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The Quarterly Review of Economics and Finance
46 (2006) 268–283

The QUARTERLY REVIEW of ECONOMICS and FINANCE

www.elsevier.com/locate/qref

Structural estimation of caloric intake, exercise, smoking, and obesity

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Received 2 September 2003; received in revised form 27 October 2005; accepted 17 November 2005
Available online 25 January 2006

Abstract

The escalating rate of obesity in the US highlights the importance of understanding the causes for this rise. In this paper I employ the First, Second, and Third National Health and Nutrition Examination Surveys to estimate a structural model of the determinants of adult obesity. To control for the potential endogeneity of some explanatory variables, such as caloric intake (adjusted for activity level) and smoking, a set of reduced form equations for these outcomes is estimated simultaneously with the obesity equation. To identify each equation, I use an array of state-level characteristics as instrumental variables. Trends in these variables shed light on the sources of the rapid increase in obesity since 1980.

JEL classification: I10; I12

Keywords: Obesity; Instrumental variables; Health production

1. Introduction

According to the National Health and Nutrition Examination Survey, the percentage of individuals classified as obese in the United States increased by 67% between 1971 and 1994, my period of analysis, with most of this increase occurring during the 1980s. Obesity is the second most important cause of premature death (Allison, Fontaine, Manson, Stevens, & VanItallie, 1999; McGinnis & Foege, 1993), a statement still supported by the Centers for Disease Control despite their recent downward correction to the death toll attributed to obesity (Mokdad, Marks, Stroup,

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1062-9769/$ – see front matter
doi:10.1016/j.qref.2005.11.002

& Gerberding, 2005). While certain foods can influence hormones and genes, the increase in obesity probably does not reflect a change in the genetic make-up of the US, since the gene pool did not change significantly between 1990 and 1994 (Koplan & Dietz, 1999). The way our built environment looks is very different from the way it looked just over two decades ago, largely due to advancements in technology. This paper explores the idea that the recent rapid increase in obesity rates is due to economic changes that have in turn changed the amount that Americans eat, exercise, smoke, and do other things that affect their weight. These changes, while advantageous in numerous ways, have nevertheless had negative health consequences. In addition, since demographic characteristics and socioeconomic status influence overweight and obesity, I consider the effect of demographic changes on trends in obesity.

In order to study the determinants of a person's body mass index (BMI), which is most often used in measuring obesity, I employ pooled micro-level data from the First, Second, and Third National Health and Nutrition Examination Surveys. I augment these data using state-level data on the price of a restaurant meal, the cigarette tax, average January and July temperatures, and clean indoor air laws.

2. Background

Obesity and sedentary lifestyles are second only to smoking as the leading cause of premature death (Allison et al., 1999; McGinnis & Foege, 1993). They have been linked to coronary heart disease, stroke, high blood pressure, cancers of the colon, breast and prostate, and diabetes (Mokdad et al., 2003; Must et al., 1999). Obesity has also been associated with high cholesterol, menstrual irregularities, pregnancy complications, and psychological disorders such as depression (NIDDKD, 1996). Type II diabetes, once termed adult-onset diabetes, is now not uncommon in children as a result of the obesity epidemic (Freedman, Dietz, Srinivasan, & Berenson, 1999). Recently obesity in adulthood has been shown to reduce life expectancy, especially among persons overweight in their youth (Fontaine, Redden, Wang, Westfall, & Allison, 2003; Peeters et al., 2003). Economic costs related to overweight and obesity were estimated to be $99.2 billion as of 1995 (Wolf & Colditz, 1998), and more recently this estimate has risen to $117 billion (USDHHS, 2001). This is especially a major concern for the public, as obesity-related illnesses have contributed to the overall growth in health care spending (Thorpe, Florence, & Joski, 2004). Social costs of obesity being higher than private costs are grounds for possible government intervention.[1]

There has been much debate as to what constitutes a proper diet, and recently the USDA's Food Guide Pyramid was replaced with an alternative that stresses vitamin intake, the intake of whole-wheat foods, and exercise, the so-called Healthy Eating Pyramid (McCullough et al., 2002; Willett, 2001). Excess carbohydrates in the body have been shown to be converted to fat. Measurements of the glycemic index in the body, which measures the rate of carbohydrate absorption after a meal, has shed light on the importance of controlling the intake of carbohydrates as well as that of fat, a high glycemic index being what contributes to obesity (Ford & Liu, 2001; Ludwig, 2002). Since the carb-to-lipid ratio might not be so important, it seems to make more sense to focus on total caloric intake rather than, say, intake of calories from fat. However, there is still some potential concern about the origin of calories, that not all calories are the same.

Money spent on weight-loss drugs has largely contributed to increasing the costs of obesity, as drugs intended to reduce weight have become popular, with a rapid increase since 1990.

[1] See Rashad and Grossman (2004) for a discussion of the role of the government and possible policy implications of obesity.