Do Friendship Networks Matter?

Examining Gender, Friendship Networks, and Adolescent Mental Health

Lisa M. Leach*

The Ohio State University

Crystal M. Stephens

The Ohio State University

Kristi Williams

The Ohio State University

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* Address correspondence to Lisa M. Leach, Department of Sociology, The Ohio State University, 300 Bricker Hall, 190 N. Oval Mall, Columbus, OH 43210 (e-mail: leach.61@osu.edu). We would like to thank Dana Haynie for her insightful comments and assistance on this project. Additionally, we must thank James Moody for his encouragement with the first draft of this paper, his help with the use of the network variables, and his assistance with the SAS creating and coding of the isolation variable used in this analysis.

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ABSTRACT

This study examines the influence of friendship networks on the mental health of adolescents, with a particular focus on gender differences in these associations. We use data from the National Longitudinal Study of Adolescent Health (Add Health) and incorporate a social network perspective. Consistent with theoretical expectations and previous empirical research, findings indicate that female adolescents are more prominently situated within their friendship networks (i.e., they are less isolated, more popular, and more central) than their male counterparts. Additionally, we find that network characteristics affect female and male levels of depression. However, contrary to our expectations, we find that the influence of network characteristics on mental health does not differ by gender. Furthermore, we find that parent-child relationship quality moderates the influence of popularity on adolescent depression, but the direction of the association differs for boys and girls.

Do Friendship Networks Matter?

A central tenet of sociological research on mental health is that personal relationships have a substantial influence on psychological well-being (Cohen and Wills 1985; House, Umberson, and Landis 1988b). Given the strong and consistent evidence for the effect of social networks on adult mental health, it is surprising that the impact of these factors on adolescent mental health has not been systematically investigated. Because adolescence is a time of developing one's own identity and establishing greater independence from one's family, (Bell 1981; Brown, Eicher, and Petrie 1986) it is often a time of increased strain in the parent-child relationship. In order to maintain well-being, there is a need for other friendships to offset these strains, suggesting that integration into a friendship network should be especially important to adolescent mental health.

Friendship not only directly affects health and well-being, but also helps individuals cope with stressful life events and chronic strains. This coping assistance provides a buffer that protects individuals from the negative health consequences of stress exposure (Cohen and Wills 1985; House et al. 1988b; Thoits 1995). Research and theory, however, indicate that gender differences in adult relationships—both in the kinds of relationships men and women have, as well as the effects of those relationships on well-being—start with gender differences in childhood socialization. Even at early ages girls and boys form qualitatively different relationships (Maccoby 2002). These differences persist as girls and boys enter adolescence and develop new roles and coping styles, all of which may contribute to the onset of gender differences in depression during adolescence.

In the present study, we integrate social network analysis with a social epidemiological perspective to develop and test a set of hypotheses about the importance of friendship networks to adolescent mental health. We analyze prospective data from the National Longitudinal Study of Adolescent Health (Add Health) to answer four questions. First, do the friendship networks of adolescent girls and boys systematically differ? Second, are characteristics of an adolescent's peer network and their placement within it (i.e., density, centrality, popularity, and isolation) prospectively associated with depression? Third, does the influence of specific network characteristics on mental health differ for adolescent girls and boys? Finally, does parent-child relationship quality moderate the effects of network characteristics on adolescent depression?

THE SOCIAL NETWORK PERSPECTIVE AND MENTAL HEALTH

Evidence of the profound influence of social ties on mental health dates back to Durkheim's ([1951] 1997) classic study of social integration and suicide. In *Suicide*, Durkheim argues that geographic variations in aggregate rates of suicide are linked to the level of social integration or cohesion of the group. In the subsequent fifty years, research has confirmed that integration in social networks is associated with a range of positive mental and physical health outcomes among adults (Berkman and Breslow 1983; Cohen 1988; House, Landis, and Umberson 1988a; see Berkman et al. 2000 for a review). Although several mechanisms are thought to account for the influence of social ties on psychological well-being, social support has by far received the greatest attention. Literally thousands of studies establish that the advice, caring, and aid provided by close

social relationships influences health and well-being both directly and indirectly, by enabling individuals to more effectively cope with stress (see Thoits 1995 for a review).

As Berkman and colleagues (2000) recently argue, however, social support is but one of several mechanisms that account for the salutary effects of social ties on health and well-being. The near-exclusive focus on social support has led researchers away from a classic Durkheimian focus on the influence of the *structural* characteristics of social relations on mental health and well-being. Central to this more "upstream" focus is the notion of social engagement. According to this perspective, the companionship and interaction that results from integration in a social network reinforces social roles, aids in the development of identity, and provides individuals with a sense of meaning and purpose that, in a Durkheimian sense, wards off feelings of anomie that can undermine health and well-being (Berkman et al. 2000). Moreover, the lack of strong social ties is itself stressful and can, therefore, directly undermine psychological well-being.

