ARTICLE

Social Marginalization of Overweight Children

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Background: Overweight is the most common health problem that faces children and adolescents. Although the correlation among overweight, low self-esteem, and depression is well known, social isolation among overweight children and adolescents has not been studied.

Objective: To investigate social networks of overweight and normal-weight adolescents in a large, nationally representative sample.

Design: Cross-sectional, nationally representative cohort study.

Population: A total of 90 118 adolescents aged 13 to 18 years who were enrolled in the National Longitudinal Study of Adolescent Health, of which a 1:5 subsample was selected for detailed in-home assessment, including height and weight measurements (n=17 557). Overweight was defined according to body mass index (>95th percentile for age and sex).

Main Outcome Measures: This analysis focuses on the number of friendship nominations each adolescent received from other adolescents. The number of friendship nominations and other social network measures were calculated using statistical software.

Results: Overweight adolescents were more likely to be socially isolated and to be peripheral to social networks than were normal-weight adolescents. Although overweight adolescents listed similar numbers of friends as normal-weight adolescents, overweight adolescents received significantly fewer friendship nominations from others than were received by normal-weight adolescents (mean [SE] number of friendship nominations, 3.39 [0.08] vs 4.79 [0.04]; $P<.001$). Overweight adolescents were also more likely to receive no friendship nominations than were normal-weight adolescents (odds ratio, 1.71; 95% confidence interval, 1.39-2.20). Decreased television viewing ($P<.001$), increased levels of sports participation ($P<.001$), and increased participation in school clubs ($P<.001$) were associated with significantly more friendship nominations and higher network centrality scores among both overweight and normal-weight adolescents.

Conclusions: Many overweight adolescents are socially marginalized. Such isolation may aggravate the social and emotional consequences of overweight in this age group.

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There is no doubt that obesity is an undesirable state of existence for a child. It is even more undesirable for an adolescent, for whom even mild degrees of overweight may act as a damaging barrier in a society obsessed with slimness.

Hilde Bruche, 1975[1]

The professional community is concerned with the medical concomitants of obesity, but the psychological and social perils are at least as important to those afflicted by the problem. The reason is clear; society does not tolerate excess weight. The effects of this overt and covert pressure to be thin can be powerful and permanent.

Brownell and Wadden, 1984[2]

CHILDHOOD OVERWEIGHT is rapidly increasing.[3] With important exceptions, the most serious medical sequelae of overweight do not arise until the adult years.[4-6] However, the social and emotional aspects of overweight are immediate and apparent and influence many aspects of child and adolescent well-being, independent of their concrete health effects.

Few problems in childhood have as significant an impact on emotional development as being overweight. Monello and Mayer[7] observed that overweight girls often have expectations of rejection and pro-

gressive withdrawal. Many studies find that overweight adolescents have higher prevalence of depressive symptoms[8] and lower self-esteem than are found among their normal-weight peers.[9-11] However, other studies report normal levels of self-esteem.[12,13] Differences in age, race, and income among studies may account for the discrepant findings. For instance, low self-esteem is not characteristic of obese, inner-city, African American children[14] or obese preschool children.[15] Analysis of the data from the National Longitudinal Survey of Youth indicates that early adolescence is a critical time for the development of low self-esteem in overweight children.[16]

Other data indirectly reflect the strong stigma associated with overweight during childhood and adolescence.[17] Studies of children as young as 6 years find that overweight individuals are likely to be described in derogatory terms.[18,19] The studies performed by Richardson et al[20] in the 1960s indicated that overweight children are ranked by other children as the least-desirable friends. Childhood and adolescent overweight is associated with adverse social and economic status in subsequent adulthood, with particularly strong effects reported among women. Gortmaker and colleagues[21] found that adolescent girls who were overweight in 1981 had lower earnings, were less likely to be married, and were more likely to be in poverty than were otherwise comparable nonoverweight peers.

