

FRIENDSHIP INTEGRATION AND ADOLESCENT MENTAL HEALTH

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CHAPTER I

LITERATURE REVIEW

Overview

Early sociological studies of mental health linked high rates of mental disorders among certain people to their deteriorated social relationships. The investigation of the association between social integration and mental health has continued in contemporary sociological research, but there have been two major methodological and theoretical changes, including the shift from aggregated analysis to individual analysis and the increasing emphasis on mild forms of emotional disturbance, instead of severe mental disorders. Contemporary studies have consistently demonstrated that socially isolated individuals have worse mental conditions than those who are socially integrated. Drawing on these early and contemporary studies, I make distinctions among network, behavioral, and affective/cognitive aspects of social integration and propose how these aspects relate to each other and influence mental health. Further, these sociological studies frequently targeted adult populations, but I argue that the concept of social integration and the processes that link social integration to mental health also apply to adolescents.

My dissertation focuses on adolescents and examines the extent to which friendships, as an element of adolescents' social environment, reduce depressive symptoms. Developmental psychologists have established the most extensive body of literature on this topic. In these studies, friendship formation and maintenance are viewed as developmental tasks (or their consequences) which are motivated by a need for intimacy with peers. Consistent with sociological studies of social integration and mental health among adults, developmental studies have shown that adolescents who are integrated into friendships have better mental health, including fewer depressive symptoms. In reviewing these two bodies of literature, I identify patterns in previous findings as well as study limitations.

Social Integration in Sociological Studies of Mental Health

Social integration generally refers to the degrees to which people are connected to each other in society or in social groups. Durkheim's (1865/1966) *Suicide* is often identified as the

most influential work that addressed the impact of social integration on mental health. Durkheim analyzed suicide rates in Europe and demonstrated that countries or social groups characterized by very high and very low levels of social integration had higher suicide rates than those with moderate levels of social integration. His work on suicide rates seems to have been motivated by his general concern about modern societies: People have become more individualistic, and traditional institutions such as religion and family no longer tie people together with strong obligations and emotional attachment (also see *The Division of Labor in Society* 1893/1984). Instead, the division of labor in modern society has created interdependence among people based on their individualistic, practical needs. Durkheim thus addressed the problem of social disorganization in modern societies by linking it to epidemiological patterns of suicide rates.

There are two important assumptions in Durkheim's work which are incorporated in contemporary research. First, people have an innate need for social engagement and sense of belonging. Second, suicide (and other mental health outcomes such as depression and psychological distress, as contemporary researchers would add) result from social environments that do not meet this fundamental need. Durkheim originally proposed a curvilinear effect of social integration on suicide by arguing that strong obligations to others can undermine one's hope for the future and desire to live, whereas low levels for social integration will not meet the need for social engagement. However, contemporary researchers who examine the mental health consequences of social integration tend to focus on the harm associated with low degrees of social integration, perhaps because the psychological damage associated with very high degrees of social integration may be rare and only apply to extreme cases (Johnson 1965).

In the United States, Faris and Dunham (1939) conducted the first major epidemiological study in the United States that suggested the causal link between lack of social integration and mental health. They compared rates of mental disorders in Chicago neighborhoods using admission records at mental hospitals. Their analyses concluded that rates of schizophrenia were high when neighborhoods had high residential turnover rates and high degrees of socio-demographic diversity, which often resulted from large numbers of immigrants in the neighborhoods. Building on Mead's (1934) theory of symbolic interaction, Faris and Dunham argued that communications among residents are problematic in these neighborhoods because people have perceptions that are very different from each other's. The difficulties in communications and instability in personal contacts do not allow residents to validate their

perceptions so that they lack opportunities to develop a sense of what exists in the world and what is real, which in turn contributes to the onset of schizophrenic symptoms such as delusions. To my knowledge, however, no contemporary study has directly demonstrated this causal pathway to schizophrenia proposed by Faris and Dunham. It should also be noted that Dunham (1965) later modified his view and argued that geographical distributions of mental disorders in urban areas in part result from the “drift” process—people who are mentally ill become concentrated in certain neighborhoods because they cannot live in other places. Thus, he reversed the causal direction of the relationship between social integration and mental disorders.

