Running Head: Network Members' Socioeconomic Status and Body Weight Ratings

Does Your Body Know Who You Know?

Multiple Roles of Network Members' Socioeconomic Status for Body Weight Ratings[*]

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Social (as well as genetic) factors have been well demonstrated to influence body weight (Bombak 2014; Gard and Wright 2005; Bordo 2003; Bourdieu 1979/1984; McLaren 2007; Ross and Mirowsky 1983). Recently, the social network perspective on social determinants of body weight has stimulated much research (e.g., Christakis and Fowler 2007; Cohen-Cole and Fletcher 2008; de la Haye et al. 2011; Fletcher et al. 2011; Kiernan et al. 2012; Hruschka et al. 2011; Leahey et al. 2011; Trogdon et al. 2008; Valente et al. 2009). Accessed SES—network members' (or alters') socioeconomic status—has achieved decades-long prominence in the social network literature (Fischer et al. 1977; Homans 1950; Lazarsfeld and Merton 1954; Laumann 1966). However, its relationship with body weight has been given little attention (Christakis and Fowler 2007; Moore et al. 2009b).

The purpose of this study is to extend the theory of social capital (Lin 1982, 2001) to the domain of body weight by combining research on accessed SES with work on SES, gender, and lifestyle (Bordo 2003; Cockerham 2005; McLaren 2007; Ross 1994). We analyze four roles of accessed SES for body weight ratings: direct association, indirect association through lifestyle, mediating role in the relationship between SES and body weight ratings, and interaction with gender. Data are drawn from the 2004 General Social Survey (GSS) in the United States, which to our knowledge includes the only nationally representative data of adults with information on body weight and accessed SES. The data allow the measurement of body weight ratings (visually evaluated by GSS interviewers) and accessed SES on the educational dimension. The findings extend social capital theory and advance our understanding of the complex social dynamics of body weight at both the individual and network levels.

LITERATURE REVIEW

SOCIAL NETWORKS, ACCESSED SES, AND BODY WEIGHT

Traced back to Durkheim's classic study on suicide ([1897] 1951), the social network perspective has inspired a long research tradition on health consequences of various relationship-based factors (for reviews, see Berkman et al. 2000; House et al 1988; Pescosolido 2006; Smith and Christakis 2008; Song et al. 2011; Thoits 2011; Umberson and Montez 2010). Recently, this perspective has grown into a burgeoning approach to the social distribution of body weight.

Existing social network research on body weight centers on four network factors: alters' body weight, lifestyle, network norm, and social support. Using longitudinal community data collected in Framingham, Massachusetts, Christakis and Fowler (2007) first demonstrate that one (or ego) is more likely to become obese if connected to obese friends. The positive association between ego's and alters' weight and the positive association between ego's and alters' weight-related lifestyle are further confirmed in most later studies (e.g., Cohen-Cole and Fletcher 2008; de la Haye et al. 2011; Fletcher et al. 2011; Fowler and Christakis 2008; Hruschka et al. 2011; Leahey et al. 2011; Trogdon et al. 2008; Valente et al. 2009; VanderWeele 2011). Theoretically, from the social causation perspective, one major explanation for these positive associations is social network influence. In addition, network norm measured as alters' subjective attitude toward body shape and weight control is positively related to ego's weight loss intention and behavior (Leahey et al. 2011; Paxton et al. 1999). Furthermore, social support from alters is shown to facilitate ego's weight loss (Kiernan et al. 2012; Marcoux et al. 1990).

Accessed SES is an upstream structural attribute of personal networks. This attribute captures alters' positions in the socioeconomic hierarchy, and constitutes the meso-level hierarchical context in which ego dwells and socializes in daily life. Accessed SES can directly influence the aforementioned four network factors (i.e., alters' body weight, lifestyle, network norm, and social support). It has attracted voluminous research for its role in social interaction, social exchange, social comparison, status attainment, and health in the past six decades (Fischer et al. 1977; Homans 1950; Laumann 1966; Lazarsfeld and Merton 1954; for reviews see Lin 1999; Song 2013). Among diverse theoretical approaches to social capital (Bourdieu 1986 [1983]; Carpiano 2006; Coleman 1990; Lin 1982, 2001; Portes 1998; Putnam 2000), one network-based approach directly theorizes the function of accessed SES and can help us understand the significance of accessed SES for body weight (Lin 1982, 2001). Other approaches to social capital are beyond the scope of this present study.

Lin's network-based approach conceptualizes social capital as resources embedded in social networks, operationalizes it as assets alters possess, and specifies it as alters' hierarchical social positions especially alters' SES (Lin 1982, 2001). Two network instruments can be used to measure accessed SES: the position and name generators. The position generator asks respondents to identify contacts associated with a sample of occupational positions (Lin, Fu, and Hsung 2001). The name generator asks respondents to name contacts they discuss important matters with (Burt 1984). The network-based approach to social capital argues that accessed SES indicates nonredundant valuable social resources beyond and above ego's own resources, and can be accessed and mobilized to facilitate ego's purposive actions through multiple mechanisms, including exerting influences, offering information, serving as social credentials, and reinforcing group identity and recognition. Substantial empirical research verifies the positive impact of accessed SES on status attainment across societies over the past three decades (for reviews, see Lin 1999; Portes 1998). Recently, this network-based social capital theory has been extended to health and well-being outcomes (for a review, see Song 2013). Theoretically, accessed SES protects health through seven pathways: encouraging healthy norms, providing social support, cultivating healthy lifestyle, facilitating access to health care, decreasing stress exposure, advancing social status, and reinforcing psychological resources (Erickson 2003; Song 2011; Song and Lin 2009). The positive associations between accessed SES and various health-related outcomes (e.g., physical and mental health, life satisfaction, health information search, and smoking cessation) are demonstrated across societies (Acock and Hurlbert 1993; Christakis and Fowler 2008; Haines et al. 2011; Moore et al. 2011; Song 2011; Song and Lin 2009; Song and Chang 2012; Verhaeghe and Tampubolon 2012).