Friendship is an essential vehicle for the social and psychological development of adolescents.[22-24] Given the importance of peer appearance norms, body image, and physical fitness to social and emotional development, overweight may have lasting implications for child development and adolescent well-being. Yet few studies provide concrete measures to scrutinize the social implications of overweight for individuals' friendship ties and relationships with school peers.

To understand the extent that overweight adolescents may be isolated or socially marginalized in relationships with school peers, we analyzed data from the National Longitudinal Survey of Adolescent Health (Add Health). We explored the social marginalization of overweight adolescents, as measured by the most detailed available nationally representative data set, to explore social connections among more than 20 000 high school students for whom biometric data could be obtained.

METHODS

SAMPLE

The study population consisted of 7th to 12th grade adolescents enrolled in wave 1 of Add Health. Add Health is a federally funded study designed to assess the health status of adolescents and explore causes of health-related behaviors. A novel feature of Add Health is the collection of detailed friendship network data. These data provide direct assessment of an individual respondent's social standing with her school peers. Restricted data were obtained by arrangement with Add Health after approval from the University of Medicine and Dentistry of New Jersey Institutional Review Board.

The primary sample frame for Add Health was the Quality Education Data database, which is thought to be the most comprehensive list of high schools available. The sample high schools were selected systematically, with selection probabilities proportional to the school's enrollment. Before sampling, the schools were sorted by size, school type (public, parochial, private), census region, level of urbanicity, and percentage of white students. Detailed sampling procedures are described elsewhere.[25] All students who completed an in-school questionnaire (n = 90 118), plus those who did not complete the questionnaire but were listed on the school roster, were eligible for 1:5 random selection for an in-home evaluation. These data include a broad range of information regarding family income, household composition, academic achievement, and the presence of other health-related medical conditions.

Table 1. Demographic Data of Adolescents Enrolled in the National Longitudinal Study of Adolescent Health, 1994

Demographic	Normal Weight (n = 15 705)	Overweight (n = 1852)
Sex, % male	50	60
Ethnicity, %		
African American	15	20
Hispanic	11	13
Single parent household, %	28	30
Family income, mean, $	46 700	38 000
Parental education, % college	52	44
Television or video, mean ± SE, h/d	3.16 ± 0.08	3.89 ± 0.12
Club participation, mean ± SE, No.	1.21 ± 0.04	1.00 ± 0.06
Sports participation ≤2 times per week, %	55	59

Complete demographic data were available for more than 90% of the resulting sample. Special oversamples included African Americans and Hispanics and a subset of schools from which all enrolled students were selected. Demographic details of the cohort are shown in **Table 1**. The weighted in-school (n = 90 118) and in-home (n = 20 762) samples approximate a nationally representative, probability-based survey of adolescents in grades 7 through 12.

OVERWEIGHT

Self-reported weight and height were obtained from the in-home interview (n = 17 557: 2908 Hispanic, 3778 African American, 10 871 non-Hispanic white). Previous research has validated self-reported weights and heights as an indicator of overweight in adolescents.[26] Within this specific study, there was more than 95% concordance of overweight status using both calculated and measured weights and heights.[27] Overweight was defined as a body mass index (BMI) (calculated as weight in kilograms divided by the square of height in meters) greater than the 95th percentile for age and sex (n = 1852) derived from the most recent Centers for Disease Control and Prevention National Center for Health Statistics growth curves.[28] This definition is in accordance with recommendations of the expert panel on childhood obesity.[29]

SOCIAL NETWORKS

A unique aspect of Add Health is the mapping of social networks using data from all (responding) students who attended participating schools (n = 90 118). Each participating student designated his or her 5 best male friends and 5 best female friends. This study design allows investigators to explore the interplay between individual characteristics and the social structure of the school within which the student is enrolled. Add Health data include the identification number of students iden-