Contemporary sociologists have come to conceptualize mental illness somewhat differently. First, researchers now tend to focus on depression, and other mental disorders are not studied very frequently. Another trend in contemporary studies is to view mental illness, depression in particular, as a continuous construct, which diverges from a previously held view that individuals either have or do not have the disease. Investigators who view depression as a continuous construct often measure depression by self-administered scales such as the CES-D (Center for the Epidemiologic Studies Depression) scale, which were originally developed as a screening device for clinical depression diagnoses. With these scales, contemporary researchers assign scores to individuals, assuming that those who score high have more depressive symptoms (or more serious depression). Many people who score high on these scales in fact meet the clinical diagnostic criteria of depression, although there are some individuals who have high scores but are not clinically depressed (Link and Dohrenwend 1980; Radloff 1977). Because of this gap, some researchers have argued that mild forms of mental disturbance that these scales measure, commonly called “psychological distress” or “demoralization,” may be somewhat different from depression or depressive symptoms in quality (Link and Dohrenwend 1980). However, highly distressed individuals without clinical diagnoses of depression are not necessarily as healthy as those who do not score high on distress scales nor meet clinical criteria of depression, because these individuals are more likely to have other existing disorders and develop disorders in the future (Gotlib, Lewinsohn, and Seeley 1995). When reviewing past studies, it would be confusing to make a distinction between depressive symptoms and psychological distress because scores on the same scales are interpreted as depressive symptoms by some researchers and as psychological distress by others. Thus, to simplify my review, I will

assume screening scales to measure depressive symptoms. Distinguishing these concepts makes little difference in terms of identifying patterns in previous research on social integration.

Second, another important element of contemporary sociological research on social integration and mental health is the shift in unit of analysis from countries, social groups, and geographical areas to individuals. Analyzing individual-level data has an advantage of avoiding ecological bias. For example, a finding that less integrated neighborhoods have higher averages of depressive symptoms does not necessarily suggest that socially isolated individuals have more symptoms. However, individual-level analysis also has theoretical and methodological limitations. Because researchers are forced to treat social integration as individual characteristics, they cannot directly examine the mental health consequences of aggregated-level social integration. Very recently, however, with innovations in statistical techniques that allow cross-level analysis (e.g., hierarchical linear models), researchers have begun to investigate how characteristics of social contexts and institutions influence individual mental health outcomes.

Third, the concept of social integration has become clearer since researchers started to make a distinction between social integration and a new concept, social support. The current body of literature on social support began in the 1980's among researchers who examined the psychological consequences of life events and chronic strains. These investigations have been mostly based on stress theory, which proposes that individuals develop various physical and emotional symptoms when they run out of resources to adjust to life changes and cope with chronic strains (Selye 1956; also see Lazarus and Folkman 1984). Social support is commonly conceptualized as a type of resource that individuals use in their coping attempts. In contrast, social integration is conceptualized independent of coping behaviors and assumed to promote mental health regardless of the presence of life events or chronic adversities in their living conditions. Thus, the independent effect of social integration is consistent with Durkheim's explanation for the association between lack of social integration and suicide rates: People have a constant need for social integration, and emotional and behavioral problems develop when the need is not met.

In sum, early sociological studies used epidemiological patterns of mental illness to demonstrate a consequence of declining social integration in modern society. Contemporary researchers have shifted their focus to individual-level analysis of milder forms of emotional disturbances. As the next section shows, contemporary studies have demonstrated that

individuals who are socially isolated have more emotional problems, consistent with aggregated analysis in early studies.

Findings from Contemporary Sociological Studies

In this section, I will review previous findings from contemporary sociological studies. The review mostly focuses on studies that examined depressive symptoms, which I will use as the primary outcome variable in my data analysis. However, I will also review studies that examined other mental illnesses (e.g., post traumatic stress disorder) because the mechanisms proposed in these studies to explain the effects of social integration are applicable to depression. I will also discuss findings on happiness and life satisfaction because these constructs of positive mental health generally show moderate, negative associations with depressive symptoms. Most of the studies discussed in this section are based on adult studies, from which the concept of social integration was developed. I will discuss findings from adolescent studies separately in the next section, where I incorporate developmental approaches.