In the present analysis, we return to this "upstream" focus on social network characteristics and argue that the structure of friendship networks should be particularly consequential for adolescent psychological well-being. Theoretical and methodological advances in social network analysis, although not commonly applied to research on mental health, offer great opportunities to empirically examine multiple dimensions of network structure and the location of the individual within those networks—both of which should be significantly associated with mental health and well-being.

Social Network Analysis and Adolescent Mental Health

Social network analysis is an ideal lens through which to examine the influence of friendship networks on adolescent well-being. Social network analysis shares much in common with Durkheim's foundational assumptions—that the structural arrangement of ties between social actors influences the emotions and behavior of the individual (Hall and Wellman 1985, cited in Berkman et al. 2000). Moreover, social network analysis has developed sophisticated measures of the characteristics of network structure that should have the strongest influence on the individual. Given the basic assumptions shared by both, it is surprising that the social epidemiological perspective on mental health has progressed largely independent of the methodological and theoretical advances in social network analysis. In the present study, we draw upon social network analysis to develop a set of hypotheses about the mental health consequences of: (1) an important structural characteristic of adolescent friendship networks--their density, and (2) the structural position of the adolescent within the friendship network, as defined by his or her centrality, popularity, and isolation from the network.

Dating back to Erikson's (1968) classic work, *Identity: Youth and Crisis,* and Coleman's (1961) seminal study, *The Adolescent Society,* research indicates that adolescence is a period in which individual identity is developed and independence from one's family begins to be established (also see Bell 1981; Brown et al. 1986). According to Erikson, adolescence is a life course stage in which young people begin to establish a psychosocial self-definition and to identify their primary roles in their social environments. Ego identity is crucial to psychological well-being because it facilitates

the definition of one's social roles and instills within the individual a sense of meaning and purpose in life. Research indicates that adolescents who are unsuccessful at the process of identity formation experience anxiety, a poor self concept, and a sense of meaninglessness or anomie (Donovan 1975; LaVoie 1976; Logan 1978; Marcia 1966; Vandenplas-Holper and Campos 1990).

Successful identity development in adolescence is affected by many factors, but the influence of peers is central (Kinney 1993; McLellan and Pugh 1999; Piaget [1939] 1965; Stone and Brown 1999). Identification with a peer group helps adolescents to define who they are and to carve out their own role within the larger social network (Kinney 1993). The peer networks most relevant in this regard are those that exist within the school, because it is these that adolescents encounter most frequently. The structure of peer networks in school may differ considerably across several domains and these variations may be expected to influence the identity formation process and, ultimately, adolescent psychological well-being.

Network structure and density. Social network analysis identifies many structural dimensions along which peer networks can be classified (Wasserman and Faust 1994). Perhaps most central to our discussion of identity formation and psychological well-being in adolescence is the concept of network density. Network density refers to the extent to which members of the friendship network are tied to and interact with one another. As Coleman (1990) has noted, cohesive peer networks facilitate the formation of individual adolescent identity because they offer a clear and consistent picture of group norms and

values. Dense, cohesive networks expose adolescents to fewer conflicting messages and fewer roles to consider during the identity formation process (Granovetter 1973). Moreover, cohesive networks appear to offer greater opportunities for the provision of social support, which is strongly tied to psychological well-being (Barrera 1986; Wellman and Wortley 1990). It is important to note that membership in a dense peer network may pose problems for adolescents who do not identify with the primary values of the group and who, because of the cohesive, yet closed, nature of a dense school network, have few alternative networks with which to affiliate. However, given the advantages of cohesive networks for the identity formation process and for mobilizing social support, *we expect that, on average, adolescents who have dense friendship networks will have lower levels of depression than their counterparts whose networks are less cohesive (Hypothesis 1).*

Structural position in the network. The benefits of friendship networks for adolescent well-being extend beyond the identity formation process. Friendship can be a source of satisfaction, security, and support. It also influences the way that individuals—and especially adolescents—evaluate themselves and others (Feld 1991). However, the extent to which friendships provide support and encourage the development of a positive self-image should depend on the structural location of the adolescent within his or her immediate friendship network and within the school network as a whole. Adolescents located in prominent positions within their network should, on average, receive greater

psychological benefits from membership in that network than those located in more peripheral positions.

Social network analysis has developed multiple measures of structural location within peer networks that should be relevant to adolescent mental health. These include centrality, popularity, and isolation. *Centrality* measures the proportion of the adolescent's immediate friendship network with which the adolescent has ties, and is weighted by the centrality of those with whom the adolescent has direct ties. These ties consist of those individuals that ego names as a friend (send-network) and those individuals who name ego as a friend (receive-network). Thus, centrality taps the individual's prominence within his or her own immediate friendship network. Research indicates that adolescents located in central positions both exert more influence and are more highly influenced by the other members of their immediate network (Giordano 1983; Haynie 2001).

There are two primary reasons why network centrality should influence adolescent psychological well-being. First, because adolescents in central positions have greater influence over the friendship group as a whole, they have greater power to shape the norms and values of the group to be consistent with their own individual identities. This process should minimize identity- or role conflict and, therefore, enhance psychological well-being. Second, the prominence of the individual within a friendship network should contribute to a positive self-image, which in turn, enhances psychological well-being. In sum, *we expect that, on average, adolescents located in more central*

positions within the immediate friendship network will have lower levels of depression than those located in less central positions (Hypothesis 2).