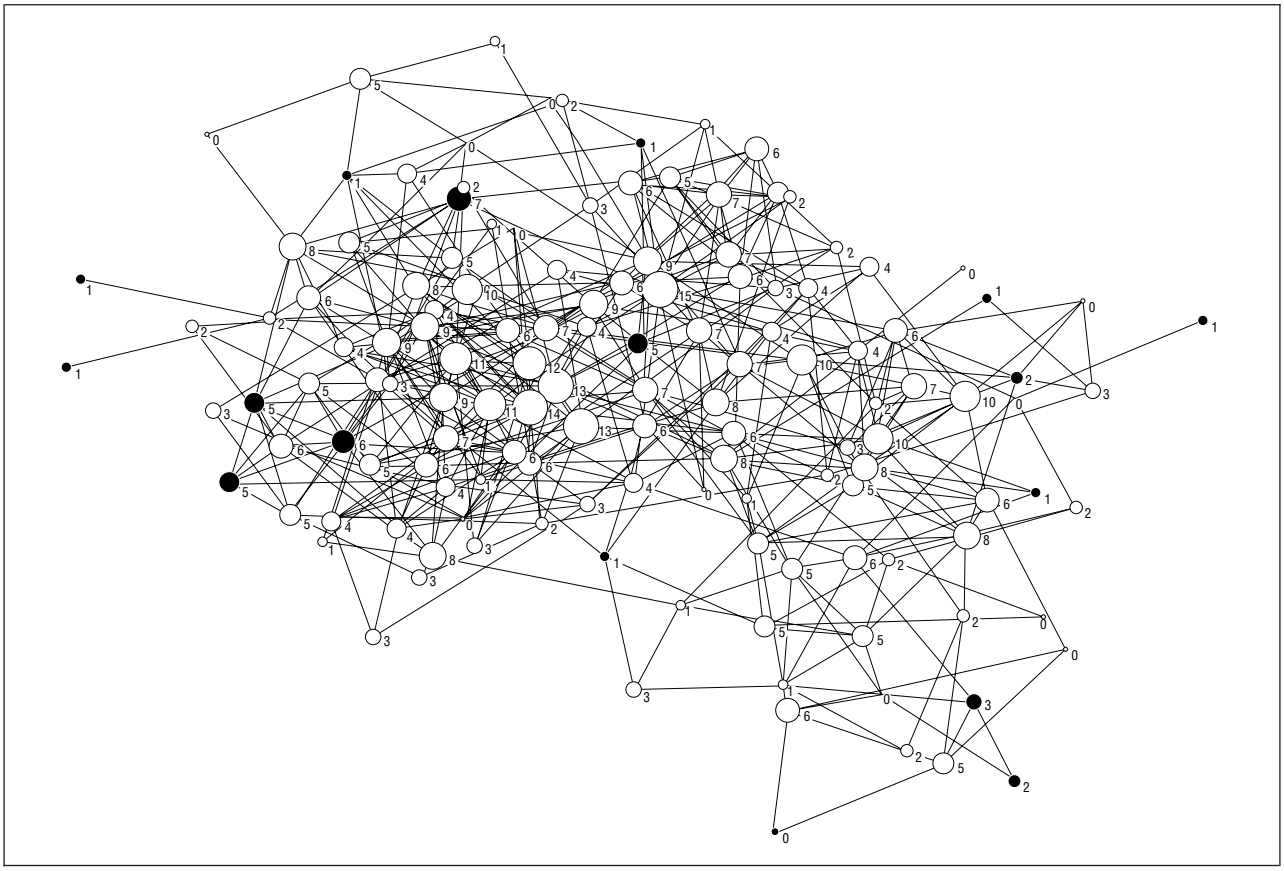

Figure 1. Kamada-Kawai free energy drawing of a social network mapping for 1 of the 132 schools included in the analysis. Each dot in the figure represents a National Longitudinal Study of Adolescent Health respondent. The size of the dots and the number next to each dot represent the number of friendship nominations by others. The black dots represent overweight adolescents. As shown in the figure, overweight adolescents received less friendship nominations and were less centrally located in the social network than normal-weight adolescents.

tified or "nominated" by the respondent as friends (out-degree measure). Using matrix programs (PAJEK, available on the Internet at http://vlado.fmf.uni-lj.si/pub/networks/pajek; and SAS IML, SAS Institute Inc, Cary, NC) the connections and relationships between each student were determined (**Figure 1**). Social network data were available for more than three quarters (77%) of adolescents with weight and height data. Figure 1 demonstrates a social network of one of the schools with complete friendship data in the Add Health study.