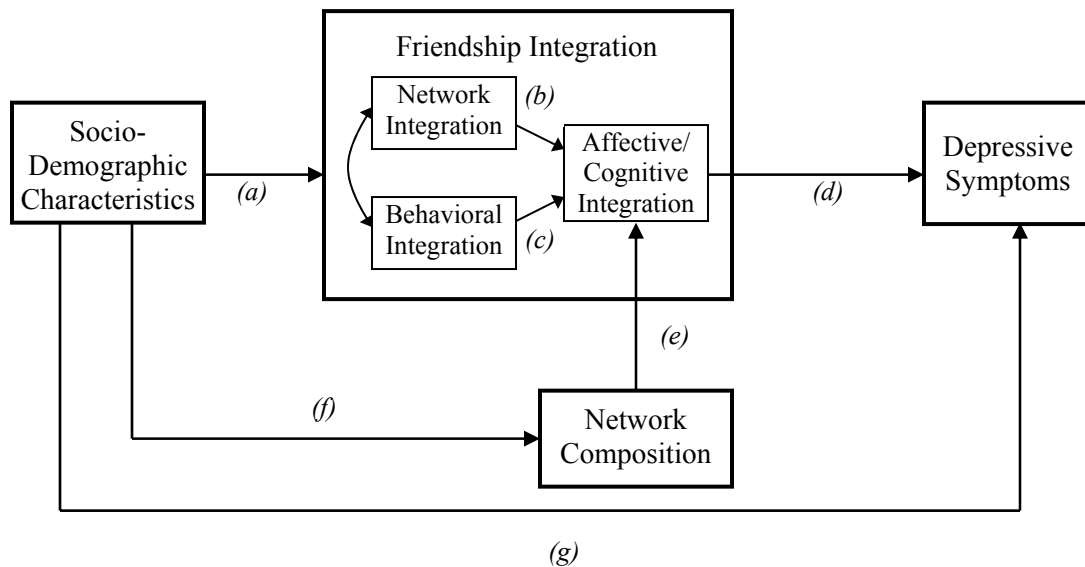


Figure 1.1. A Conceptual Model of Friendship Integration and Mental Health

Contemporary sociological studies tend to focus on specific aspects of social integration at a time, and the study focus varies across studies. I broadly classify these aspects of social integration into the following three categories: (1) *network integration* (i.e., the degree to which

individuals are embedded in social networks), (2) *behavioral integration* (i.e., the frequency of contacts and activities with others), and (3) *affective/cognitive integration* (i.e., the strength and frequency of positive feelings and thoughts about one's connections to others and those about the group). I will use this classification to organize past findings and also to formulate hypotheses about how these aspects of social integration relate to each other and influence mental health in a conceptual model (Figure 1.1). Each specific path in the conceptual model will also be discussed below.

Network Integration

I use network integration to refer to the extent to which individuals are embedded to social networks. A social network consists of actors (individuals in most mental health studies) and ties among these actors. The presence of a tie between two actors is frequently measured in network nominations, where respondents name their network members. Criteria for nominations vary across studies, and investigators may ask respondents to nominate friends, acquaintances, partners in support exchange, and people whom respondents know by name, people with whom respondents had direct contact in a given period of time, and so on. In some studies, boundaries of networks are defined along with organizational or geographical boundaries so that respondents can nominate only people who go to the same schools, work for the same company, or live in the same cities or neighborhoods.

Although there is no clear agreement among network analysts about which network properties measure degrees of social integration, egocentric network size and density are the most commonly used measures of network integration. These network variables also have stronger and more consistent effects on mental health than other network variables, according to Lin and Peek's (1999) recent review of past studies.¹ An *egocentric network* is composed of actors with whom the focal person (ego) is directly connected (alters) and the ties among them. *Egocentric network size* simply represents the number of alters in egocentric networks, and *egocentric network density* is the proportion of possible ties among alters that are actually present and thus can indicate the degree to which alters are connected with each other.