Three studies have examined the impact of accessed SES on weight-related outcomes (Christakis and Fowler 2007; Legh-Jones and Moore 2012; Moore et al. 2009b). Two of them analyze data from a community sample of young and middle-aged adults (eighteen to fifty-five years old) in Montreal, Canada (Legh-Jones and Moore 2012; Moore et al. 2009b). They measure accessed SES on the occupational dimension using the position generator. They find that accessed occupational status is negatively associated with body weight (measured by waist circumference and body mass index) and physical inactivity. Another study uses data from a longitudinal community sample of adults aged twenty-one or older in Framingham, Massachusetts (Christakis and Fowler 2007). It measures accessed education using the name generator, and shows no significant association between accessed education and body weight (measured by body mass index). Note that some prior studies focus on parents or households and contribute to documenting a negative association between parental or household SES and body weight (Ball and Mishra 2006; Baum and Ruhm 2009; Langenberg et al. 2003; O'Dea and Caputi 2001; Schmeer 2010). But these studies are limited to only family relationships. They do not completely capture one’s personal networks and thus cannot fully measure accessed SES.

In sum, despite the growing attention to the association between social networks and body weight, the role of accessed SES remains underexplored. The two existing studies report mixed evidence. Moore et al. (2009b) finds a direct negative association between accessed occupation and body weight, but the Christakis and Fowler (2007) reports no evidence for the direct association between accessed education and body weight. These inconsistent results may be due to four major differences respectively in research designs, samples, societies, and measurements of accessed SES. Furthermore, the results from these three studies lack national representativeness and generalization due to their data limitations. Theoretically more importantly, how accessed SES works together with well-documented individual-level social determinants of body weight (i.e., SES, gender, and lifestyle) remains unclear.

SES AND BODY WEIGHT

SES is in general positively associated with perceived body weight but negatively associated with actual body weight in developed countries (Chang and Christakis 2003; Sobal and Stunkard 1989). In a recent literature review on the association between SES and obesity/overweight (McLaren 2007), more than 65 percent of all report associations involving education are negative, 2 percent positive, and 33 percent nonsignificant or curvilinear (N=48). The corresponding numbers for occupation and income are respectively 59, 4 and 37 percent (N=27), and 31, 8 and 61 percent (N=62). The fact that education plays a more consistent negative role than occupation and income may be due to its more direct relevance to body weight. Education can be more directly positively related to the internalization of social expectations on body weight, health literacy, weight concern, sense of control, and weight-related lifestyle earlier on in people's lives (McLaren 2007; Ross and Wu 1995; Trost et al. 2012). Occupation may affect body weight through its physical requirement, working environment, and social status. The role of income may come in last in the form of financial and time investment in weight management.

GENDER AND BODY WEIGHT

Gender affects body weight mainly due to gendered social norms on body weight. The slenderness norm is more strictly imposed on women than on men (Bordo 2003; Hesse-Biber 2007). Women are more likely to evaluate themselves as overweight, suffer from body dissatisfaction, perceive weight stigma and discrimination, and engage in weight management practices (Chang and Christakis 2003; Schafer and Ferraro 2011; Warin et al. 2008). Women but not men pay socioeconomic, marital status, and social penalty due to excess body weight (Conley and Glauber 2007; Crosnoe, Frank, and Mueller 2008). In contrast, men face two gender norms: breadwinning and masculinity (Courtenay 2000; McLaren 2007). The norm of gendered division of labor labels men as breadwinners who should aim at socioeconomic resources. Men are also more expected to choose physical labor careers. At the same time, a larger body size remains an important symbol of masculine identity and social dominance for men.

Note that SES interacts with gender (Ross 1994). Thinness is a more distinctive symbol of socioeconomic positions for women than men (Bourdieu 1979/1984). As a recent literature review on the association between SES and obesity/overweight reports (McLaren 2007), among developed societies, more than 95 percent of all report significant associations for women are negative and less than 5 percent positive (N=480), while the corresponding numbers for men are respectively 80 and 20 percent (N=262).

LIFE STYLE AND BODY WEIGHT

Weight-related lifestyle reflects collective patterns of weight-related behaviors, including dietary habits, and light, moderate or vigorous physical activities and exercise such as walking, running, basketball, aerobics, tennis, swimming, biking, and lifting heavy objects (Grzywacz and Marks 2001; Ross 1994; Wardle and Griffith 2001). Weight-related behaviors benefit weight management and control and are negatively associated with body weight (Bauman 2004; Ross 1994). As described later, although collecting no data on weight-related lifestyle, the 2004 GSS has information on athletic identity. Athletic identity refers to "one's perception of him/herself as a person who participates in exercise, sports, and physical activity or as one who does not, and the active efforts made to verify this self-view" (Anderson 2004: 39). It predicts and can serve as a proximate indicator of weight-related lifestyle. Self-rated measures of athletic identity have proven to be positively associated with exercise status, exercise frequency, physical and athletic activities, and sports participation (Anderson 2004; Anderson et al. 2009; Lamont-Mills and Christensen 2006; Lau, Fox, and Cheung 2004; Schutte and McNeil 2015). In the study of Anderson (2004), for example, the significant positive coefficients for the correlations between four latent factors of athletic identity (i.e., appearance, importance, competence, and encouragement) and a latent factor of physical activity with two indicators (i.e., stage of exercise behavior and exercise frequency per week) are strong and range from .56 to .90.

HYPOTHESES: FOUR ROLES OF ACCESSED SES FOR BODY WEIGHT RATINGS

Based on available data and prior work on accessed SES, SES, weight-related lifestyle, and gender, this study theorizes four roles of accessed SES in the social distribution of body weight ratings (see Figure 1): 1) direct association (Figure 1a); 2) indirect association through lifestyle

(Figure 1b); 3) mediating role in the relationship between SES and body weight ratings (Figure 1c); and 4) interaction with gender (Figure 1d).