For each adolescent, the number of friendship nominations from other students was identified (in-degree measure), as was the total number of friends and friends of friends (extended network). The group of adolescents who received the most nominations for friend and best friend were considered the most popular. Reciprocity represented the likelihood that an individual who was nominated as best friend also returned the nomination.

We also explore the centrality of Add Health respondents in their social networks, as captured by the Bonacich measure.[30,31] In brief, these centrality measures compare an individual's popularity to that of individuals with whom he or she is connected. Individuals who have fewer friends than do others in their friendship networks would have low centrality scores.

We use centrality measure based on the in-degree social network. In-degree measures rely on friendship ties reported by others rather than those identified by self-report. Previous research identifies in-degree centrality as superior to out-degree measures in obtaining accurate descriptions of friendship and advice networks.[32] In-degree measures are also designed to capture observed differences in social ties and reciprocity among unpopular, average, and popular adolescents that do not arise in self-reported out-degree measures among the same respondents.[33]

SAMPLE BIAS

The completeness of friendship nomination data and BMI data differed across race/ethnic groups. However, these differences were small and not likely to influence outcome. Overall, friendship nomination data were available for 77% of adolescents with calculated BMI *z* scores (Hispanic, 74.6%; African American, 80.2%; white, 76.3%). Similarly, although there were significant sex differences in those with (male, 48%) and without (male, 51%) friendship data, these differences were also relatively small. There were no significant differences in BMI *z* scores or obesity prevalence in those with and without friendship nomination data (mean [SE] BMI *z* score, 0.34 [0.02] vs 0.29 [0.03]; $P = .83$; obesity prevalence, 10.6% vs 9.6%; $P = .23$).

STATISTICAL ANALYSIS

Friendship networks were generated using PAJEK and SAS IML statistical software.[34] Because the survey oversampled African Americans and Hispanics, we used Add Health sample weights to provide prevalence estimates corresponding to a national representative sample as recommended.[34] SEs were adjusted to account for school-wide clustering using Stata statistical software version 7.0 (Stata Corp, College Station, Tex). Differences in proportions were compared by the χ^2 test. Multivariate analysis, accounting for the weighted and stratified nature of Add Health, was used for continuous variables.

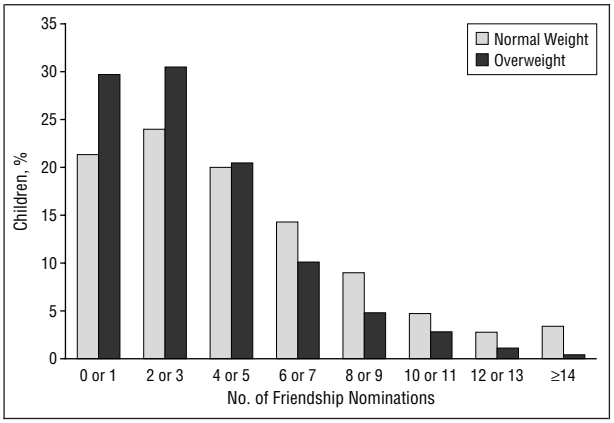

Figure 2. Histogram of total number of friendship nominations (in-degree measure) for overweight and normal-weight adolescents enrolled in the National Longitudinal Study of Adolescent Health. Overall, overweight children were more likely than normal-weight children to have 0 to 3 friendship nominations from other children ($P<.001$), whereas normal-weight children were more likely to have 6 or more friendship nominations compared with overweight children ($P<.001$).