Related to centrality is the concept of *popularity*. However, unlike centrality, which refers to the prominence of the individual within his or her immediate friendship network, popularity refers to the prominence of the individual within the school network as a whole. It is a measure of the total number of individuals in the school who name the adolescent as a friend, regardless of whether the nomination is reciprocated. Although popularity has been measured in various ways, much prior research indicates that girls, in contrast to their male counterparts, are more concerned with popularity than with achievement or success (Coleman 1961; Eder 1985). Interestingly, however, some studies indicate that maintaining this valued position within the school can be a source of stress for some (Eder 1985; Simmons, Rosenberg, and Rosenberg 1973). Given the advantages of popularity for self-esteem, however*, we expect that popularity will be negatively associated with depression (Hypothesis 3).*

Although it is measured in various ways, social isolation has long been tied to poor psychological well-being (Berkman and Breslow 1983, Durkheim [1951] 1997). In terms of school friendship networks, isolation refers to the extent to which an individual is on the periphery of the central friendship group or groups within the school. Research indicates that, in most schools, there are two large groups that contain almost all students, and there is at least one tie between these two large groups (Wasserman and Faust 1994). In social network analysis this is referred to as a bi-component. Isolated individuals are those whose friendship ties locate them on the periphery of the main bi-component of

their school. This conceptualization of isolation does not mean that the adolescent has no friends, but rather (s)he is not tied to the majority of the student body. *We expect that isolation will be positively associated with depression (Hypothesis 4).*

In sum, we expect that the position of an adolescent in the friendship network, as well as the structure of the network itself, will have important consequences for adolescent mental health. Our integration of social network analysis with a social epidemiological perspective on mental health allows us to focus on the "upstream" dimensions of social relationships' influence on psychological well-being—the structure of social networks and the placement of the individual within them. Central to this argument is the recognition that the context in which particular network relations are experienced should be highly consequential for psychological well-being. We, therefore, examine the effects of two contextual dimensions that are particularly relevant to adolescent well-being: gender and parent-child relationship quality.

GENDER, SOCIAL NETWORKS, AND ADOLESCENT MENTAL HEALTH

Whether it is a result of differences in childhood socialization, differences in gender roles, or differences in coping styles, sociologists, psychologists, and gender researchers all agree that gender differences exist in childhood and adolescent friendship networks. The adult mental health literature further argues that gender differences exist in the effect of personal relationships on mental health, with the effect being stronger for women (Rosenfield 1980; Umberson et al. 1996). Although gender differences in adolescent well-being appear to follow the same pattern as their adult counterparts,

gender differences in the effect of friendship networks on adolescent mental health have yet to be systematically investigated. This study aims to fill this gap in the literature by examining gender differences in the structure of adolescent friendship networks and in the effects of those network characteristics on mental health.

Gender Differences in Friendship Networks

Research shows that childhood socialization processes produce gender differences in the size and dynamics of childhood and adolescent friendship networks. A central tenet of socialization theory is that gender differences in childhood socialization encourage girls to become nurturing, emotional, and relationship-oriented and encourage boys to become aggressive and competitive (Chodorow 1978; Gilligan 1982). The result is that girls are most likely to form friendships exclusively with one other girl while boys are more likely to form friendships with many other boys (Beneson et al. 2001; Montemayor and Van Komen 1985). Moreover, female adolescents demand stronger loyalty from their friends and exert more pressure on each other to spend time together, whereas boys tend to form loose and casual relationships (Maccoby 2002).

Despite clear gender differences in the size and dynamics of friendship networks, little is known about the structure of boys and girls' networks or about the relative status of boys and girls within them. There are several reasons to expect to find gender differences in network characteristics. First, because of girls' affinitive nature, they are more likely than boys to be considered as a friend by boys and girls, thereby increasing females' overall popularity. Second, because girls tend to have dyadic same-sex relationships, female friendship networks should be denser than their male counterparts.

In contrast, because males tend to create large groups based on shared activities, such as football or science club, male friendships should be less likely to contain one central friend. Additionally, this tendency of male adolescents to compose large groups based on shared interests in activities, such as sports and science, isolates those adolescents that do not participate in such activities. Therefore, we expect that males should have a stronger propensity to be isolated than females. *In sum, we expect that females will have denser friendship networks, will be more central, more popular, and less isolated than their male counterparts (Hypothesis 5).*

Gender Differences in Effects of Friendship Networks on Mental Health

Very little is known about potential gender differences in the effect of *social integration or network structure* on mental health, either among adults or other age groups. Theoretically, the sense of meaning and purpose that results from integration into a cohesive network is generally thought to be a universal human need. Thus, there is no clear reason to expect that the effect of social integration and network structure on psychological well-being would differ for men and women, at least among adults. Among adolescents, however, friendship networks are especially salient to individual development and identity (Kinney 1993; McLellan and Pugh 1999) and interpersonal relationships during this life course stage are highly gendered. This increases the likelihood that the structure of the friendship network and the individual's location within it will be differentially important to the mental health of adolescent boys and girls.