Insert Figures 1a-1d about here

Direct and Indirect Associations

The network-based theory of social capital argues that accessed SES represents valuable social resources (Lin 1982, 2001). As such, accessed SES can be associated with body weight for three reasons: network norm, social support, and lifestyle. First, alters' SES can shape network norm (Song and Chang 2012). Network norm can regulate people's attitude toward and belief about body weight. Higher-SES people are more weight conscious and more concerned about body image and weight management (Bourdieu 1979/1984; Chang and Christakis 2003; McLaren 2007; O'Dea and Caputi 2001; Schafer and Ferraro 2011; Wardle and Griffith 2001; Williams 1995). If surrounded by higher-SES alters, ego are exposed to a stronger network norm of weight control and more conscious of body weight (Brewis et al. 2011; Hruschka et al. 2011; Leahey et al. 2011; Paxton et al. 1999). Second, alters' SES can determine the quantity and quality of social support available from alters (Lin and Ao 2008; Song et al. 2011). Weight management requires the investment of "economic and cultural means" (Bourdieu 1979/1984). Higher-SES contacts may be more able to offer ego diverse forms of assistance (e.g., informational, instrumental, emotional, appraisal, and financial aid) with weight management or loss (Kiernan et al. 2012; Marcoux et al. 1990; Trost et al. 2002). Third, alters' SES can help cultivate lifestyle. Lifestyle is an objective product of socioeconomic standing (Bourdieu 1979/1984; Cockerham 2005; Weber

1978). Higher-SES people are more likely or able to practice and manifest weight-control lifestyle (Grzywacz and Marks 2001; Ross 1994; Wardle and Griffith 2001; Trost et al. 2002). If connected to higher-SES alters, ego are more likely to observe and imitate those weight-control behaviors (Paxton et al. 1999). Therefore, the direct-association or social resources hypothesis states that accessed SES is negatively associated with body weight ratings (H1; see Figure 1a).

Athletic identity strongly predicts athletic and physical activities, and can serve as a proximate indicator of weight-related lifestyle (Anderson 2004). Ego with higher-status alters can be more likely to be athletically and physically active and develop athletic identity, and thus be less likely to be overweight (Legh-Jones and Moore 2012; Ross 1994; Yang, Telama, and Laakso 1996). The indirect-association or lifestyle hypothesis states that accessed SES is negatively associated with ego's body weight ratings indirectly through its positive association with ego's athletic identity (H2; see Figure 1b).

Mediating Roles

Social capital indicated by accessed SES is an endogenous social factor. It can act as a mediating pathway, linking its social antecedents with instrumental and expressive outcomes (Lin 2001; Song 2011). This present study focuses on one of the most documented social precursors of accessed SES as well as body weight: ego's SES or personal capital (i.e., resources ego possesses and controls) (Lin 1999; McLaren 2007; Sobal and Stunkard 1989). Ego's SES is convertible to accessed SES through three possible mechanisms (Bourdieu 1983/1986; Lin 2001; Song 2011). First, in comparison with lower-SES egos, higher-SES egos may have more structural opportunities to encounter contacts who occupy higher socioeconomic positions in society. Second, higher-SES egos possess more resources, and may be more able to invest in social networking and reach higher-SES alters. Third, higher-SES egos may be more attractive to higher-SES alters due to the homophily principle (i.e., people tend to associate with like others) (McPherson et al. 2001). Therefore, based on the direct- and indirect-association hypotheses (H1, H2), two mediating-role or capital convertibility hypotheses state that accessed SES by itself (H3a) or together with athletic identity (H3b) negatively mediates the relationship between ego's SES and body weight ratings (see Figure 1c).

Interaction with Gender

The impact of accessed SES on body weight can be moderated by gender norms on body weight and division of labor. We propose two alternative hypotheses on this moderating process by drawing on prior work on the interaction effect between SES and gender on body weight. As reviewed before, there are two gender-specific patterns: 1) more consistent evidence for a negative SES-obesity association among women than men, and 2) relatively stronger evidence for a positive SES-obesity association among men than women (McLaren 2007).

The first pattern manifests the more strict imposition of the slenderness norm on women, in particular higher-SES women (Bordo 2003; Hesse-Biber 2007). Higher-SES women are more dissatisfied with weight and more likely and able to practice weight-control lifestyle than lower-SES counterparts (McLaren and Kuh 2004; Warin et al. 2008). When connected with higher-SES alters, in contrast with men, women have to conform to a more coercive network norm of slenderness, seek and receive more social support, practice more weight-control behaviors, and mobilize more of their alters' resources for weight management. Thus, the first interaction-with-gender (or ideal slender women) hypothesis states that accessed SES is negatively associated with body weight ratings to a greater degree for women than for men (H4a; see Figure 1d).

The second pattern suggests the coexistence of two gender norms among men: breadwinning and masculinity (Courtenay 2000; McLaren 2007). If surrounded by higher-SES alters, men may be exposed to a stronger network norm of breadwinner masculinity and be less concerned about weight management and risks of excess weight. Based on the dominant negative SES-obesity association among women (McLaren 2007), the second interaction-with-gender (or men as masculine breadwinners) hypothesis states that accessed SES is associated with body weight ratings positively for men but negatively for women (H4b; see Figure 1d).

DATA AND METHODS

Data

Data were drawn from the 2004 U.S. GSS. The GSS is a repeated cross-sectional survey of a nationally representative sample of non-institutionalized U.S. adults, which has been conducted by the National Opinion Research Center since 1972. Using a full-probability sample design, the GSS interviewed respondents face to face through computer-assisted personal interviewing. The GSS regularly includes topical modules apart from core items, but does not administer all modules to all respondents. The 2004 GSS includes two modules among others: 1) social networks, and 2) genes and the environment. The first module allows the measurement of accessed SES and the second one has information on athletic identity and body weight ratings.