Table 2. Friendship Network Scores for Normal-Weight and Overweight Boys, National Longitudinal Study of Adolescent Health, 1994

Variable	Normal Weight	Overweight	*P* Value
Friendship nominations by others, mean (SE)			
Immediate (in-degree)	4.55 (0.14)	3.38 (0.20)	<.001
Extended (reach × 2)	20.42 (0.87)	14.67 (0.98)	<.001
Popularity, %			
≥5 Friendship nominations	40	28	<.001
≥2 Best friend nominations	26	18	<.002
Reciprocity, %			
Best male friend nominates as best friend	34	31	.30
Best female friend nominates as best friend	24	18	.049
Bonacich centrality score, mean (SE)	0.69 (0.02)	0.54 (0.03)	<.001

Table 3. Friendship Network Scores for Normal-Weight and Overweight Girls, National Longitudinal Study of Adolescent Health, 1994

Variable	Normal Weight	Overweight	*P* Value
Friendship nominations by others, mean (SE)			
Immediate (in-degree)	5.01 (0.17)	3.41 (0.17)	<.001
Extended (reach × 2)	22.39 (1.00)	14.06 (0.89)	<.001
Popularity, %			
≥5 Friendship nominations	47	27	<.001
≥2 Best friend nominations	30	16	<.001
Reciprocity, %			
Best male friend nominates as best friend	29	12	<.002
Best female friend nominates as best friend	46	34	<.002
Bonacich centrality score, mean (SE)	0.78 (0.02)	0.53 (0.03)	<.001

RESULTS

All measures of social relationships demonstrated that overweight adolescents were more isolated and more peripheral to social networks than were their normal-weight peers. Overweight adolescents were significantly less likely than normal-weight adolescents to be selected as friends (**Figure 2**, **Table 2**, and **Table 3**). The extended network neighborhood of overweight adolescents included fewer friends than was found for normal-weight adolescents (Tables 2 and 3). Adolescents who nominated overweight peers as their friends tended to be less popular themselves; friends of overweight respondents received less friendship nominations than did friends of normal-weight peers (mean [SE] number of nominations, 4.30 [0.10] vs 4.84 [0.09]; $P<.001$). In addition, the number of friendship nominations was related to overweight in a dose-dependent manner (mean [SE] number of nominations, 4.94 [0.15] for BMI <85th percentile group; 3.97 [0.14] for BMI 85th-95th percentile group; 3.39 [0.15] for BMI >95th percentile group; and 3.12 [0.15] for BMI >97th percentile).

Overweight adolescents were less popular than their normal-weight peers when evaluated by other measures of social ties. Overweight adolescents were significantly less likely to receive 5 or more friendship nominations than were normal-weight adolescents and were significantly less likely to receive 2 or more best friend nominations (Tables 2 and 3). Overweight adolescents were significantly more likely than normal-weight peers to receive no friendship nominations (12% vs 7%; odds ratio, 1.71; 95% confidence interval, 1.39-2.20). Adolescents nominated by overweight respondents as best friends were less likely to reciprocate the nomination than identified best friends of normal-weight adolescents (Tables 2 and 3).

We found similar patterns using more global network measures. Bonacich centrality scores, which measure an adolescent's connection to highly nominated peers, were significantly lower for overweight adolescents than for normal-weight adolescents (Tables 2 and 3). The Freeman betweenness measure of the extent to which social ties pass through an individual also indicates that overweight respondents are significantly less likely to play an "intermediary" role between well-connected adolescents compared with normal-weight adolescents ($P=.004$).

Self-reported out-degree network measures appeared to overstate the social connectedness of overweight adolescents, as reported by peers. Normal-weight respondents reported the same mean number of friendship ties about others (4.58) as others reported about them (4.79). Overweight respondents provided significantly more nominations of others (4.29) than they received (3.39). Controlling for ethnicity, sex, parental education, family income, school size, and mean school network density, overweight adolescents received fewer friendship nominations than did otherwise comparable normal-weight peers who reported the same number of out-degree friendship ties ($P<.001$).