Research on adolescents hints at such gender differences. For example, much prior research indicates that girls, in contrast to their male counterparts, are more concerned with popularity than with achievement or success (Coleman 1961; Eder 1985) and female adolescents appear to be especially concerned with the status of their relationships and the opinions of others (Nolen-Hoeksema 2001). This suggests that popularity and other indicators of prominence within the network (i.e., centrality and isolation) may be more important to the psychological well-being of adolescent girls than adolescent boys. Moreover, because socialization processes encourage girls to value close, emotionally confiding relationships, the general cohesiveness of the network (i.e., density) should be more important to adolescent girls compared to their male counterparts. In sum, *we expect that the influence of network density, popularity, centrality, and isolation on adolescent depression will be stronger for girls than for boys (Hypothesis 6).*

PARENT-CHILD RELATIONSHIPS AND ADOLESCENT MENTAL HEALTH

Up to this point we have focused on the effects of an adolescent's friendship network on psychological well-being, with gender being a particularly important contextual dimension. Although the adolescent spends the majority of his or her time in school and with friends, the adolescent's home remains their primary environment and this context is both permanent and largely involuntary for a substantial portion of the adolescent's life (Rossi and Rossi 1990). Research has established that parent-child relationship quality has a direct effect on child and adolescent well-being (Cherlin 1999;

Wallerstein and Lewis 1997; Warr 1993). Specifically, young children and adolescents whose parents convey affection, acceptance, and support report higher self-esteem and lower anxiety and depression (Roberts and Bengtson 1993) than their counterparts who have strained parent-child relationships. Similarly, strains in the parent-child relationship have the potential to dramatically affect the psychological well-being of the adolescent (Furstenberg, Morgan, and Allison 1987; Wenk et al. 1994).

Although it is generally recognized that relationships with family and friends are primary influences in the lives of adolescence, they have been commonly viewed as "stemming from separate systems serving different functions in the course of development (Franco and Levitt 1998 Family Relations, vol. 47, p. 315)." Yet, there are several reasons to expect that the nature of family and peer relationships interact to influence adolescent development and well-being. Having good relationships to learn and model from leads children to participate in and form quality friendships (Doyle and Markiewicz 1996). Parents also foster certain traits in their children, which, in turn, direct a child toward certain peer groups (Brown et al. 1993). Second, research on social stress indicates that social relationships indirectly affect mental health in part by providing a buffer that protects individuals from the negative psychological consequences of stress (Thoits 1995). Thus, the extent to which resources or challenges are present in one's life likely influences the importance of peer friendships to one's well-being. Although adolescents are exposed to a range of stressors, strains in the parental relationship are particularly salient. *Thus, we hypothesize that the influence of social networks on the adolescent's mental health should be greater for those who have strained*

relationships with their parents (Hypothesis 7). We also examine whether gender differences exist in the moderating effect of parent-child relationship quality on the association of network characteristics and mental health.

DATA

To address our research questions, we use Waves I and II of the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative sample of seventh to twelfth grade students from the 1994-1995 school year. In addition to completing brief in-school surveys, 20,745 students and 17,670 parents were interviewed in their homes during the summer of 1995. Approximately fourteen thousand of these individuals were re-interviewed in their homes during the summer of 1996. Our sample includes all adolescent respondents who participated in the in-school survey and both in-home interviews and who have non-missing information on all sampling weights, control, and independent variables (N=9,016)[1].

Add Health data provide comprehensive measures of adolescent physical, mental, and emotional health. These data work well for the research at hand because the data include social network information, which allows us to analyze an adolescent's network density, their own centrality within this network, and whether or not the adolescent is

[1] Our drop in sample size is primarily due to a substantial number of missing values on the sampling weights. Also, network variables were only constructed for schools in which more than 50% of the student body completed the in-school questionnaire. Finally, there is a substantial amount of missing information on parental education. However, supplementary analyses (not shown, but available upon request from the authors) indicate that there are no significant differences between adolescents with complete information on parental education and adolescents with missing information on parental education.

isolated or popular. Additionally, these data allow us to assess the adolescent's relationship with their parents. Below, we briefly discuss our measures.

MEASURES

Depression

A summed CES-D depression scale (Cronbach's alpha=.87) serves as our dependent variable. During the second in-home interview, adolescents were asked about their experiences of depressive symptoms in the past seven days. Adolescents reported how often they felt bothered by things that normally did not bother them, had a poor appetite, could not shake the blues, had trouble concentrating, felt depressed, felt too tired to do things, felt life was a failure, felt fearful, felt lonely, talked less than usual, felt others were unfriendly, felt sad, felt others disliked them, lacked motivation, and felt life was not worth living (0=never or rarely – 3=most of the time or all the time). Additionally, adolescents were asked how often they felt happy, enjoyed life, felt hopeful about the future, and felt as good as other people; all of these variables were reverse-coded and included in the scale with the indicators of depression.

