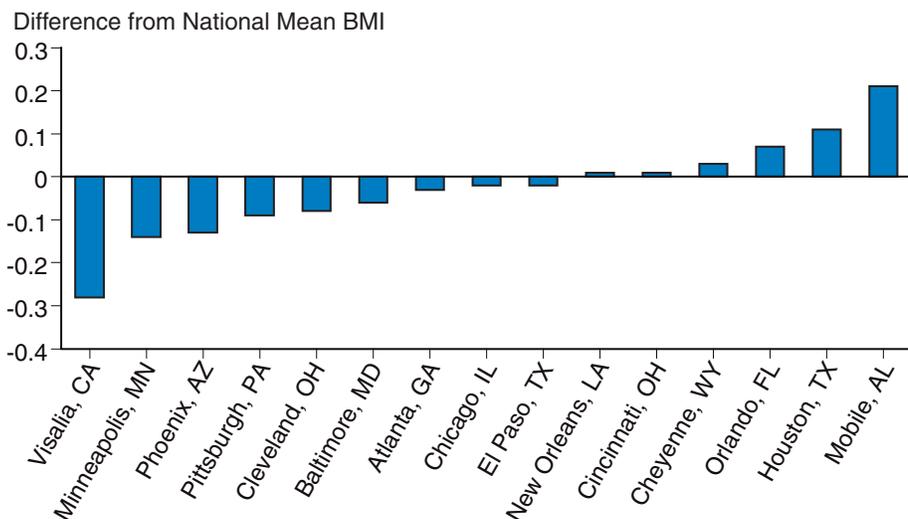
Based on recent studies, produce prices may be important in a search for causes of obesity and overweight in childhood. Among both adults and youth, increased fruit consumption has been linked to a lower body mass index (BMI, based on a ratio of weight to height), although no similar effect was observed in young children (Lin and Morrison, 2003). Low-income families in the United States are twice as likely as higher income families not to buy any fruits or vegetables in a given week (Blisard et al., 2004). It is not known whether local produce prices or availability play a role in this difference. However, even if average national prices were low enough to make fruits and vegetables affordable for most families, prices would vary widely across market areas (Reed et al., 2004). Can this variation be a factor in weight gain among young children?

## What Did the Study Find?

- On average, children in the study gained 29 pounds over the study period, from kindergarten through third grade. According to the Center for Disease Control growth charts, a child at the 50th percentile of the weight distribution should have gained about 22 pounds over the period, whereas a child at that percentile in the study actually gained 25 pounds.
- Children who lived in metropolitan areas where fruits and vegetables were relatively expensive gained significantly more weight than children—matched for otherwise-similar characteristics and standard of living—who lived where fruits and vegetables were cheaper. Fresh produce cost about twice as much in the highest cost metropolitan statistical areas (MSAs) as in areas with the lowest cost, a variation large enough to account, potentially, for differences in weight gain. Figure 1 shows how the BMIs of children in selected MSAs in the study varied from the national mean for children from kindergarten to third grade. The variations reflect only the estimated effects of fruit and vegetable prices and adjust for all other differences in sociodemographics and standard of living.
- In the region with the highest relative price for fruits and vegetables—Mobile, AL— children gained about 0.21 BMI units more excess weight than similar children nationally. Among children in the area with the lowest relative cost for fruits and vegetables—Visalia, CA—average excess BMI gain was 0.28 BMI units less than for similar children nationally, or roughly half of the average national excess BMI gain for children in the same age group.
- In families with income below the poverty line, children at risk of overweight (defined as being over the 85<sup>th</sup> percentile on the growth charts) at baseline, and Hispanics, the estimated effects were noticeably larger than for the full population. However, we do not have the statistical results to conclude that these differences are statistically significant.
- One behavioral factor that was as strongly associated with weight gain as fruit and vegetable prices was time spent watching TV. Children who watched 2 to 3 hours per day more television on average than the national average gained 50 percent more excess weight, as measured by the BMI.

Figure 1

### Effect of local food prices on BMI change between kindergarten and third grade



NOTE: The chart shows the expected differences to national mean BMI change as a function of local real food prices, after adjusting for sociodemographic differences and standard of living (real income) across areas.

- Regarding the distribution density of food providers such as grocery stores, restaurants, and fast food establishments, suggested by some groups to have a link with childhood overweight: We found no significant relationship between children’s excess weight gain and the presence of many convenience stores, restaurants, or grocery stores near their homes.

## How Was the Study Conducted?

The analysis compared children living in one area with otherwise similar children living in another area, in families who had the same standard of living but faced different food prices or availability,

We examined how variations in real prices (i.e., the dollar cost relative to the cost of living) of fruits, vegetables, and other foods and neighborhood food-outlet density related to changes in the BMI between kindergarten and third grade. Because children’s body composition often changes as they grow, researchers usually chart weight gain in terms of the BMI.

The dependent variable in the analysis was the change in BMI between spring semester of kindergarten and spring semester of third grade. The main explanatory variables were: (1) price indices for fruits and vegetables, meats, dairy, and fast food in an MSA, and (2) per capita number of grocery stores, convenience stores, full-service and limited-service restaurants, and the ratio of grocery to convenience stores and of full-service to limited-service restaurants in a child’s home Zip Code. The results were adjusted for other individual factors, including BMI in kindergarten, birthweight, real family income (income adjusted by the cost of living in the area), sex, mother’s education, race/ethnicity, hours of television watching per day, physical

activity, school physical education, and number of activities that the parent participates in with the child. The final sample size for analyzing BMI change between kindergarten and third grade was 6,918 children; for analyzing BMI change between kindergarten and first grade in 59 MSAs it was 8,008 children. The growth charts developed by the Centers for Disease Control were used as the standard for BMI measures (available at <http://www.cdc.gov/growthcharts/>).

We analyzed data from the Early Childhood Longitudinal Study-Kindergarten Class (ECLS-K), a nationally representative dataset for the United States that follows a cohort of kindergartners from the 1998-99 school year, merged with Zip Code-level data on food outlets from the Census and with MSA-level data on food prices from the American Chambers of Commerce Researchers Association.

Lacking longitudinal data on consumption and price changes, we cannot confirm the causal relationship between higher prices and the purchase and use of fresh produce. However, the findings suggest the need for more research to determine the impact prices may have on the consumption of fruits and vegetables by children.

## References

Lin, B.H., and R. M. Morrison. "Higher Fruit Consumption Linked with Lower Body Mass Index," *FoodReview*, Vol. 25, No. 3, January 2003, pp. 28-32.

Blisard, N., H. Stewart, and D. Joliffe. *Low-Income Households' Expenditures on Fruits and Vegetables*. U.S. Department of Agriculture, ERS Research Brief, May 2004. [http://www.ers.usda.gov/publications/aer833/aer833\\_researchbrief.pdf](http://www.ers.usda.gov/publications/aer833/aer833_researchbrief.pdf)

Reed, J, E. Frazão, and R. Itskowitz. *How Much Do Americans Pay for Fruits and Vegetables?* U.S. Department of Agriculture, Economic Research Service, Agriculture Information Bulletin No. AIB790, July 2004. <http://www.ers.usda.gov/publications/aib790/>