¹ Frequency of contacts and satisfaction also had some effects, but I do not consider them as measures of *network* integration here.

Despite the wide and frequent use of egocentric network size in mental health and other sociological studies, researchers rarely provide a theoretical explanation of why it should indicate degree of social integration. Perhaps, it is intuitive to many researchers that people who are well integrated should have large egocentric networks. The use of egocentric network size is also supported by empirical studies that demonstrate socio-demographic distributions of egocentric network size predicted by theories of social integration. For example, Campbell and Lee (1992) found that social groups that Durkheim explicitly and implicitly identified as being socially integrated (i.e., the middle-aged, women, the married, and those with high education and income) actually had larger egocentric networks in Nashville neighborhoods. A similar pattern was previously observed in Marsden's (1987) analysis of General Social Survey (GSS) data, where network members were not limited to neighbors but included all people with whom the respondents discussed important matters.² As Fischer and Phillips (1982) demonstrated with data on Northern California residents' egocentric networks (defined as those who provided certain types of instrumental and emotional support and lived within a one-hour drive from respondents' homes), the associations between some of these socio-demographic variables and egocentric network size were clearer when network members were limited to those who were not family members or relatives. For example, level of education and income were positively associated with number of non-kin network members but also negatively associated with number of kin members.

There are many studies that report mental health benefits associated with large egocentric networks, and a few examples are described below. Using the above mentioned survey data of Northern California residents, Phillips (1981) showed that people who had more network members tended to score higher on an index of happiness. However, this effect of egocentric size was limited to non-kin members so that people who had many family and relatives as their network members were not necessarily happy (Fischer and Phillips 1982). Similarly, Burt (1987) analyzed the network data in the GSS survey mentioned above and reported a positive association between egocentric network size and happiness. Thus, Burt's study replicated Phillips' finding with a nationally representative sample of adults, but the measure of happiness

² In contrast to Campbell and Lee (1992), Marsden (1987) did not find any gender difference in network size. In addition to the difference in the definitions of network members (i.e., neighbors vs. confidants), the GSS differs from Campbell and Lee's Nashville neighborhood study in that the nomination of network members was limited to six individuals and that kin constituted larger proportions of egocentric networks, which might have contributed to the lack of gender differences.

in the GSS was somewhat weak (a single four-point Likert scale question “taken all together, how would you say things are these days?”).

The effects of egocentric network size on mental illness, as opposed to positive mental health such as happiness, were first reported in studies of psychiatric patients. These studies commonly contrasted patients’ networks to those of non-patients. Reviewing these studies, Mueller (1980) concluded that psychiatric patients tend to have smaller egocentric networks but that the causal order of the association is not yet clear. Some of these studies (e.g., Cohen and Sokolovsky 1978) also showed that patients who have larger egocentric networks are less likely to have relapses than patients with smaller networks, indicating that having more network members contributes to the recovery from mental illness as well as reducing the chance of onset.

Larger and more recent studies based on community samples treated egocentric network size as a measure of social support and demonstrated the association between larger egocentric networks and fewer depressive symptoms (see review in Cohen and Wills 1985). Many authors (Cohen and Wills 1985; House, Umberson, and Landis 1988; Thoits 1995) cautioned, however, that egocentric network size only measures the sum of direct social ties and that actual exchange and perceived availability of social support are more appropriate measures of social support.

Although most studies found desirable effects of larger egocentric networks, there is at least one exception. Haines and Hurlbert (1992) examined the Northern California Community Study data originally collected by Fischer and found that egocentric network size was *positively* associated with psychological distress.³ The researchers further demonstrated that number of stressors mediated the relationship between egocentric network size and psychological distress. That is, people who had larger egocentric networks were exposed to stressors to a greater degree, which in turn increased psychological distress. Thus, this study suggested a possibility that the ability of larger egocentric networks to promote mental health might be outweighed by their costs in stress exposure. The cost seems to be higher for women, many of whom occupy caring roles and are therefore more vulnerable to stressors that occur to their network members (also see Kessler and McLeod 1984).