Network Variables

During the initial in-school survey, adolescents were given a roster of students from their school and asked to nominate up to five male and five female friends. Using these friendship nominations, social networks within the school can be constructed. Before describing the network variables in detail, we must first explain some of the

pertinent terminology (i.e., ego, alter, and the send- and receive-network), which was used to construct all of the network variables. Ego is the respondent, alter is a "student in the same school as ego who is eligible to be nominated as a friend," and the send- and receive-network is "the union of ego's send-network and ego's receive-network" (Carolina Population Center 1997, 4). In other words, the send- and receive-network consists of all individuals (alters) that the adolescent respondent (ego) nominated as friends and all alters who nominated ego as a friend. With this basic network terminology in mind, we now move on to discuss the specific network measures we use in this study.

Centrality. Centrality is the adolescent's centrality within the social network weighted by the centrality of those to whom the adolescent sent nominations (Bonacich 1987). In other words, an adolescent's centrality, or prestige, is equal to a function of the prestige of those they are connected to. As a result, adolescents who are tied to other central adolescents should have higher prestige or centrality than those who are not.

Network density. Density is "composed of ego, the set of alters nominated by ego, and the set of alters who nominate ego" (Carolina Population Center 1997, 15). Density is the number of ties in the adolescent's send-receive network divided by the number of possible ties in the total send-receive network.

Popularity. We measure popularity using the pre-constructed "in-degree" measure, which is defined as the "the number of times ego is nominated by other students in the school" (Carolina Population Center 1997, 9). In other words, popularity is the

total number of times the adolescent was nominated as a friend by other adolescents in their school. This is the receive side of the send-receive network.

Isolation. In addition to the above pre-constructed variables, we construct one other network measure: isolation. As mentioned previously, social network analysis finds that in most schools, there are usually two large groups that contain almost all students with at least one tie between these two large groups, which is referred to as a bi-component. Isolation is a simple measure indicating whether or not the adolescent is isolated from the main bi-component of their school. If an adolescent is not at all attached to this main network within the school, then the adolescent is considered isolated. This measure of isolation does not mean that the adolescent has no friends, but rather (s)he is not tied to the majority of the student body either directly or indirectly.

Moderator Variables

Gender. Gender is measured with a dichotomous dummy variable that compares male and female respondents, with males serving as the reference category.

Parent-child relationship quality. Three adolescent reports of their relationship with their mother and father were used to measure the quality of the parent-child relationship. Adolescents reported the extent to which their parent is warm and loving, the extent to which they are satisfied with the way they communicate with their parent, and overall how satisfied they are with the relationship (1=strongly disagree - 5=strongly agree). Adolescents answered the questions individually for mother and father. We constructed a scale (Cronbach's alpha=.89) by summing the adolescent responses to the

above questions and dividing by the number of resident parents (one versus two) that the adolescent has.

Control Variables

Time 1 depression, race, grade, family structure, and family SES are included as control variables. During the first in-home interview, adolescents were asked the same series of questions regarding depressive symptoms that serve as our dependent variable. We control for T1 depression using this CES-D depression scale (Cronbach's alpha=.86). Because preliminary analysis indicated that the association between Time 1 and Time 2 depression is curvilinear, we also control for the squared value of Time 1 depression. To control for an adolescent's race, we include dummy variables to compare whites, blacks, and other races with whites serving as the reference category. Grade is measured as the actual grade that the adolescent was completing at Wave I (7=7th grade, 12=12th grade). Family structure is measured using an indicator of the adolescent's presence in a two-parent family versus all other family types with all other family types serving as the reference category. Finally, family socioeconomic status is measured using an indicator of parents' highest education[2] (1=8th grade education or less, 9=professional training beyond a 4-year college or university). This measure is constructed for one parent only—the parent with the highest education.

[2] Using parental education as an indicator of family SES is preferable because of the tremendous amount of missing information on income.

METHOD OF ANALYSIS

Our study is longitudinal in nature with our dependent variable, depression, measured at Time 2 (T2) and all of our other control, independent, and moderator variables measured at Time 1 (T1). Our longitudinal analysis allows us to control for the T1 value of the dependent variable, depression. This represents an improvement over cross-sectional models because it minimizes the probability that associations we observe between network characteristics and depression are due to a reverse causal process—the influence of depression on network characteristics. Further, it minimizes, but does not completely eliminate, the possibility that associations between friendship networks and depression reflect the selection of depressed adolescents into less cohesive networks or into less central, less popular, or more isolated positions within their networks.

To assess the impact of an adolescent's gender, network characteristics, and parent-child relationship quality on depression, we perform a series of regression analyses. We mean-centered all of our continuous independent (predictor) variables (i.e., parent-child relationship quality, centrality, density, popularity) by subtracting the overall unweighted mean of each variable from the original variable. All analyses are conducted using survey-corrected statistical procedures available in STATA (version 8) to correct for the clustered and stratified nature of the Add Health sample. STATA allows for the incorporation of sampling weights to yield nationally representative estimates and ensures that the standard errors are not deflated, which reduces the likelihood of rejecting the null hypothesis when it should have been accepted (see Chantala and Tabor 1999; Chantala 2001).