We also examined race/ethnic variation in our main results, with group-specific results provided for the 3 largest race/ethnic groups: Non-Hispanic white (non-

Table 4. Friendship Network Score for Normal-Weight and Overweight Girls by Race/Ethnicity, National Longitudinal Study of Adolescent Health, 1994*

Subject	Friendship Nominations by Others				Bonacich Centrality			
	Normal Weight	Overweight	Regression Coefficient Associated With Overweight	*P* Value	Normal Weight	Overweight	Regression Coefficient Associated With Overweight	*P* Value
Non-Hispanic white boys	4.75 (0.15)	3.52 (0.22)	−1.16 (0.28)	<.001	0.72 (0.03)	0.56 (0.04)	−0.15 (0.04)	<.001
Non-Hispanic white girls	5.38 (0.17)	3.52 (0.22)	−1.69 (0.30)	<.001	0.81 (0.03)	0.47 (0.07)	−0.31 (0.05)	<.001
African American boys†	4.04 (0.24)	3.22 (0.61)	−0.75 (0.61)	.22	0.60 (0.03)	0.47 (0.04)	−0.14 (0.10)	.18
African American girls†	4.11 (0.22)	3.30 (0.30)	−0.63 (0.27)	.02	0.71 (0.04)	0.60 (0.05)	−0.09 (0.07)	.19
Hispanic/Latino boys	3.79 (0.24)	2.59 (0.29)	−1.16 (0.36)	<.002	0.60 (0.07)	0.54 (0.11)	−0.00 (0.19)	.99
Hispanic/Latina girls	3.69 (0.28)	3.06 (0.40)	−0.88 (0.44)	.05	0.65 (0.05)	0.68 (0.08)	0.06 (0.12)	.64

*Data are presented as mean (SE). Multivariate analysis, controlling for family income, education, and marital status and school size and school-wide network density (number of actual nominations per school/number of possible nominations per school).

†Excludes individuals identified as both Hispanic and African American.

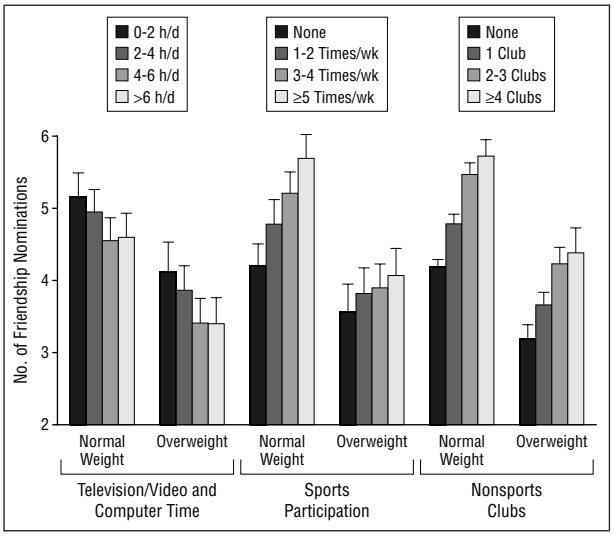

Figure 3. Impact of television, video, and computer time ($P<.001$; weight status, $P<.001$; interaction, $P=.73$), sports participation ($P<.001$; weight status, $P=.006$, interaction, $P=.003$), and number of nonsports clubs ($P<.001$; weight status, $P=.005$; interaction, $P=.42$) on the number of friendship nominations received by overweight and normal-weight adolescents. In all cases, both main effects were independently correlated with the number of friendship nominations. Similar results are also obtained with network centrality scores (data not shown).

Table 5. Regression Coefficients Associated With Overweight*

Dependent Variable	No. of Friendship Nominations Received (In-Degree Measure), Mean (SE)		*P* Value
	Boys	Girls	
Model 1: overweight	−1.17 (0.20)	−1.61 (0.18)	<.001
Model 2: overweight and demographic	−1.14 (0.22)	−1.28 (0.22)	<.001
Model 3: overweight, demographic, and lifestyle	−1.03 (0.20)	−1.18 (0.22)	<.001
Model 3: overweight, demographic, lifestyle, and school-wide network measures	−1.03 (0.22)	−1.25 (0.21)	<.001

*Demographic factors include ethnicity, parental education, family income, and marital status; lifestyle factors, television and video viewing (hours), club participation (number), sports participation (frequency); and school-wide network measures, adjusted for school-size and individual network density per school (number of actual nominations per school/number of possible nominations per school).

