Uncovering peer effects mechanisms with weight outcomes using spatial econometrics

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ABSTRACT

Research about how peers influence weight outcomes among adolescents has yielded mixed findings. This paper seeks to not only estimate these peer effects, but also to distinguish between two mechanisms: social multiplier effects and social norm effects. After estimating an augmented spatial autoregressive model using data from the National Longitudinal Study of Adolescent to Adult Health Survey, this study finds significant peer interactions in body mass index, which can be explained by both mechanisms of peer influence; the social norm effect is much larger than the social multiplier effect. The estimated peer effects for overweight and obesity statuses suggest that peer effects are important for overweight status but not for obesity status, and peer influence for overweight status appears to operate solely through social multiplier effect. These findings provide important information for the design of obesity-prevention interventions in schools.

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1. Introduction

Obesity is a significant problem among adolescents in the United States. Ogden, Carroll, Kit, and Flegal (2012) show that the percentage of children ages 12–19 who are considered obese has increased from 5% in 1980 to 18% in 2010. In addition to adverse health conditions, obese adolescents are also subject to social and psychological problems related to their weight (Crosnoe, Frank, & Mueller, 2008). Much research has examined the various causes of the increase in childhood obesity (Larson, Wall, Story, & Neumark-Sztainer, 2013; Papoutsi, Drichoutis, & Nayga, 2013). The purpose of this paper is to study the role of peer group effects on weight outcomes.

Studies in the peer effects literature primarily focus on identifying the direct impact of peers on individual behavior, also known as the endogenous peer effect (Manski, 1993). However, peer effects comprise a wide range of mechanisms that influence individual behavior (An, 2011). Two such mechanisms are the social multiplier effect and the social norm effect. With the social multiplier effect, change in behavior of any one individual in the peer group spreads to the other members of the group. With the social norm effect, individuals conform to the average behavior of the entire peer group. Other mechanisms that influence behavior are also at work in an individual's social environment. Socialization and selection are two types of these mechanisms. Socialization can happen directly through positive or negative social reinforcement, and indirectly through observation of peer behavior. Selection is manifested through similar choices made by adolescents

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engaging in friendship. Peer selection based on observed peer behavior is another possibility: "Birds of a feather flock together." The difficulty in isolating the direct behavioral effect of peers on individual behavior is that there are several mechanisms driving the correlation between individual outcomes and peer group outcomes. In order to account for all these influences and to identify the endogenous peer effect, this study's estimation strategy builds upon the conceptual framework from the social interactions literature (Manski, 1993, 2000). The paper moves beyond the standard peer effects literature by using spatial econometric methods to estimate the social interactions effects. Spatial econometric models are usually employed in situations where sample data observations are taken with reference to regions on a map. Such data often exhibit spatial dependence as the actions in one region impact those in a neighboring region (Anselin, 1988). The dependence structure is given in a weight matrix, which defines the relationship between the regions.[1] If these units are individuals instead of regions, one can model social interaction effects. In this case, actions of one individual impact actions of a neighboring individual, such as a peer. Peer groups provide the foundation for the spatial econometric models.

This paper addresses two research questions. First, what is the influence of an individual's peer group on the individual's weight outcomes? Second, what is the mechanism that drives these peer group effects? An estimated spatial econometric model distinguishing between different types of endogenous peer effects–social multiplier effect, social norm effect–is used to answer these questions. In addition, unlike the standard approach of using exogenous effects as instruments for peer group outcome (Halliday & Kwak, 2009), the estimated spatial model addresses the endogeneity of peer group outcomes in addition to controlling separately for each of the mechanisms potentially driving the correlation between the individual's and the peers' outcomes. Using spatial econometrics to estimate the role of peer group effects in weight outcomes is a significant methodological improvement upon the extant empirical literature on peer effects, one that should better inform policy targeting adolescent obesity.

2. Literature review

2.1. Peer effects and obesity

There is an expansive literature exploring the social network effects in obesity and in weight-related behaviors. Christakis and Fowler (2007) initiated this research by establishing a relationship between peers and obesity, but there is controversy over the data sample and methodology (Cohen-Cole & Fletcher, 2008) because Christakis and Fowler (2007) did not fully account for shared environment, which is usually controlled for by including peer network fixed effects. Trogdon, Nonnemaker, & Pais (2008) find that peer effects exist and are larger for females and

adolescents with high body-mass index (BMI). Halliday and Kwak (2009) analyze the methodological issues with estimating peer effects, focusing on peer group definitions. Mora and Gil (2013) find strong positive peer effects using a sample of Spanish adolescents whose social network is defined from classmate nominations. Controlling for numerous confounding factors and fixed effects, they find that adolescents are susceptible to peer influences. Yang and Huang (2013) find that association with obesity among youth is asymmetric: Weight gain is associated with an increase in the number of obese peers, but this association does not exist for weight loss.

2.2. Peer effects and physical activity

While not addressed in this study, the peer effects and obesity literature has analyzed the influence of peers on physical and sedentary activities. Peer effects have been found at all ages from children to college age individuals. Ali, Amialchuk, & Heil& (2011) find that that peer effects play a role in physical activity, which has implications for adolescent obesity. Carrell, Hoekstra, & West (2009) find that college peers who had poor fitness levels influence others. Gesell, Tesdahl, & Ruchman (2012) find that increasing activity levels in an afterschool program can boost the activity levels of a child through their immediate social network. de la Haye, Robins, Mohr, and Wilson (2010) find peer effects in obesogenic behaviors that are gender-specific: Female friends are more likely to engage in screen-time activities while male friends engage in high calorie food consumption. de la Haye, Robins, Mohr, and Wilson (2011a), de la Haye, Robins, Mohr, and Wilson (2011b) find that friends not only engage in similar behavior but also tend to choose friends based on similar levels of physical activities. This literature shows that interventions geared toward weight-reducing behavior can spread within an individual's peer group. What has not been extensively studied is what type of interventions are going to be more effective: those that focus on individuals or those that target a group as a whole.

3. Social interaction models

3.1. The reflection problem

Social interaction models provide hypotheses about the relationship between individual and collective behaviors. These models try to explain the mechanisms behind the observation that individuals within the same group tend to exhibit the same behavior. In the popular social interactions model of Manski (1993, 2000), peer group outcomes are related to individual outcomes through three channels: endogenous interactions, exogenous interactions, and correlated effects. Endogenous interactions occur when the behavior of the group affects the behavior of the individual; exogenous interactions occur when characteristics of the group like age, gender, or race affect the behavior of the individual, and correlated effects occur when the environment plays a role in explaining similar behavior of individuals within a group. Among other influential

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[1] Legerski and Thayn (2013) use spatial econometrics to study the spatial patterns with adverse birth outcomes.