[TABLE 1 ABOUT HERE]

RESULTS

Table 1 displays the weighted means and standard deviations for all variables, by gender. These results indicate that mean level differences exist between males and females on many of the central variables of interest. Mean level depression scores are significantly higher for females than for males at both T1 (11.517 versus 9.583, respectively) and T2 (11.791 versus 9.728, respectively). Consistent with Hypothesis 5, the bivariate results shown in Table 1 suggest that females are less likely to be isolated and have higher levels of centrality and popularity than their male counterparts. However, there are no gender differences in network density. We explore these gender differences in greater detail in the multivariate models that follow.

Gender Differences in Network Characteristics

Table 2 presents a series of regression analyses that examine whether gender differences exist in the structure of adolescent friendship networks or in the placement of the adolescent within his or her network. This is a cross-sectional analysis because all network variables were measured only at T1. Due to the dichotomous nature of the dependent variable isolation, we perform a survey-corrected logistic regression (svylogit in STATA). We find that gender is significantly associated with isolation. Specifically, females are 45.9% less likely to be isolated than males. Because centrality, density, and popularity are relatively normally distributed, we perform survey-corrected OLS regressions (svyreg in STATA) to determine the association between gender and each

network characteristic. As shown in Table 2, gender (i.e., being female) is significantly and positively associated with centrality, popularity, and isolation, but the same is not true for density. In sum, it appears that being female is significantly and positively associated with 3 out of 4 of the network characteristics we examine, lending support to hypothesis 5. However, we find no evidence of gender differences in network density

[TABLE 2 ABOUT HERE]

The Influence of Friendship Networks on Mental Health

We next examine our central hypotheses regarding the influence of network characteristics on adolescent mental health. Table 3 presents the results of the OLS models examining the impact of network characteristics on T2 depression, controlling for T1 depression. The results support two of our four hypotheses regarding the association of network characteristics with mental health. In support of hypotheses 1 and 2, network density and centrality are significantly and negatively related to depression. However, we fail to find support for hypotheses 3 and 4. Neither popularity nor isolation is significantly associated with depression. Consistent with prior research, being female is associated with a .823-point increase in T2 depression. As expected, parent-child relationship quality is negatively and significantly related to T2 depression; each unit increase in parent-child relationship quality is associated with a .200-point decrease in T2 depression.

[TABLE 3 ABOUT HERE]

Moderating Influence of Gender and Parent-Child Relationship Quality

We next test the hypothesis that network characteristics are more important to the mental health of adolescent females than to their male counterparts. The interaction of gender with each network characteristic and with parent-child relationship quality is entered in Model 2 of Table 3. The coefficients for each interaction term are small, and none reach statistical significance. In sum, the results fail to support hypothesis 6 regarding gender differences in the influence of network characteristics on mental health. In general, network density and centrality are strongly and similarly associated with the mental health of girls and boys.

The interaction of parent-child relationship quality with each network variable is entered in Model 3 to test the hypothesis that the influence of friendship networks on adolescent mental health are greater for those who have poor relationships with their parents. We do not find support for hypothesis 7, as none of the interaction terms are significant. To summarize, we find that gender and parent-child relationship quality alone do not appear to moderate the effect of network structure on depression.

[TABLE 4 ABOUT HERE]

Next, we explore whether gender, parent-child relationship quality, and network characteristics interact with each other in their estimated effect on depression. Table 4 displays results of four models that include three-way interaction variables (i.e., female*quality*each network characteristic). Only one of the models displays significant results: female*quality*popularity. As Figure 1 demonstrates, our results indicate that for girls with low parent-child relationship quality, popularity is associated with increased

T2 depression, whereas for boys with low parent-child relationship quality, popularity is associated with decreased T2 depression. Popularity does not appear to influence the mental health of girls who have a strong parental relationship or boys who have a strained parental relationship.

[FIGURE 1 ABOUT HERE]

DISCUSSION

Our research has returned to an "upstream" focus on the classic Durkheimian theory of the influence of *structural* characteristics of social relations in examining adolescent psychological well-being. This return to social integration indicates that, overall, the structure of adolescent friendship networks and the position of the adolescent within these structural networks are very important to adolescent mental health. Consistent with our theoretical expectations and hypotheses, adolescents who are located in more dense networks and who are more prominently positioned within those networks experience lower levels of depression than their counterparts. In exploring the differences in the network structure of male and female friendship networks, we find support for our hypothesis that females are more prominently positioned within friendship networks, less likely to be isolated, and more popular than their male counterparts. Ultimately, however, we find that boys and girls are really not so different--network structure and prominence within the network are very important to the mental health of both.