Hispanic), African American, and Hispanic/Latino adolescents (**Table 4**). Within our stratified multivariate analysis, overweight respondents received significantly fewer friendship nominations in 4 of the 6 examined subgroups, with the strongest results found among non-Hispanic whites of both sexes and among young Hispanic men. Point estimates were notably smaller among African Americans than among non-Hispanic whites even after controlling for confounding factors.

Aside from overweight, several covariates were significantly associated with friendship nominations (**Figure 3**). Decreased hours of television viewing ($P<.001$), increased levels of sports participation ($P<.001$), and increased participation in school clubs ($P<.001$) were associated with significantly more friendship nominations among both overweight and normal-weight adolescents. Although the effects of sports participation were strongest among normal-weight respondents, an overweight respondent who participated in sports 5 times per week nevertheless received approximately the same number of friendship nominations as a normal-weight adolescent who did not participate in such activities.

Multivariate analysis also confirmed the relationship between overweight and decreased friendship nominations (**Table 5**). We found a robust association between overweight and in-degree social ties. Our point estimates were significant and stable across a range of specifications. In model 1, we examine unadjusted differences, finding a mean social penalty of 1.17 nominations among boys and 1.61 among girls. In model 2, we control for standard sociodemographic factors and find virtually identical point estimates among boys and decreased point estimates among girls.

Because overweight might reflect sedentary lifestyle factors associated with social marginalization, we control in model 3 for television watching, club participation, and sports. (Note that if overweight contributes to increased sedentary activity, model 3 would, in principle, understate the impact of overweight on social ties.)

As shown, inclusion of lifestyle factors had little impact on our results.

Schools may systematically differ in social network characteristics based on school size (which alters possibilities for social connections), region, economic, or cultural factors. If such variation is correlated with overweight prevalence, these patterns could produce a spurious correlation between overweight and social ties. To examine this possibility, we included school size and school-specific network density as covariates in the same regressions. Inclusion of these effects had a negligible impact on our results for boys and led to slightly stronger estimated overweight effects among girls.

Finally, the relationship between overweight and decreased friendship nominations was seen across almost all schools studied; overweight adolescents had fewer friendship nominations than did normal-weight adolescents in 108 (88.7%) of the 123 schools with available friendship network data. In addition, other chronic childhood health conditions (eg, asthma, migraine headaches, and chronic abdominal pain), in contrast to overweight status, were not associated with decreased friendship nominations or with decreased network centrality (**Table 6**).

Table 6. Influence of Chronic Health Conditions on Adolescent Friendship Networks*

	Friendship Nominations (In-Degree Measure)		Bonacich Network Centrality	
Medical Condition	Mean (SE)	*P* Value	Mean (SE)	*P* Value
Asthma	4.50 (0.20)	.18	0.71 (0.03)	.84
No asthma	4.70 (0.13)		0.72 (0.02)	
Migraine headaches	4.45 (0.20)	.15	0.68 (0.02)	.16
No migraine headaches	4.71 (0.13)		0.72 (0.02)	
Recurrent abdominal pain	4.59 (0.17)	.35	0.71 (0.03)	.75
No recurrent abdominal pain	4.70 (0.13)		0.72 (0.02)	
Overweight	3.39 (0.15)	<.001	0.54 (0.03)	<.001
Normal weight	4.79 (0.14)		0.73 (0.02)	

*The presence of asthma (12%) and migraine headaches (12%) was assessed by parental report. Recurrent abdominal pain was defined as the presence of abdominal pain or stomachache once a week or more by self-report (18%).