The 2004 GSS has a response rate of 70.4 percent with a sample size of 2,812. The subsample for this study included only those respondents who were administered both the social networks module and the genes and the environment module (N=1,273). The subsample is nationally representative, although its size is smaller than the full sample size (Song and Chang 2012). The comparison of all used variables' characteristics in the full GSS sample and the subsample found no significant difference. As in previous studies on ego-centered networks (Marsden 1987; Song and Chang 2012), we had to exclude social isolates naming no contact (N=276) and the subsample size dropped to 997 after that exclusion. Supplemental analyses showed no significant correlations of social isolation (1= naming no contacts, 0=naming one or more contacts) with athletic identity and body weight. The listwise deletion of cases with missing values on the variables of interest can further incur a loss of 22 percent of the subsample. We employed the multiple multivariate imputation method in Stata to correct missing-data bias and imputed missing values in the variables of interest based on ten imputations (Royston 2005). Multiple imputation assumes that data are missing at random (MAR). Our sensitivity analysis through applying the pattern-mixture model approach suggested that departures from the MAR assumption did not affect our conclusions (Allison 2002). Each of these ten imputed data sets included 974 respondents. Occupational prestige was not imputed for respondents who never worked as long as one year (N=23). Table 1 shows the summary of unweighted raw sample characteristics. Also the 2004 GSS adopted a non-respondent, sub-sampling design, and we weighed its data using one sampling weight variable, WTSS. The sampling weight variable, WTSS, "takes into consideration a) the sub-sampling of non-respondents, and b) the number of adults in the household" (Smith et al. 2011: 3103).

Insert Table 1 about here

Dependent Variable

Body weight ratings. The 2004 GSS interviewers visually rated respondents' weight without asking ("If respondent is pregnant, consider her weight aside from being pregnant.") on a broad four-point scale (1=below average; 2 =average; 3=somewhat above average; 4=considerably above average). We have some reasonable confidence with interviewers' evaluation for two reasons: 1) interviewers are experienced and well-trained, and assess respondents' body weight using only four broad categories rather than a detailed scale; and 2) supplemental analyses find no associations between interviewers' social attributes (i.e., age, gender, race/ethnicity, and years of service) and their evaluation. There is evidence that well-trained personnel can accurately or adequately estimate actual body weight in general (Arsalani-Zadeh et al. 2010; Lim et al. 2013).

Independent Variables

Accessed SES. The 2004 GSS collected information on ego-centered networks using the name generator (Burt 1984). The original wording for the first question is: "From time to time, most people discuss important matters with other people. Looking back over the last six months, who are the people with whom you discussed matters important to you? Just tell me their first names or initials." The first five names (alters) were recorded. Respondents who named one or more alters were further asked the highest educational level of each alter (1=0–6 years; 2=7–9 years; 3=10–12 years; 4=high school graduate; 5=some college; 6=associate degree; 7=bachelor's degree; 8=graduate or professional degree). Similar to previous studies using the name generator (Acock and Hurlbert 1993; Song and Chang 2012; Haines et al. 2011), we calculated two indicators of accessed SES on the educational dimension: alters' average education and proportion of alters with some college education or more. We conducted analyses separately using the two indicators for two reasons. First, the two indicators were highly correlated with each other (.858, $p<.001$). They were analyzed separately to avoid multicollinearity. Second, prior studies and their measurement-specific results suggest the possible distinction between different indicators of accessed SES (Song 2015a; Song and Chang 2012).

Athletic identity. The 2004 GSS asked one question on athletic identity: "please indicate how well the description ("an athletic person") applies to you". This item was ordinal rated on a five-point scale (1=a very good description; 2=a good description; 3=a fair description; 4=not a very good description; 5=not a good description at all). We reversed the order of these five responses so that the higher the score, the more athletic respondents perceived themselves.

Gender was a dummy variable (0=female; 1=male). Three socioeconomic indicators were years of education, occupational prestige coded through the NORC/GSS Occupational Prestige scores (Nakao and Treas 1990), and annual family income in constant dollars. We applied a logarithmic transformation to normalize the distribution of annual family income.

All analyses controlled for three demographic factors, one indicator of employment status, and two network structure factors. Demographic factors included age in years, race/ethnicity (0=minority, including black and other races/ethnicities; 1=white), and marital status (0=unmarried; 1=married). Employment status was a binary variable (0=not employed full time; 1=employed full time). Two network structure factors—network size (the number of alters) and role relationship (proportion of alters who were family members)—were controlled for a robust test of the impact of accessed SES. Supplemental analysis found no significant interaction effect between role relationship and accessed SES in the prediction of body weight.

Analytic Strategy

This study first conducted bivariate analysis of the associations between accessed education and body weight ratings, athletic identity, and SES. Then, it estimated path analysis models using the

Mplus program to simultaneously examine the first three hypotheses (Muthén and Muthén 1998-2012). It used the robust mean- and variance-adjusted weighted least squares estimator because of the presence of both continuous and ordinal dependent variables. We estimated a path analysis model with three equations, respectively, for three dependent variables: accessed education (Y_1), athletic identity (Y_2), and body weight ratings (Y_3). The first equation was an ordinary least squares regression of two continuous indicators of accessed education on control variables (X_1). The second equation was an ordinal logistic regression of athletic identity on accessed education and control variables. The third equation was an ordinal logistic regression of body weight ratings on athletic identity, accessed education, and control variables. Two approaches—the Sobel test and the bootstrapping method—were used to evaluate the indirect and mediating roles of accessed education (Bollen and Stine 1990; Sobel 1982). Note that no statistical methods are available for running path analysis of dyadic observations with clustering on the ego. To examine the interaction between accessed education and gender, we added the product term of gender with mean-centered accessed education (X_2) to equation 3 (see equation 4). Significant coefficients of product terms indicate the presence of interaction (Cohen and Cohen 1983). Supplemental dyadic analysis found similar results.

$$Y_1=f(X_1) \tag{1}$$

$$Y_2=f(X_1+Y_1) \tag{2}$$

$$Y_3=f(X_1+Y_1+Y_2) \tag{3}$$

$$Y_3=f(X_1+Y_1+Y_2+X_2) \tag{4}$$

RESULTS

Table 1 shows the summary of unweighted raw sample characteristics. Most of the sample (68%) were rated as average body weight, with women significantly more often rated as both below average and above average than men. The majority of the sample (59%) identified with being an athletic person, with men having significantly stronger athletic identity than women.

Accessed Education and Body Weight Ratings

Our bivariate analysis showed that at the p-value of .001, alters' average education was correlated negatively with body weight ratings (-.108) and positively with other four key variables: athletic identity (.135), years of education (.554), occupational prestige (.404), and annual family income (.314). At the p-value of .001, the proportion of alters with some college education or more was correlated negatively with body weight ratings (-.114) and positively with athletic identity (.140), years of education (.476), occupational prestige (.315), and annual family income (.254). We also conducted separate bivariate analysis for men and women and found similar results with one exception. The negative correlations between the two indicators of accessed education and body weight ratings were significant only for women.