Consistent with previous research on adolescents (Ge et al. 1994) and adults (Mirowsky and Ross 1995), we find that female adolescents are more depressed than

their male counterparts. This suggests that girls would be worse off relative to boys if they did not have the advantages they do in terms of network structure (i.e., more central, more popular, less isolated).

In this study, we further investigate whether the quality of the parent-child relationship conditions the effect of network characteristics on depression. The results suggest that the extent to which this is true is highly dependent on gender and the specific network characteristic examined. Consistent with our hypothesis, popularity appears to be more protective of the mental health of adolescent boys who have strained relationships with their parents than for their counterparts with higher parent-child relationship quality. In contrast, popularity is associated with *increased* depression for girls who have strained relationships with their parents. Although we did not anticipate the latter result, it is consistent with prior research on gender and popularity. Because girls are more concerned with what others think of them and have a desire to maintain their social status, popularity is both a reward and a strain for girls. For those girls with low parent-child relationship quality, the strains in both relationships are likely too much to bear. However, in the case of boys, popularity significantly decreases depression, but only in the face of poor parent child relationship quality. For boys, it appears, occupying a prominent position in one's friendship network can offset strains experienced at home. For boys and girls with positive relationships with their parents, popularity appears less important to overall psychological well-being.

It is important to recognize a few limitations of our study. First, since friendship networks were only measured at one point in time, we cannot completely rule out the

possibility that the observed associations between friendship network characteristics and depression are due to the influence of prior depression on the placement of the individual within his or her network. We minimize this probability, however, by controlling for the baseline value of depression. Second, we cannot analyze the impact of changing social networks on depression. Do changes that occur in the network cause changes in depression? Additionally, we examine the effect of social networks on depression within a one-year time frame – thus we cannot hypothesize about potential long-term effects of social networks over the life course. These are all potential avenues for future research.

Contrary to our theoretical expectations and hypotheses, we do not find popularity and isolation to be significantly associated with depression. Future research should examine the impact of these network characteristics on other mental health states, including anxiety and anger. Delinquency literature, specifically general strain theory (Agnew 1992), suggests that strains experienced by adolescents result in the development of negative affective states, such as anger, anxiety, and frustration, which then pressure the adolescent toward delinquent responses. It may prove fruitful to explore how occupying a peripheral position in one's friendship network can serve as a strain that results in the experience of various negative emotions and undermines overall psychological well-being.

Additionally, because we find significant associations between our catchall 'other racial minorities' category and depression, it is necessary for future research to further disaggregate 'other racial minority' into more specific categories (e.g., Asians, Hispanics, etc.). We may find that the relationship between network characteristics and

depression varies depending on which racial minority category an adolescent belongs to. It also may be prudent for future research to disaggregate this analysis by race and gender and look at the differences among various demographic groups such as Black males, Black females, White males, White females, Asian males, Asian females, Hispanic males, Hispanic females, etc. This would allow us to see if network characteristics differentially impact depression scores for White versus Black versus Asian versus Hispanic males and females.

Finally, this study is the first step in research's return to the upstream focus on the importance of social integration. Our study further supports the notion that social integration is as important to adolescent well-being as it is for adults. However, as current research by Aneshensel and Succoff (1996) points out, research on adolescent mental health must consider socioeconomic and demographic environments. Along these lines, we suggest that even more research is needed to examine the importance of social integration for adolescents at all levels – the friendship network, the school, and the community.

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TABLE 1. Weighted Means and Standard Deviations, by Gender

	Females (N=5,731)		Males (N=5,297)	
	Mean	Std. Dev.	Mean	Std. Dev.
DEPENDENT VARIABLE				
Depression (Time 2)	11.517***	7.913	9.583	6.730
CONTROL VARIABLES				
Depression (Time 1)	11.791***	8.170	9.728	6.723
Grade	9.047	1.498	9.068	1.515
Black	16.436%**	.361	13.842%	.354
Other Race	17.082%	.389	18.340%	.399
Two-Parent Family	72.458%**	.453	75.584%	.446
Parent Education	5.143	3.051	5.129	3.071
INDEPENDENT VARIABLES				
Parent-Child Relationship Quality	11.830***	2.510	12.174	2.147
Network Characteristics				
Isolation	5.777%***	.2333	9.900%	.300
Centrality	.893***	.600	.801	.650
Density	.291	.135	.294	.148
Popularity	5.066***	3.804	4.427	3.964

Significant difference between females and males, ***p<.001, **p<.01, *p<.05, two-tailed test

TABLE 2. Regression of Network Characteristics on Gender and Control Variables

	Isolation[&]	Centrality[+]	Density[+]	Popularity[+]
	or	b	b	b
	(se)	(se)	(se)	(se)
Constant	-2.251***	.848***	.301***	4.053***
	(.426)	(.085)	(.025)	(.578)
Female	.541***	.099***	-.001	.585***
	(.059)	(.021)	(.004)	(.138)
Grade	1.045	-.022**	-.001	-.001
	(.048)	(.007)	(.002)	(.058)
Black	1.688**	-.140***	-.008	-1.039***
	(.310)	(.033)	(.010)	(.230)
Other Race	2.214***	-.090***	.022**	-1.231***
	(.359)	(.026)	(.008)	(.197)
Two-Parent Family	.827	.068**	.004	.467*
	(.112)	(.021)	(.007)	(.191)
Parent Education	.902***	.027***	-.000	.095***
	(.022)	(.003)	(.001)	(.022)
R^2	.046	.041	.005	.032
N	9,361	9,361	9,043	9,361

