



The Economics Of Obesity

An Application of the Law of Demand to Obesity Prevalence within the United States

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Abstract

We estimate the demand function for obesity using a panel model across fifty-one U.S. states over the years 2000 to 2010. We study the impact of educational attainment, average commute time to work, relative price, per capita income, and the state unemployment rate on obesity levels, controlling for differences in regional culture. We find that since 2001, obesity is a function of the relative prices of healthy and non-healthy foods across regions, as well as state per capita income and educational attainment. From 2005 to 2010, we find that average commute time to work is a significant factor in the state obesity rate as well. Our results indicate that obesity is an inferior good due to its negative relationship with per capita income. In addition, we find obesity to be very inelastic to changes in the relative price of healthy and non-healthy food over both time periods. For every one percentage increase in the relative price of healthy food, the obesity rate increased by only 0.062 percent. Our findings suggest that in order to most effectively reduce the state obesity rate, public policies should focus on increasing educational attainment rather than lowering the relative price of healthy food. We find regional culture to be the largest indicator of state obesity rate. This suggests that, regardless of the price of food, some people will choose to adopt an unhealthy lifestyle as a result of cultural influence.

Data Set

- Sample Size: 510
- Panel Data Set– captures changes in the obesity rate caused by both cross sectional and time sensitive variables as indicated by the subscript “it”
- Data Transformations**
 - Relative Price: Calculated based on the break down of the Consumer Price Index regarding specific food prices, published by the Bureau of Labor Statistics. The relative price of healthy foods was determined by the average price of bananas, tomatoes, lemons fresh chicken and lettuce per lb. The relative price of unhealthy foods was determined by the average price of white bread, ground beef, white potatoes, and bacon per lb. Each food with equal weight.
 - Average Commute: The U.S. Census Bureau published data in 2000 and from 2005 to 2010. Simple averages were used to interpolate remaining data values.
 - Educational Attainment: Data was collected from the U.S. Census Bureau in 2000 and from 2006 to 2009. Simple averages were used to interpolate remaining data values.

Empirical Results

Results from Ordinary Least Squares Regression Analysis:

Variables	2001 - 2010				2005 - 2010	
	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5	Regression 6
Educational Attainment	-0.283366 (0.0036)	-0.284416 (0.0034)	-0.285718 (0.0020)	-0.286351 (0.0019)	-0.332851 (0.0234)	-0.293717 (0.0387)
Relative Price	0.027362 (0.0948)	0.027508 (0.0923)	0.027487 (0.0914)	0.027609 (0.0893)	0.065756 (0.0015)	0.06193 (0.0024)
Per Capita Income	-1.03E-06 (0.0113)	-1.03E-06 (0.0106)	-1.01E-06 (0.0045)	-1.02E-06 (0.0040)	-9.21E-07 (0.1760)	-1.31E-06 (0.0245)
Average Commute	-0.000316 (0.8465)		-0.000307 (0.8503)		0.00408 (0.0820)	0.03686 (0.1116)
Unemployment Rate	-0.005276 (0.9369)	-0.004376 (0.9474)			0.092928 (0.2818)	
Adjusted R-Squared	0.934079	0.934221	0.934226	0.934368	0.934226	0.919673

*Bold indicates preferred results. The regressions were run in the order which they are listed in the table. The number listed first for each of the variables are the coefficient values and below those, in parenthesis are the probability values.

Empirical Analysis

- The data set was restricted from 2005 to 2010 in order to see if data interpolation affected accuracy of the model. The data transformation which occurred in the earlier years did not appropriately capture the affect commute time has on the obesity rate. The coefficient of educational attainment, however remained significant in both time periods.
- Regression 6 shows that using the Fixed Effects Model, variations in per capita income, educational attainment, relative price and average commute time can explain 91.97% of the variations in state obesity rates. Therefore, Regression 6 is the preferred regression overall.
- Results indicate that an increase in education will have a greater impact on the obesity rate than a reduction in the relative price of food.
 - For every one percentage increase in the relative of healthy to non-healthy foods causes only a 0.0619% increase in the obesity rate.
 - For every one percentage increase in the educational attainment of a state the obesity rate of that state will lower by 0.294%.
- Positive relationship between the obesity rate and average commute suggests that the more suburbanized a state is the more people tend to lead sedentary lifestyles.
 - For every one minute increase in the average commute, the obesity rate of the state will increase by 0.0369%.