Next, we estimated two path analysis models to simultaneously examine the direct, indirect, and mediating roles of accessed education for body weight ratings (see equations 1-3, and Table 2). The results support two of the four hypotheses (H2, H3b). Net of control variables including ego's own education, alters' average education was not directly associated with body weight ratings (see equation 3 and Model 1). But it was positively associated with athletic identity (.077, $p<.01$), which in turn had a negative association with body weight ratings (-.179, p<.001; see equation 2). As results from both the Sobel test and the bootstrapping method indicated, alters' average education was indirectly associated with body weight ratings through athletic identity in a negative direction (-.014, p<.05). Adults connected with on average more educated contacts perceived themselves more athletic, and further the more athletic adults had lower body weight ratings. Furthermore, all three indicators of SES—education (.213, p<.001), occupational prestige (.012, p<.01), and annual family income (.198, p<.001)—had positive associations with alters' average education, but only education was associated with body weight (-.055, p<.01; see equation 1). As results from both the Sobel test and the bootstrapping method showed, alters' average education played a significant negative mediating role (-.003, p<.05), together with athletic identity, in the relationship between education and body weight ratings. More educated adults had on average more educated contacts, and those tied to, on average, more educated contacts were more athletic and had lower body weight ratings. Supplemental analyses found no evidence for the indirect effects of other factors apart from that of education on body weight ratings through accessed SES and athletic identity.

Insert Table 2 about here

The results in Model 2 are similar to those in Model 1. The second indicator of accessed education (proportion of alters with some college education or more) was negatively associated with body weight ratings at a marginal significance level (-.239, *p*<.10) (see equation 3 and Model 2). But it had a positive association with athletic identity (.254, p<.05; see equation 2) which in turn was negatively associated with body weight ratings (-.175, p<.001). As results from both the Sobel test and the bootstrapping method indicated, its negative indirect association with body weight ratings through athletic identity was significant (-.044, p<.05). Furthermore, all three indicators of SES—education (.052, p<.001), occupational prestige (.002, p<.05), and family income (.047, p<.01)—had positive associations with this indicator of accessed education, but only education was associated with body weight ratings (-.055, p<.01; see equation 1). As results from both the Sobel test and the bootstrapping method showed, this indicator of accessed education together with athletic identity negatively mediated (-.002, p<.05) the association between education and body weight ratings.

Interaction between Accessed Education and Gender

Finally, we examined the interaction between accessed education and gender by entering product terms of gender with two mean-centered indicators of accessed education respectively into the ordinal logistic regression model of body weight ratings (see equation 4 and Table 3). Results support one of the two interaction-with-gender hypotheses (H4b). Both indicators of accessed education positively interacted with being male (.226, p <.05; 1.238, p<.01) (see Models 1 and 2). They were associated with body weight ratings positively for men (.041, .243) but negatively for women (-.185, -.995). With more educated network members, men had higher body weight ratings, but women had lower body weight ratings. Supplemental analysis created a binary variable to indicate above-average body weight ratings (0=below average or average, 1=somewhat or considerably above average), and found similar results with one exception. Alters' average education interacted with gender at a marginal significance level (p<.10).

<u>Insert Table 3 about here</u>

CONCLUSION AND DISCUSSION

Analyzing nationally representative data from the 2004 U.S. GSS, this study systematically examines four roles of accessed education in the social distribution of body weight ratings. Accessed education is associated with body weight ratings indirectly through athletic identity. Also it mediates, together with athletic identity, the association between education and body weight ratings. Furthermore, the association between accessed education and body weight ratings is positive for men but negative for women. Findings in this study advance our theoretical understanding of network, socioeconomic, lifestyle, and gender disparities in body weight.

This study contributes to the existing literature in five ways, theoretically and methodologically. First, its findings support the extension of social capital theory (Lin 1982, 2001) into body weight through the pathway of lifestyle, and suggest the theoretical utility of integrating social capital theory with classic stratification theories on lifestyles (Bourdieu 1984 [1979]; Cockerham 2005; Weber 1978). Although showing no evidence for the direct association between accessed education and body weight ratings, this study finds that accessed education is indirectly associated with body weight ratings through athletic identity in a negative direction. Individuals' body weight can be associated with not only their own education, but also their network members' education. Net of their own SES or personal capital, network size, role relationship, and other sociodemographic characteristics, adults living in a higher-SES network context perceive themselves more athletic and more athletic adults have lower body weight ratings. Also, lifestyle scholars tend to emphasize the decisive role of personal capital in the formation of lifestyles (Bourdieu 1984 [1979]; Cockerham 2005; Weber 1978). This study sheds light on the independent association between social capital and athletic lifestyle net of personal capital. In particular, note that alters' average education is positively associated with athletic lifestyle more significantly and strongly than ego's own education. As these findings imply, policy interventions on lifestyle and body weight should not just target individuals but take into consideration socioeconomic attributes of social contacts. For a more complete picture of the role of accessed SES and the extension of social capital theory, future research needs to directly measure lifestyle, and examine other possible mechanisms linking accessed SES to body weight.

Two prior studies have mixed results on the direct effect of accessed SES. Christakis and Fowler (2007), as in our study, report that accessed education is not directly associated with body weight. Moore and colleagues (Moore et al. 2009b) find that accessed occupation is directly and negatively associated with body weight. Four major differences—respectively in research designs, samples, societies, and measurements—between these three studies may account for their inconsistent results. Christakis and Fowler examine longitudinal community data of adults in Framingham, Massachusetts. Moore and colleagues analyze community data of young and middle-aged adults in Montreal, Canada. Our study examines nationally representative GSS data in the United States. Also, accessed SES is captured on the educational dimension through the name generator in the Framingham study and our study but measured on the occupational dimension through the position generator in the Montreal study. Furthermore, body weight is measured objectively in the two prior studies but subjectively in our study. Although results here cannot be considered conclusive and cannot reconcile the discrepancy in prior work, together with prior findings, they imply that accessed occupation may be more strongly related to body weight than accessed education. In order to address such inconsistency and achieve generalizability, future efforts need to collect nationally representative data on multi-dimensional measurement of accessed SES and diverse indicators of body weight.

