

## Does Smoking Have a Causal Effect on Weight Reduction?

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### Abstract

Obesity and smoking are two major health-related concerns in the U.S. Hedley *et al.* (2004) found that 65.1% of the adults aged 21 and over in 1999–2000 were either overweight or obese, 30.4% were obese, and 4.9% were extremely obese. Brown *et al.* (2000), Kuchler and Variyam (2003), and Mokdad *et al.* (2003) assessed the deleterious effects of an overweight population. Meanwhile, tobacco smoking, associated with more than 400,000 deaths annually, remains the leading preventable cause of mortality in the U.S. (Perkins, Hickcox and Grobe, 2000). Researchers have given increased attention to the relationship between obesity and smoking (e.g., Brown *et al.*, 2000; Lin, Huang and French, 2004; Wilson, Habib and Philpot, 2002). An inverse relationship between smoking and being overweight (obese) was found. Chou, Grossman and Saffer (2004) suggested that the anti-smoking campaign, especially the state and Federal excise tax hikes and the settlement of state Medicaid lawsuits, had contributed to the recent upward trend in obesity.

Although smoking may be associated with lower body weight, it has well-known undesirable health related effects. The weight-reducing effect of smoking in some studies may have been overestimated. Audrain, Klesges and Klesges (1995) found that that smoking increased resting energy expenditure (REE) in both normal-weight and obese smokers, but the metabolic effect is larger and lasts longer in normal-weight smokers. This has potential implications for discouraging obese persons from taking up smoking and intervening among those who already smoke. Smoking itself is likely to be an endogenous decision, thus simultaneity between smoking and body weight equations may exist. Perkins, Hickcox and Grobe (2000) found substitution effects between food intake and nicotine reinforcement. Treating the decision to smoke as exogenous will produce biased estimates of the causal effects if, in fact, the decision is endogenous.

Based on data from the 1994–96 Continuing Survey of Food Intakes by Individuals (CSFII), the relationship between smoking and body mass index (BMI) with a simultaneous equation system allowing the endogeneity of the number of cigarettes smoked, which has been overlooked by previous literature on smoking and overweight was examined. Results suggest smoking does not have a direct long-term effect on body mass after controlling for the endogeneity. The negative relationship between smoking and BMI reported in previous literature is likely due to the endogeneity of smoking, therefore should be interpreted carefully.

People who resided in the Midwest and members of households on food stamp program were found to be more likely to have high BMIs than the reference group, which included the residents of the western states. Individuals residing in cities were less likely to be overweight. Personal characteristics also had strong effects on BMI. Age had a nonlinear effect but was negative for those aged 21 to 85. Hispanic and Black survey respondents were more likely to have high BMIs. Exercise had a negative effect, and hours watching TV or playing video games had a positive effect, which were well within our expectation. Vegetarians had lower BMIs, which may reflect their ability of self-control. Men were more likely to have higher BMIs than women, while respondents with higher levels of education tended to have lower BMIs. Preference for low-fat milk had a positive effect on the BMI, which is consistent with Lin, Huang and French (2004) but rather puzzling. Our conjecture is that either the use of low-fat milk increases the total amount of milk consumed and/or overweight respondents are more concerned with the fat content. Those who took vitamin supplements regularly and those who had used alcohol in the past year were more likely to have lower levels of BMI. More intakes of wine, legume and fruit were associated with lower BMI, while intakes of beverages, eggs, meat were associated with higher level of BMI. This sheds light on which diet pattern might be preferred for the purpose of weight control.

Tobit estimates of cigarette equation revealed the following relationships. Respondents residing in metropolitan and suburban areas smoked less than those in rural areas. Northeastern residents smoked less than those in other areas. Respondents who were members of larger households smoked less than those who were from smaller households. Age had a nonlinear effect on the number of cigarettes smoked due to the significance of age and age-squared coefficients. Education reduced the number of cigarettes smoked. Men smoked more than women. Respondents of different race or gender groups displayed significant differences. Hispanic, black, and other races smoked less than the reference group (white). Employment reduced and working with heavy involvement of

physical labor increased the number of cigarettes smoked. Home ownership, active exercising and vegetarians reduced the number of cigarettes smoked while TV watching or video games was associated with more smoking.

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