Policy Implications

Our research indicates that because obesity is relatively more elastic to changes in education, a more efficient policy to reduce obesity in these areas would be to educate people on the effects their lifestyle has had on their health and offer healthier alternatives.

Relative Price

- A fat tax is an inefficient policy to reduce the obesity levels, which is aimed at reducing relative price by making unhealthy foods more expensive than healthy foods for consumers to purchase.
- Based on the relative price elasticity of 0.06193, in order to reduce the state obesity rate by one percent, a fat tax would have to increase the price of unhealthy foods by 16.47%, relative to healthy foods.

Regional Culture

- We attribute cross sectional heterogeneity to differences in regional culture. These differences in regional culture can be considered a type of “Paula Dean Effect” which typifies lifestyles in certain regions in the U.S. that are more conducive to obesity.
- Our results suggest that even with a dramatic decrease in the price of healthy foods compared to unhealthy foods, people who have inherited an obese lifestyle will likely continue to eat unhealthy foods.

Theory

General Functional Form

$$OBR_{it} = F(RP_{it}, PCI_{it}, EA_{it}, UR_{it}, AC_{it})$$

- OBR_{it}: Adult Obesity Rate as a percentage of the ith state from 2001 to 2010
- RP_{it}: Relative price of healthy and non-healthy foods measured over the North-east, Midwest, South and West, of the United States from 2001 to 2010.
- PCI_{it}: Per Capita Income of the ith state from 2001 to 2010
- EA_{it}: Educational Attainment of the ith state from 2001 to 2010 measured as the percentage of people 25 years and older who have completed a Bachelor’s degree or higher
- UR_{it}: Unemployment rate of the ith state from 2001 to 2010
- AC_{it}: Average commute time to work of the ith state measured in minutes from 2001 to 2010

Fixed Effects Model

In order to capture the unobserved impact of time invariant and cross sectional invariant omitted variables, the Fixed Effects model was used.

Econometric Equation and Variables

$$OBR_{it} = \beta_0 + \beta_{RP} RP_{it} + \beta_{PCI} PCI_{it} + \beta_{EA} EA_{it} + \beta_{AC} AC_{it} + \beta_{UR} UR_{it} + \epsilon_{it}$$

