Commentary
EPIDEMIOLOGY/GENETICS

Obesity

Advancing Mechanistic Understanding of Social Influence of Obesity Through Personal Networks

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In 2007, Christakis and Fowler (1) published a seminal paper on the spread of obesity in a large social network. This article generated an exceptional degree of interest, as it offered evidence that obesity can spread like an infectious disease, or as the popular press put it, "your friends make you fat." However, this attention also brought scrutiny, including critiques that the peer influence (contagion) effects were not identifiable and therefore could not be distinguished from homophily (birds of a feather flocking together) and that the mechanisms for spread over networks remained obscure (2).

In the current and previous issues of *Obesity*, three papers address mechanisms by which obesity might spread from person to person: norms around desirable body size and behaviors and social support from important others. These papers are notable for using egocentric designs, whereby individuals are drawn from a larger population and asked about their own personal networks, allowing inferences to be made on the larger network from which the sample is drawn. The disadvantages when compared with a whole-network (sociometric) approach are that one must rely on the egos' reports of their alters' characteristics (such as friend's body size), that salient network characteristics cannot be calculated at all, or can only be calculated with bias (3), and that the state-of-the-art method for teasing apart network dynamics and social influence (the stochastic actor-based SIENA model) cannot be used (4). Nevertheless, egocentric approaches are much more feasible and generalizable because they do not entail the complete enumeration of single networks.

The study by Shakya et al. (5) examined 1-year changes in dieting, alcohol consumption, and physical activity given comparisons between individual study participants (egos) and their named friends and family members (alters). This study is noteworthy because it used a large, nationally representative sample and a variation on the widely used General Social Survey network instrument. The investigators used a social comparison model, whereby egos rated whether they saw themselves as fitter (or less fit) or thinner (heavier) than alters. This study found that individuals who reported themselves to be less fit than their average alters at baseline were less likely to exercise 1 year later, whereas those who thought themselves thinner than their average alters were less likely to diet. These results suggest that peer comparisons can both promote and harm health.

Winston et al. (6) used a cross-sectional analysis of a "small change" weight loss program. Participants were asked to place alters within one of three circles representing importance in the ego's life and to rate whether each alter helped or harmed the ego in achieving his or her weight loss and physical activity goals. Having helpful alters was associated with greater weight loss in the program, whereas having only harmful alters was associated with weight gain. Intriguingly, having a mixture of helpful and harmful alters was associated with similar weight loss to having only helpful alters, highlighting the need for social support.

A third study by Leahey et al. (7) examined the normative environment of participants in a weight loss program. Participants reported whether their social contacts were overweight. Participants also reported acceptability of unhealthy eating habits and frequency of encouragement for unhealthy eating and physical inactivity in their personal network. Although having overweight family members and best friends was associated with baseline BMI, social norms were not. Nevertheless, obesity-promoting social norms and number of overweight casual friends were associated with smaller weight loss, suggesting that an overweight norm in the larger network can undermine weight loss.

All of these studies point to the double-edged nature of networks: they not only offer social support and healthy exemplars but also undermine efforts to change behavior. However, none of these studies can disentangled peer influence from network selection, which means that they are almost certainly confounded. People who choose thinner friends may be more predisposed to dieting in the first place. Whether confounding is so great as to completely invalidate these results is unknown. As noted above, there are tools available to control for confounding, but they require whole networks followed over time, and the trade-off is with facility and generalizability.

A final concern is the lack of clarity on how to translate intriguing findings from observational studies into actionable network-based interventions (8), a problem that is not unique to network analysis but observational studies more generally. To date, the public health successes of network analysis have primarily been in the infectious disease realm, including identification of the sexual and injection pathways of HIV and control of epidemics through social distancing and isolation. Why have we had success with infectious disease but not obesity and other health behaviors? Part of it may be greater experience with infectious diseases, as the Hebrew Bible describes social isolation (a network intervention) as a means of containing infections (e.g., Leviticus 13.4). Obesity has always existed as an individual phenomenon but has only recently become a mass epidemic, and it is driven by numerous other factors.

In summary, greater weight loss is associated with having thinner friends, fewer overweight friends, fewer friends who promote

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overeating, and at least one supportive ally. The causal question is whether changing any of these things actually promotes weight loss. If an obese individual does not have thinner friends, will befriending such friends spark weight loss? If this same individual does not have an ally, will befriending one lead to greater success losing weight? What impact would a norm against encouraging large portions have at the population level? At this point in time, no one really knows the answers to these questions. What would it take to answer them? Clinical trials are one route, but before we get there, better observational evidence is needed. Methodology is always evolving, and it is conceivable that methods developed for whole networks could be adapted to egocentric data. Thus, current egocentric approaches are unlikely to be of much help addressing the confounding issue.O

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