

The Effects of Relative Food Prices on Obesity — Evidence from China: 1991-2006

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Abstract

A driver of health care costs and a risk factor for various non-communicable diseases, obesity has become a serious public health problem worldwide. In the United States, obesity is a leading cause of preventable death with two thirds of the adult population being overweight, and half of them obese in 2004 (Ogden et al., 2006). Meanwhile in developing countries, obesity has become significantly more prevalent over the past decade, along with fast-paced urbanization and diet pattern changes.

Despite collective efforts to curb obesity, the rising trend has not shown any sign of reversal in recent years. On the other hand, certain mechanisms of obesity are not well understood. For example, although fast food proximity has become a more salient risk factor, there is mixed evidence on what price effects are on obesity, at least in the U.S.

This paper explores the effects of food prices on obesity with a unique dataset the China Health and Nutrition Survey (CHNS), which is an on-going panel of individuals from over 200 communities in 9 provinces. The main advantage of this data is that food prices are available at the community level from 1991 to 2006. We limit the sample to adult individuals who are between 18 and 75 years old at the time of interview, and use two different measures for obesity, BMI (body mass index), and TSF (triceps skinfold thickness). BMI is the most commonly used measure for obesity, but TSF is a more direct and accurate measure of body fat. TSF is used here because, even without a BMI greater than 25 or 30, individuals can still be at risk for CVD and diabetes, if they have a high level of body fat — a situation that applies to certain individuals. The key independent variables are staple oil prices, in relative or absolute terms. We construct the prices by taking into consideration how food is usually prepared and consumed. Main food sources such as grains (staple food), meats, and vegetables, in addition to staple oils, are modeled in the regressions. The other control variables include gender, age, age quadratic, type of residence (urban or rural), education attainment, income levels, physical activity levels, and year dummies.

According to the CHNS data, all food prices in nominal terms are increasing every year, due to inflation and economic growth, but the rate of increase in oil prices is much lower than in the other three foods that the relative prices of oil unanimously decrease over time. Within the same time period, the prevalence of overweight and obesity skyrocketed by the definition of BMI

cutoffs: the fraction of overweight ($25 \leq \text{BMI} < 30$) individuals increased from 12.4% to 23.5%, and the fraction of obese ($\text{BMI} \geq 30$) individuals rose from 1.1% to 3.2%. By looking at both trends at the community level, we find that the relationship between the relative oil price and obesity is negative and statistically significant, but the downward slope is steeper for TSF, or body fat, than for BMI, or body weight.

To explore further the link between relative food prices and obesity, and to test whether the effects are persistent and robust, we use all the applicable and commonly used model specifications including pooled ordinary least squares regressions (OLS), random effects (RE) models, and fixed effects (FE) models. We find that across all model specifications, relative oil prices are generally shown to be negatively associated with TSF, and thus body fat, except in one FE model where the oil price relative to vegetables is used. This confirms the hypothesis that when oil prices are lower, body fat will increase. However, the expected negative treatment effects on BMI only appear in some model specifications, all of which OLS regressions. And those effects vanish in the RE and FE regressions. This implies that individuals consume more edible oils when the prices are lower, and additional oil consumption subsequently leads to a higher level of body fat. At the same time, individuals are likely to keep total calories consumed per day within a certain limit, and reduce the consumption of other foods, such as rice, flour, meats, and vegetables, to compensate for more oil intake, such that the total calorie intake will not change substantially, but a higher fraction of calories will come from fat.

In addition to the all the models mentioned above, we also adopt an instrumental variable approach to address potential price endogeneity, such as self selection from the demand side and reverse causality. We use the price of gasoline as the instrument because it constitutes part of the production cost for foods from the supply side and because gasoline is unlikely to be directly linked with body weight and body fat, due to limited car ownership in China. We find that in the FE-IV models, prices effects remain all negative and statistically significant on TSF, echoing what we find from earlier FE models. On the other hand, the price effects on BMI are all shown to be negative and statistically significant as well, which is aligned with the findings on the outcome of TSF, but different from what we find in the FE models on BMI earlier.

In conclusion, while we find that decreases in the price of energy-dense foods have consistently led to elevated body fat, this price effect does not always hold for BMI. The policy implications are twofold: changes in food consumption induced by varying food prices can increase body fat to risky levels even without substantial weight gain, and BMI might not be the optimal proxy for obesity.