Second, this study demonstrates the convertibility argument on the relationship between personal and social capital (Bourdieu 1983/1986; Lin 2001). It expands our understanding of social precursors of social capital, and extends our knowledge of network mechanisms for persistent socioeconomic differences in body weight. As this study finds, accessed education together with athletic identity mediates the relationship between education and body weight ratings. Consistent with prior research demonstrating education as the most significant socioeconomic determinant of body weight (McLaren 2007), education is the only significant socioeconomic predictor of body weight ratings in this study. Although the other two indicators of SES—occupational prestige and annual family income—are also positively related to accessed SES, education is the only variable whose association with body weight ratings is mediated by accessed education and athletic identity. Results here indicate that a higher-education network context together with athletic lifestyle may help convert educational advantage to lower body weight, and that network attributes can be endogenous to individuals' own structural locations. Also, these findings support the growing critique of healthism and neoliberalism (Broom 2008; Campos 2004; Williams 2003). Body weight and health lifestyle are not simply matters of personal responsibility or outcomes of individuals' own choices. They are related to multiple layers of structural factors, such as education at the individual and network levels. To achieve a more comprehensive framework of the multilevel social production of body weight, future research should pay more attention to the mediating roles of network-level factors in linking individual-level social positions to body weight. Note that results vary by the dimension of accessed SES (Christakis and Fowler 2007; Moore et al. 2009b). Future research should collect data on all three dimensions of accessed SES (e.g., occupation, income, or wealth), and compare their mediating roles in the SES-weight relationship.

Third, this study finds the association between accessed education and body weight ratings to be in opposite directions for men and women, and adds to our comprehension of network mechanisms for the gendered construction of body weight. Dwelling in a higher-education network context, men are likely to have higher body weight ratings, while the opposite pattern applies to women. Social capital embedded at meso-level social networks bridges the micro- and macro-levels of society (Coleman 1990; Lin 2001). A higher-education network context can help produce and reproduce the gendered social norm of body weight—the slenderness ideal for women and the masculine breadwinner role for men—at the network level. The gendered network norm on body weight can be one network explanation for the higher prevalence of overweight or obesity among men than women (Hedley et al. 2004). Similar to some prior evidence on the puzzling positive SES-weight relationship among men (McLaren 2007), the positive association between accessed education and body weight ratings among men calls for future research on direct examination of possible explanations.

Furthermore, our gender-specific findings refine Lin's network-based theory of social capital (Lin 1982, 2001). Our study challenges the validity of one central assumption in that theory, that is, the social resources assumption. The social resource assumption conceives of accessed SES as valuable nonredundant social resources. Accessed SES is hypothesized to have only a positive and protective function in generating instrumental (e.g., wealth, power, and reputation) and expressive (e.g., health and life satisfaction) returns. Its positive function has been the focus of, and demonstrated by, most of relevant empirical studies (for reviews, see Lin 1999; Portes 1998; Song 2013). But our study finds that the role of accessed education for body weight ratings can be positive and negative, depending on gender. Accessed education can influence body weight through enhancing the body weight norm at the network level. But its function operates in opposite directions for the two gender groups because the body weight norm per se has gendered expectations. Our study adds to several recent studies that critically question the generalizability of the social resource assumption in social capital theory (Moore et al. 2009a; Song 2014, 2015a, 2015b; Verhaeghe et al. 2012). In order to further develop the theory of social capital as accessed SES, future research should pay more attention to how the role of accessed SES can be contingent on other social factors.

Beyond its substantive theoretical significance, this present study has methodological implications for the measurement of accessed SES. Previous studies using the name generator measure two indicators of accessed SES on the educational dimension: alters' average education and proportion of alters with certain educational levels or more (Acock and Hurlbert 1993; Haines et al. 2011; Song and Chang 2012). As this study shows, the use of the two indicators produces consistent results. Therefore, not only each alter but also higher-education alters matter for body weight. Some prior studies on health and well-being outcomes find measurement-specific results (Song 2015a; Song and Chang 2012). Their results vary by indicators of accessed SES. Taken together, these findings suggest that whether different indicators of accessed SES exert consistent effects is contingent on outcomes. Note that the name generator is not as efficient as the position generator in capturing the full range of accessed SES (Song and Lin 2009; Van der Gaag et al. 2008). Future research should employ the position generator to more fully capture the impact of accessed SES.

This present study is only a starting point for systematically exploring multiple roles of accessed SES for body weight. It has four data limitations that call for caution in the interpretation of its findings and stimulate further investigation. First, the 2004 GSS data are cross-sectional. They do not allow us to reconcile the persistent debate over social causation versus social selection. The social causation perspective states that SES, accessed SES, and lifestyle affects body weight, while the social selection perspective argues vice versa. Our study proposes hypotheses from the social causation perspective for one methodological reason. The key explanatory variable—accessed education—was measured retrospectively over the last six months prior to the survey. Body weight ratings were measured at the survey time and serve more appropriately as the outcome variable. But due to the cross-sectional nature of the data, our study is in no way to causally confirm the social causation perspective, deny the social selection perspective, or reject the coexistence of these two perspectives. Social selection explanations are possible for us to interpret our significant findings here. People who are overweight or obese may be less likely to be physically active and develop athletic identity, either because of their own intentional withdrawal or discriminatory social exclusion by others (Trost et al. 2012). People may choose to adopt a more active and athletic lifestyle in the hope of meeting higher-SES contacts. People may make efforts to get included into higher-SES networks for the purpose of status attainment and mobility (Conley and Glauber 2007). Women may perform rigid weight control and management in order to get connected with higher-SES circles (Crosnoe et al. 2008). Men may identify themselves with masculine breadwinners and pay less attention to body weight for the goal of entering a higher-SES network. Additionally, the negative association between education and body weight ratings may be partly due to weight stigma (Bombak 2014; Crosnoe and Muller 2004). For the purpose of causality tests, longitudinal data are needed.