COMMENT

Many overweight adolescent boys and girls are socially marginalized among their peers. Controlling for other factors, overweight respondents received fewer friendship nominations than their normal-weight peers. Overweight respondents were less central to their social networks and had fewer friendship ties than others with whom they were connected. Overweight respondents were more likely to receive no friendship nominations than were their normal-weight peers. The contrasts in friendship ties between overweight and normal-weight adolescents match overall patterns identified by others to distinguish popular and unpopular children in social network data.[23]

Overall, the relationship between overweight and social isolation was moderate in strength; most overweight respondents had at least one friendship nomination, and more than one-quarter had 5 or more friendship nominations. Although the quality of friendships could not be assessed, lower rates of reciprocity of best friend nominations among overweight respondents provide one suggestive indication that friendship ties involving overweight children may also be weaker.

In addition to our main results, we found noteworthy differences across the 6 race/ethnic and sex categories explored. Social marginalization of overweight children appears most pronounced among non-Hispanic whites, with the largest point estimates among young women. We found smaller effects among both African Americans and Hispanics, a result consistent with other research that suggests racial/ethnic differences in the emotional and social consequences of overweight and obesity.[12,35,36]

Although overweight adolescents appear more socially marginalized than other respondents, our multivariate analysis suggests that increased participation in collective activities is associated with improved social ties. In every subgroup examined, overweight young men and women who participated in sports and club activities and who spent fewer hours watching television displayed greater friendship attachments than their otherwise comparable overweight peers.

We hypothesize that social marginalization of overweight individuals contributes to reduced self-esteem and increased depressive symptoms among overweight adolescents. Previous studies have documented that adolescent intimacy and friendships are important determinants of anxiety, depression, self-esteem, and overall mental health.[19] Such patterns may also be especially important when viewed in light of widespread interest in "social capital" and the growing literature highlighting the role of informal ties and "contact networks" in shaping economic status,[27] educational attainment,[28] job seeking,[39] mental health,[40] and general well-being.[41] The diminished social capital available to overweight children and adolescents, captured by social network measures, may therefore contribute to the reduced social status and economic well-being of overweight adults.

From a methodologic perspective, the unique design of Add Health allows scrutiny of social patterns that would otherwise go undetected in analyses based solely on self-report. Self-reported friendship ties by overweight adolescents significantly exceed the number of friendship ties to the same adolescents, as reported by others. The desire to provide socially desired responses provides one possible explanation for these discordant patterns. The Add Health survey design may encourage respondents to list 5 friends, even if the actual number of friends is greater or smaller than this number. Respondents may also misperceive others' views of friendship ties.

Cross-sectional studies such as this one also cannot unpack the causal direction of the linkage between overweight and social ties. Both overweight and social marginalization may be correlated with other, unmeasured variables that play a strong causal role. Instrumental variable methods may help to clarify these relationships.[27] From a clinical perspective, our results underscore that over-

What This Study Adds

It is generally recognized that obesity and overweight have a negative impact on self-image and self-esteem in children and adolescents. Indirect evidence from past studies also suggests that overweight children are stigmatized. This study provides an assessment of the impact of being overweight in childhood on friendship networks. As a group, overweight children had both fewer and less reciprocal friendships. However, increased sports participation, school club participation, and less television viewing may mitigate the social isolation of overweight adolescents.

weight is a strong marker for social marginalization among US adolescents. These effects vary by race/ethnicity and sex, with the strongest social penalties facing non-Hispanic white overweight girls. In all subgroups, our findings underscore the importance of helping all adolescents to fully participate in social life with peers. These findings also underscore the importance of broader initiatives to promote more equitable adolescent peer norms. Negative attitudes toward overweight begin early in childhood and may, therefore, be difficult to change.[42] Weight-based social discrimination remains a significant concern in adult life.[43]

In addition to efforts to improve fitness and nutrition, our results suggest that overweight adolescents may benefit from increased social activities with their school peers. Overweight adolescents who participate in sports and clubs and overweight adolescents who reduce their television viewing have stronger social ties than other overweight respondents. Given the importance of friendship networks and close friendships in many aspects of adolescent development,[18,19] the social disadvantages encountered by overweight young men and women provide pressing reasons for clinical and public health concern.

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