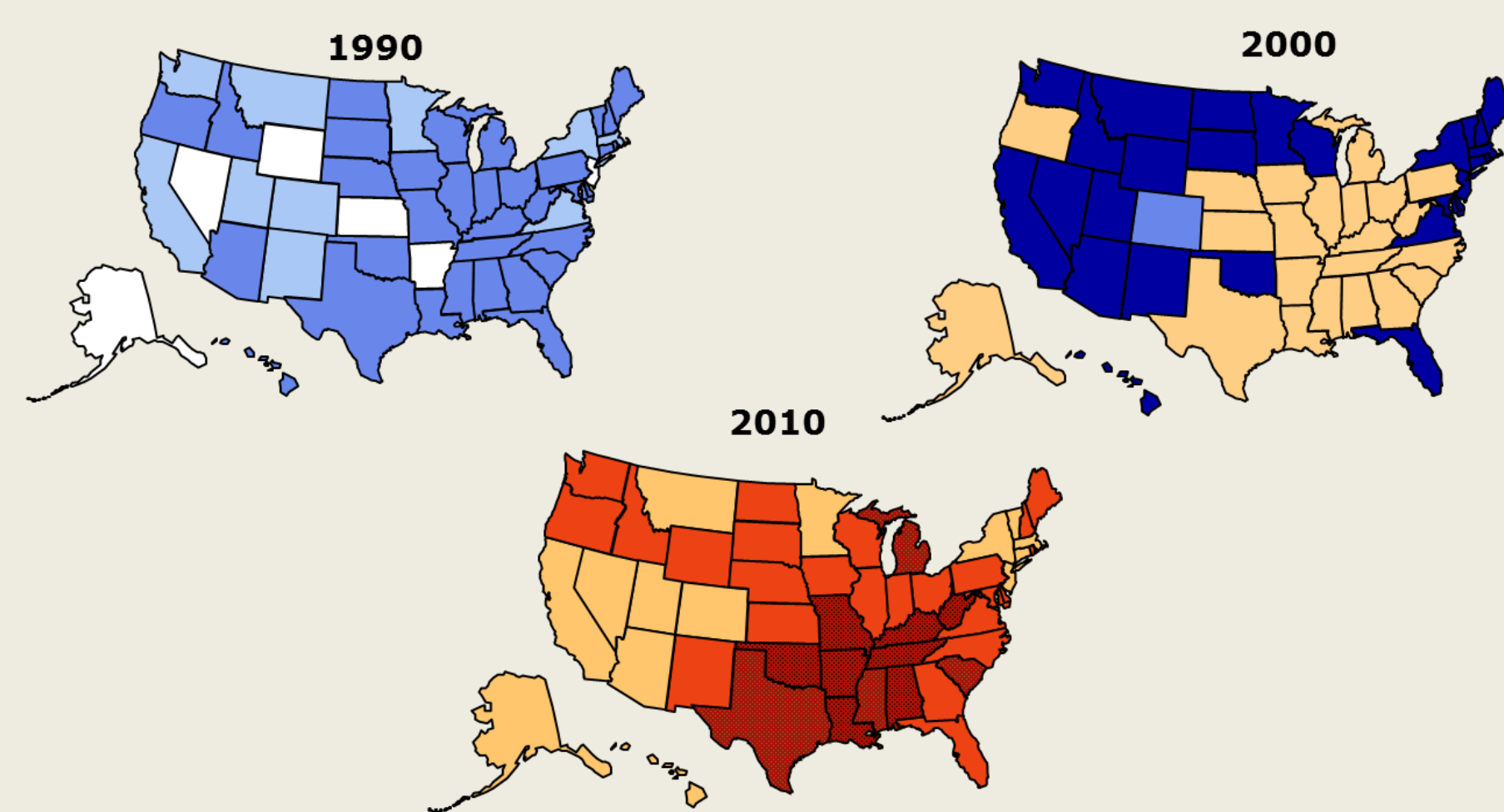
- β_{RP} (+) - Expected to have a positive relationship with the obesity rate because as the price of healthy food rises relative to non-healthy people are more likely to substitute away from healthy foods. Thus, the obesity rate would rise.
- β_{PCI} (-) - Expected to have a negative relationship with the obesity rate in each state, because as income rises a greater portion of disposable income can be allocated to food expenses. Thus, people can afford to buy healthy foods.
- β_{EA} (-) - Expected to have an adverse relationship with the obesity rate. The more educated a state’s citizens are, the more information is available about healthy food and lifestyle choices.
- β_{AC} (+) - Expected to have a positive relationship with the state obesity rate. The more suburbanized a state is the longer the average commute time will be. Thus, discouraging active transportation like walking or biking.
- β_{UR} (+) - Expected to have a positive relationship with the state obesity rate. The unemployed are under considerably more stressed than the employed, and food is often used as a coping mechanism.

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Obesity Trends* Among U.S. Adults BRFSS, 1990, 2000, 2010

(*BMI ≥30, or about 30 lbs. overweight for 5’ 4” person)



Legend: No Data, <10%, 10%–14%, 15%–19%, 20%–24%, 25%–29%, ≥30%

Key Sources:

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