Second, the 2004 GSS rests on interviewers' visual categorization of respondents' body weight. Ideally body weight can be objectively measured as a continuous variable (e.g., BMI). GSS categorizes respondents' body weight into four ordered groups. Categorical data lose finer information. Statistical analysis of categorical data is less powerful than that of continuous data

(Agresti 2010). Despite our reasonable confidence with GSS interviewers' visual evaluation, there can be measurement errors including those due to interviewers' gender bias. Future research should use objective continuous measurement of body weight to replicate hypotheses in this study. Third, in this study athletic identity serves as a subjective indirect indicator of lifestyle. Future work should measure lifestyle directly and objectively. Finally, the 2004 GSS uses the name generator to capture ego-centered networks. Ego's report of alters' education may be biased. The GSS does not probe egos to report alters' body weight, the entry of which into statistical models can help test the robustness of the effect of accessed SES. The name generator tends to map networks characterized by strong ties (i.e., high-intimacy relationships) (Marsden 1987). The position generator captures networks less constrained by strong ties (Lin et al. 2001). Future research should collect data on accessed SES simultaneously measured through both generators and examine whether results vary by these two network instruments.

Despite its limitations, the 2004 GSS provides the only nationally representative data of adults with information on body weight ratings and accessed SES. This study develops the theory of social capital as network members' resources through combining it with prior work on three social determinants of body weight (i.e., SES, gender, and lifestyle). This study advances our knowledge of the interplay between network- and individual-level social determinants of body weight. It represents a major advance by shedding light on three non-direct functions of accessed education. Accessed education has a positive association with athletic identity that is negatively related to body weight ratings. It can work together with athletic identity as one mechanism for educational disparity in body weight ratings. It can enhance the operation of gendered body weight norm within personal networks.

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Table 1. Dependent and Independent Variable Distributions by Gender (Unweighted Raw Sample)

Variables	Mean(SD)/Percent(N)		
	Full Sample (N=974)	Men (N=424)	Women (N=550)
Dependent Variable			
Body Weight Ratings***			
Below Average	7% (67)	4% (15)	10% (52)
Average	68% (629)	74% (295)	64% (334)
Somewhat above Average	19% (177)	17% (69)	21% (108)
Considerably above Average	5% (49)	5% (20)	6% (29)
Independent Variables			
Athletic Identity (Being an Athletic Person is)***			
Not a Good Description at All	12% (117)	6% (27)	17% (90)
Not a Very Good Description	29% (274)	23% (94)	33% (180)
A Fair Description	31% (300)	32% (135)	30% (165)
A Good Description	17% (171)	24% (101)	12% (70)
A Very Good Description	11% (110)	16% (67)	8% (43)
Accessed Socioeconomic Status			
Alters' Average Education*	5.37 (1.50)	5.48 (1.52)	5.29 (1.48)
Proportion of Alters with Some College Education or More†	60%	63%	58%
Age (Years)*	45.14 (16.06)	46.03 (16.00)	44.26 (16.38)
Gender (1=Male)	44% (424)		
Race/Ethnicity			
White	82% (798)	83% (350)	82% (448)
Minority (Black and Other Race/Ethnicity)	18% (176)	17% (74)	18% (102)
Marital Status (1=Married)*	56% (542)	58% (251)	53% (291)
Employment Status (1=Employed Full Time)***	54% (525)	62% (265)	46% (260)
Socioeconomic Status			
Education (Years)†	14.01 (2.84)	14.14 (3.04)	13.86 (2.70)
Occupational Prestige	46.46 (14.40)	46.96 (14.30)	46.08 (14.48)
Annual Family Income (Dollars)***	56,625 (44,466)	61,289 (43,805)	53,030 (44,678)
Network Size (Number of Alters)*	2.71 (1.40)	2.63 (1.42)	2.77 (1.38)
Role Relationship (Proportion of Alters Who Were Family Members)*	58%	55%	60%

Note: T-test (two-tailed tests) and chi-square by gender: †$p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 2. Parameter Estimates of the Path Analysis Models of Accessed Socioeconomic Status, Athletic Identity, Body Weight Ratings, and Control Variables (N=974)

	Path Analysis Model 1			Path Analysis Model 2		
	Average Education of Alters	Athletic Identity	Body Weight Ratings	Proportion of Alters with Some College Education or More	Athletic Identity	Body Weight Ratings
Age	.007**	-.010***	.005†	.000	-.009***	.006*
	(.003)	(.002)	(.003)	(.001)	(.002)	(.003)
Gender (1=Male)	.065	.546***	.122	.017	.547***	.136†
	(.086)	(.071)	(.087)	(.025)	(.072)	(.083)
Race/Ethnicity (1=White)	-.032	-.103	-.059	.018	-.106	-.045
	(.117)	(.097)	(.110)	(.033)	(.098)	(.110)
Marital Status (1=Married)	.083	-.127	-.070	.024	-.126	-.065
	(.100)	(.087)	(.098)	(.030)	(.088)	(.096)
Education (Years)	.213***	.035†	-.055**	.052***	.039*	-.055**
	(.023)	(.020)	(.019)	(.006)	(.019)	(.020)
Employed Full Time	-.057	-.001	.252**	-.026	.003	.245**
	(.089)	(.074)	(.087)	(.025)	(.074)	(.086)
Occupational Prestige	.012**	-.001	.005	.002*	-.001	.004
	(.004)	(.003)	(.003)	(.001)	(.003)	(.004)
Annual Family Income (log)	.198***	.021	-.037	.047**	.023	-.040
	(.059)	(.046)	(.052)	(.017)	(.046)	(.051)
Network Size (Number of Alters)	.046	.028	.029	.007	.032	.030
	(.033)	(.026)	(.034)	(.009)	(.026)	(.031)

Role Relationship (Proportion of Alters as Family Members)	-.544***	.063	.006	-.108**	.058	.005
	(.120)	(.097)	(.118)	(.035)	(.098)	(.120)
Accessed Socioeconomic Status						
Average Education of Alters		.077**	-.047			
		(.033)	(.035)			
Proportion of Alters with Some College Education or More					.254*	-.239†
					(.106)	(.122)
Athletic Identity			-.179***			-.175***
			(.045)			(.045)
Intercept	-0.479			-.717***		
	(.562)			(.165)		
Intercept 1		-.460	-2.432***		-.608	-2.291***
		(.449)	(.495)		(.462)	(.477)
Intercept 2		.550	-.235		.401	-.091
		(.449)	(.490)		(.463)	(.467)
Intercept 3		1.374**	.763		1.225**	.907†
		(.452)	(.486)		(.465)	(.466)
Intercept 4		2.154***			2.006***	
		(.459)			(.472)	
R-Squared/Pseudo R-Squared	.353	.119	.088	.248	.119	.094

Note: Numbers in parentheses are standard errors; †$p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (two-tailed test).