***p<.001, **p<.01, *p<.05, two-tailed test
[&]Survey-corrected logistic regression
[+]Survey-corrected OLS regression

TABLE 3: Time 2 Depression Regressed on All Variables, Gender Interactions, and Parent Quality Interactions (Survey-corrected OLS Regressions)

	Model 1		Model 2		Model 3	
	b	se	B	se	b	se
Constant	3.763***	.536	3.817***	.549	3.777***	.533
Control Variables						
Depression (Time 1)	.688***	.035	.688***	.035	.686***	.035
Depression^2 (Time 1)	-.004***	.001	-.004***	.001	-.004***	.001
Female	.823***	.197	.680***	.204	.821***	.198
Grade	.029	.053	.028	.053	.029	.052
Black	.313	.230	.338	.234	.314	.230
Other Race	.838**	.271	.854**	.273	.838**	.271
Two-Parent Family	-.570**	.192	-.571**	.192	-.576**	.191
Parent Education	-.060	.033	-.058	.033	-.060	.033
Independent Variables						
Parent-Child Relationship Quality^	-.200***	.043	-.230***	.062	-.204***	.042
Isolation	1.016	.649	.513	.745	1.014	.667
Centrality^	-.513***	.155	-.620***	.175	-.481**	.154
Density^	-1.325*	.607	-1.752*	.752	-1.343*	.638
Popularity^	.033	.024	-.009	.029	.028	.025
Gender Interactions						
Female*Quality			.044	.076		
Female*Isolation			1.186	.909		
Female*Centrality			.211	.259		
Female*Density			.991	1.346		
Female*Popularity			.090	.055		
Relationship Quality Interactions						
Quality*Isolation					.013	.247
Quality*Centrality					-.085	.065
Quality*Density					.048	.384
Quality*Popularity					.013	.013
N	9,016		9,016		9,016	
R^2	.383		.383		.383	

^Variable is mean-centered. ***p<.001, **p<.01, *p<.05, two-tailed test
Note: All interactions are constructed using the mean-centered variables.

TABLE 4: Time 2 Depression Regressed on All Variables, Three-Way, and Lower-Order Interactions (Survey-corrected OLS Regressions)

	Model 1		Model 2		Model 3		Model 4	
	b	se	b	se	b	se	b	se
Constant	3.801***	.540	3.761***	.545	3.793***	.540	3.842***	.542
Control Variables								
Depression (Time 1)	.687***	.035	.686***	.035	.688***	.035	.686***	.035
Depression^2 (Time 1)	-.004***	.001	-.004***	.001	-.004***	.001	-.004***	.001
Female	.767***	.198	.810***	.205	.809***	.197	.763***	.203
Grade	.028	.053	.032	.053	.026	.053	.025	.053
Black	.312	.230	.325	.233	.313	.230	.334	.233
Other Race	.851**	.272	.840**	.272	.858**	.271	.841**	.270
Two-Parent Family	-.566**	.193	-.575**	.190	-.567**	.192	-.589**	.192
Parent Education	-.060	.033	-.060	.033	-.060	.033	-.059	.033
Independent Variables								
Parent-Child Relationship Quality^	-.222***	.062	-.224***	.063	-.238***	.060	-.231***	.062
Isolation	.686	.725	.991	.654	1.030	.655	.983	.654
Centrality^	-.511***	.154	-.652***	.199	-.520***	.157	-.513***	.156
Density^	-1.314*	.606	-1.289*	.606	-1.427	.741	-1.288*	.606
Popularity^	.034	.024	.033	.024	.034	.024	-.020	.030

Three-Way (and Lower-Order)Interactions								
Female*Quality*Isolation	.403	.446						
Female*Quality	.031	.080						
Female*Isolation	.868	.856						
Quality*Isolation	-.119	.345						
Female*Quality*Centrality			-.217	.156				
Female*Quality			.040	.077				
Female*Centrality			.293	.252				
Quality*Centrality			.063	.113				
Female*Quality*Density					1.123	.608		
Female*Quality					.062	.076		
Female*Density					.331	1.311		
Quality*Density					-.584	.442		
Female*Quality*Popularity							-.065**	.024
Female*Quality							.050	.076
Female*Popularity							.100	.054
Quality*Popularity							.043*	.018
N	9,016		9,016		9,016		9,016	
R^2	.383		.383		.383		.384	

^Variable is mean-centered.

***p<.001, **p<.01, *p<.05, two-tailed test

Note: All interactions are constructed using the mean-centered variables.

FIGURE 1: Estimated Effect of Popularity on Time 2 Depression by Gender and T1 Parent-Child Relationship Quality