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Social capital and obesity among adults: Longitudinal findings from the Montreal neighborhood networks and healthy aging panel

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ABSTRACT

Curbing the worldwide increase in obesity requires upstream social interventions that modify the environment in which obesity emerges. Recent studies have suggested that social capital and networks may influence a person's risk of obesity. Yet, few longitudinal studies have assessed whether social capital and networks reduce obesity risk in adult populations. In this study, the data come from three waves (2008, 2010, and 2013) of the Montreal Neighborhood Networks and Health Aging Panel ($N = 2606$). Self-reported height and weight were used to calculate body mass index (BMI) with obesity defined as a BMI > 30 . Name and position generator instruments captured network measures of social capital, including: (1) upper reachability, (2) range, (3) diversity and (4) the number of kin ties. Questions on generalized trust and participation were used to assess cognitive and structural dimensions of social capital. Separate random effects logistic regression was used to examine the association among social network characteristics, social capital, and obesity. We found the greater the number of kin ties in a person's network, the greater the risk of obesity (OR: 1.33, 95% CI: 1.08–1.62). Adults with higher network diversity (OR: 0.83, 95% CI: 0.72–0.96) and high generalized trust (OR: 0.52, 95% CI: 0.35–0.77) were at a lower the risk of obesity. The current study confirmed that higher network capital and trust were protective against obesity, while having kin ties was not. Disentangling the multidimensional role that social capital plays can lead to more effective interventions to reduce obesity.

1. Introduction

Obesity is as a serious public health problem. The worldwide prevalence of obesity has nearly doubled between 1980 and 2008 (Stevens et al., 2012) and has been described as a global pandemic (Swinburn et al., 2011). To develop a greater understanding of the possible explanations of the obesity epidemic, research has increasingly examined the social and environmental influences driving the obesity epidemic (Hill and Peters, 1998; Reidpath et al., 2002). A number of recent studies have focused on social networks and social capital as important social influences affecting obesity incidence and prevalence. Research has shown social networks not only associated with obesity directly (Christakis and Fowler, 2007) but also with obesity-related behaviors, including smoking, diet, and physical activity (Lindström, 2011; MacDonald-Wallis et al., 2012; Pachucki et al., 2011).

The concept of social networks refers to the pattern of social ties existing among a set actors. While social networks have been shown associated with obesity (Powell et al., 2015; Trogdon et al., 2008), the strength and direction of that relationship often depends on the

characteristics of the social ties themselves. For example, analyses using Add Health data have shown the weight of an individual's peers associated with one's own weight, particularly among females and adolescents with an already high body mass index (BMI) (Trogdon et al., 2008). Furthermore, using longitudinal data from the Framingham Heart Study, Christakis and Fowler (2007) showed that a person's risk of obesity increased if their friend, sibling or spouse became obese (Christakis and Fowler, 2007), suggesting that strong ties may be more conducive to the spread of obesity than weak or non-mutual relationships. Strong ties (e.g., to kin) in a person's network are characterized by emotional attachment and high intimacy, and often involve people with similar socio-demographic and behavioral characteristics (Granovetter, 1973). The principle of homophily suggests that social interactions among people who are similar on certain characteristics (e.g., social class, race/ethnicity, kin) occurs at a higher rate than among those who are dissimilar (McPherson et al., 2001). Having a large number of kin in one's networks may therefore represent a greater degree of homogeneity and redundancy in the resources available to individuals as well as increased rates of social interaction among ties.

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Social capital refers to the resources that individuals and groups access through their social connections (Kawachi et al., 2008). There are two main approaches to the study of social capital in public health research: network capital and social cohesion approaches. Network capital approaches tend to focus on the resources embedded within a person's social network (Kawachi et al., 2008; Legh-Jones and Moore, 2012). Diverse network resources, a key component of network capital, tend to emerge from a person's weaker ties. Compared to a person's strong ties, their weak ties are more likely to link individuals to less redundant (i.e., more diverse) resources and provide broader information channels (Granovetter, 1973; Thoits, 2011). Cross-sectional studies on network social capital and obesity have shown higher network social capital associated with lower risk of being overweight or obese and smaller waist circumference in urban adults (Moore et al., 2009). Social cohesion approaches tend to measure social capital as the resources available to social groups (Legh-Jones and Moore, 2012) and disaggregate social capital into two dimensions: cognitive and structural. Cognitive social capital could cover trust, norm, reciprocity and perception of environment and structural social capital includes extent and intensity of social participation (Harpham et al., 2002). Studies using indicators of cognitive or structural social capital, such as trust or participation, have also shown social capital associated with a lower risk of obesity. For example, Poortinga found individuals with high trust were less likely to be obese than people with low trust (Poortinga, 2006); Ali and Lindström, 2006 showed that individuals with low compared to high levels of social participation were more likely to be overweight (Ali and Lindström, 2006).