Table 3. Ordinal Logistic Regressions of Body Weight Ratings on Accessed Socioeconomic Status, Athletic Identity, Control Variables, and Interaction Terms (N=974)

	Body Weight Ratings	
	Model 1	Model 2
Age	.012*	.012*
	(.005)	(.005)
Gender (1=Male)	.161	.187
	(.180)	(.174)
Race/Ethnicity (1=White)	-.084	-.064
	(.241)	(.236)
Marital Status (1=Married)	-.128	-.136
	(.194)	(.190)
Education (Years)	-.112**	-.112**
	(.041)	(.042)
Employed Full Time	.467*	.455*
	(.186)	(.183)
Occupational Prestige	.009	.009
	(.007)	(.007)
Family Income (log)	-.063	-.062
	(.111)	(.107)
Network Size (Number of Alters)	.038	.039
	(.065)	(.062)
Role Relationship (Proportion of Alters as Family	-.006	-.015
Members)	(.249)	(.247)
Athletic Identity	-.305***	-.303***
	(.080)	(.081)
Accessed Socioeconomic Status		
Average Education of Alters	-.185†	
	(.093)	
Proportion of Alters with Some College Education		-.995**
or More		(.349)
Average Education of Alters * Male	.226*	

	(.109)	
Proportion of Alters with Some College Education or More * Male		1.238**
		(.456)
Intercept 1	-4.577***	-4.522***
	(1.138)	(1.062)
Intercept 2	-.750	-.666
	(1.119)	(1.024)
Intercept 3	1.135	1.232
	(1.120)	(1.032)
Pseudo R-Squared	.040	.046

Note: Numbers in parentheses are standard errors; †$p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (two-tailed test).

Figure 1. The Conceptual Model of Accessed Socioeconomic Status (SES), SES, Lifestyle, Gender, and Body Weight Ratings

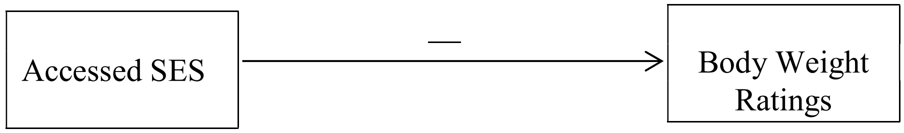

Figure 1a: Direct Effect

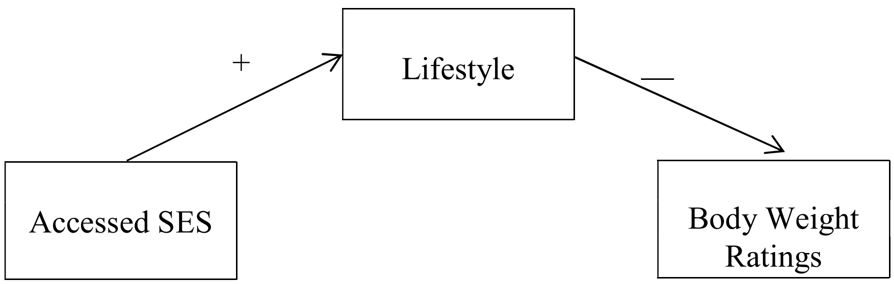

Figure 1b: Indirect Effect

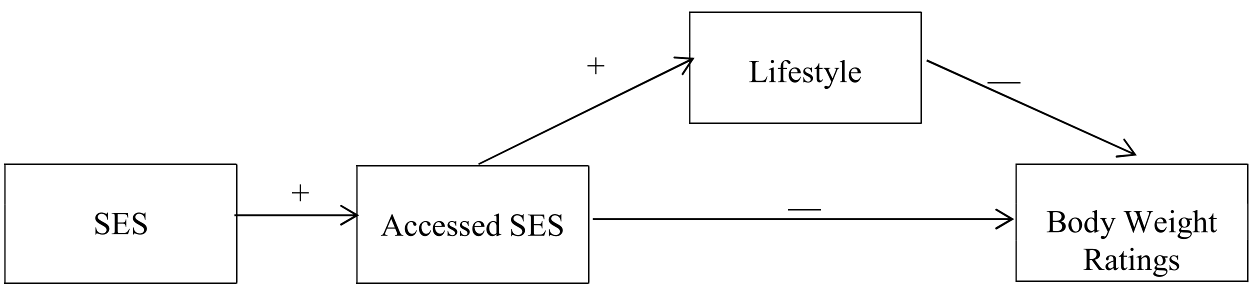

Figure 1c: Mediating Effect

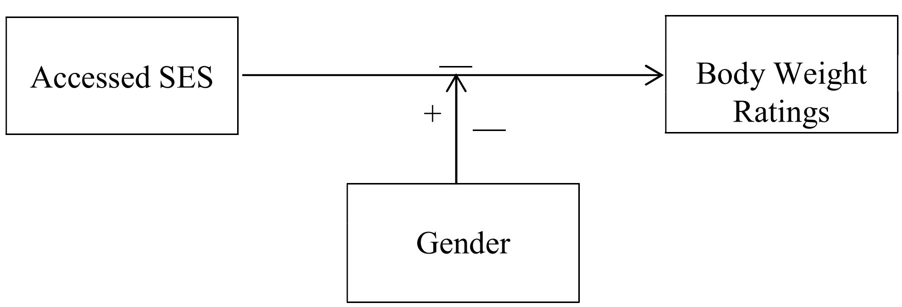

Figure 1d: Interaction Effect