Despite this previous research, there are several gaps in our knowledge of the relationship among social networks, social capital and obesity. First, most research has been based on cross-sectional data, and has thus been limited in the types of conclusions that might be drawn. Second, previous research has seldom compared measures of strong and weak ties to assess whether tie strength may alter the direction or strength of the relationship between social networks and obesity. Finally, little research has used a comprehensive set of measures to examine the relationship between different dimensions of social capital and obesity. Such knowledge would provide a greater understanding of the mechanisms linking social networks as well as social capital to obesity. The aim of this study is to examine longitudinally the relationship among social capital, social networks, and obesity. Using three waves of data, we test the following two main hypotheses:

- (1) Kin homogeneity hypothesis: Individuals with more kin in their social networks are at a higher risk of obesity than those with fewer kin.
- (2) Social capital hypothesis: Individuals with higher social capital have a lower risk of obesity.

2. Methods

2.1. Sample

Data came from three waves (2008, 2010, and 2013) of the Montreal Neighborhood Networks and Healthy Aging Study (MoNNET-HA). The MoNNET-HA study used a two-stage stratified cluster sampling design. In stage one, Montreal Metropolitan Area (MMA) census tracts ($N = 862$) were stratified into tertiles of high, medium, and low household income using 2001 Canada Census data. One hundred census tracts were randomly selected from each tertile ($n = 300$). In stage two, potential respondents within each tract were stratified into three age groups: 25–44 years old, 45–64, and 65 or older. Within each age group and census tract 3 respondents were randomly selected for a total of 9 respondents per tract, except for seven tracts in which four participants were selected. To be eligible for the study, participants had to be (1) be non-institutionalized, (2) have resided at their current address for at least one year, and (3) able to complete the questionnaire in French or

English. Wave 1 had a total sample size of 2707 adults.

Participants were administered a household questionnaire using a computer-assisted telephone interviewing system. Participants completed the initial telephone interview between mid-June and early August 2008 with follow up interviews conducted in the autumn 2010 (Wave 2; $n = 1400$) and the winter 2013/14 (Wave 3; $n = 972$). Additional information on the MoNNET-HA sample, including response and attrition rates for the panel and each wave, can be found elsewhere (Moore et al., 2014). The response rate was 38.7% for wave one, with overrepresentation of adults 65 years and older (by design), females, French-speaking households, adults who had lived at their current residence for more than five years, and those with more than a high school degree (Moore et al., 2014). Recurrent participants in MoNNET-HA (Wave 2 and 3) tended to be higher educated, dwell in French-speaking households, and between 35 and 74 years old (Moore et al., 2014). The study was approved by the Centre de recherche de l'Université de Montreal (CRCHUM) Committee of Scientific Evaluation (N.D.07.049) and Research Ethics and the General Research Ethics Board at Queen's University, Canada (GPHE-148-13).

2.2. Outcome – obesity

Participants reported their height in meters and weight in kilograms across three waves. This information was used to estimate self-reported body mass index (BMI) (kg/m^2) of each participant. Since there are well-documented reporting biases for self-reported BMI, an adjusted measure of BMI was calculated using a Statistics Canada correction factor based on the analysis of biases found in self-reported BMI. (Gorber et al., 2008) For men, adjusted BMI was recalculated as $-1.08 + (1.08 \times \text{self-reported BMI})$; for women, BMI was recalculated as $-0.12 + (1.05 \times \text{self-reported BMI})$. Obesity status was defined as an adjusted BMI $> 30 \text{ kg}/\text{m}^2$ in each wave using in the main analyses.

2.3. Main exposure – social network/social capital measures

Five social network and social capital measures from Wave one of the MoNNET-HA study were used: (1) social isolation, (2) number of kin ties, (3) network social capital, (4) generalized trust, and (5) social participation.

2.4. Social isolation and number of kin ties

To identify respondents' strong ties, the name generator/interpreter was used to collect network data, asking participants to name up to three people (i.e., their alters) with whom they had discussed important matters in the past six months. If participants reported not having discussed important matters with anyone, this was confirmed by asking them if they preferred not to answer the question or had not spoken with anyone. Those who confirmed not having spoken with anyone about important matters in the past six months were classified as social isolates. If participants named one or more discussant alters, a name interpreter instrument was used to ask participants whether those persons whom they named were kin, friends, or acquaintances. In the study, a strong tie was defined as core tie that was reported as being kin.

2.5. Network social capital

A position generator, which tends to capture people's weaker relationships, was used to measure network social capital (Lin, 2001). The position generator asked respondents to identify whether they knew someone on a first-name basis holding different occupations (Lin, 2001). To create the list of occupations on the position generator, a listing of 90 occupations was ranked from high to low prestige and grouped into octiles. One occupation was randomly selected from each

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