³ Thus, this finding contradicts Phillips’ (1981) analysis of the same data (i.e., the Northern California Community Study) mentioned earlier, which demonstrated that egocentric network size is positively associated with happiness. The discrepancy seems to be due to methodological differences between the two studies. First, Haines and Hurlbert only included employed men and women in their analysis whereas Phillips did not restrict the sample. Second, Haines and Hurlbert used a broader measure of psychological distress, which included items for negative symptoms (e.g., feeling upset) as well as positive items, on which Phillips focused (e.g., feeling happy).

Egocentric network size by itself is a limited measure of network integration because it only considers relationships between ego and alters. Another egocentric network variable, density, complements size because it considers how well alters are connected *with each other*. Social groups traditionally thought of as well integrated, such as extended family or small village residents, often have dense networks, and members of these groups tend to have strong obligations to each other (Kadushin 1983; Wellman and Gulia 1999). Dense networks may help individuals to develop a sense that they are part of a group rather than having relationships with multiple others who are strangers to each other.

Although some studies have found positive associations between egocentric network density and mental health, the pattern is not as consistent as that in findings on network size (Lin and Peek, 1999). For example, in Fischer's (1982) study of Northern California residents, egocentric density only had a weak, negative association with psychological distress. This weak association was due to the differential effects of egocentric network density among lower and higher income residents; whereas people with lower incomes benefited from having dense egocentric networks, distress levels among affluent people increased with density. Explaining the unexpected positive association for affluent people, Fisher argued that those people might have had material resources to take advantage of loosely connected egocentric networks, which provided them with various types of support. (It should be remembered that Fischer defined network members as people available to provide support.) For individuals with lower incomes, however, the relative costs of maintaining such loose networks in terms of time and money might have been high, and high density networks may have been sufficient sources of support.

The effects of density may also depend on geographical contexts. Using a sample of Vietnam veterans, Kadushin (1983) demonstrated that dense egocentric networks prevented post-traumatic stress disorder (which traumatic experiences such as fighting in a war may cause), but only when the veterans lived in rural areas. He argued that some veterans in urban areas had dense networks because they belonged to acquaintance circles. Social ties associated with these circles were superficial and did not provide as strong sense of belongingness as dense networks did in rural areas.

Still other studies reported that dense egocentric networks are harmful to mental health, particularly among people who experience stressors. For example, Hirsch (1980) showed that women experiencing stressors (those who were recently widowed or returned to college as older

students) had higher levels of psychological distress when they had dense egocentric networks. Similarly, Wilcox (1981) compared recently divorced women who had high and low levels of psychological distress and showed that those with higher distress levels had dense egocentric networks. Both researchers attributed the psychological harm associated with dense networks to the ineffectiveness of dense networks to mobilize diverse support for the stressors experienced by the women. These investigators argued that dense networks tend to take place in a limited number of organizational and geographical contexts whereas social ties in loose networks are associated with various independent contexts, which provides various types of resources.⁴ Identifying advantageous aspects of loosely knit networks, Adelman, Parks, and Albrecht (1987) also pointed out that individuals do not have to worry much about unexpectedly spreading personal information when receiving support from their network members.

As my review so far indicates, past mental health research mostly focused on egocentric networks. However, even if individuals have egocentric networks with identical size and density, they may occupy very different positions in a broader network (e.g., school-wide networks, neighborhood-wide networks). Among measures of individual positions in broader networks, centrality may be particularly useful in identifying individuals who are integrated in the networks. There are various centrality measures, and they emphasize different dimensions on which members can be integrated.⁵ For example, individuals can be thought of as more integrated when they have more direct than indirect ties to others in the network. *Closeness centrality* measures this dimension of network integration. Also, a network may include clusters (i.e., a set of individuals within a broader network who are closely connected with each other), and individuals can be viewed as more integrated when they belong to large clusters. *Eigenvector centrality* is available to measure this dimension of network integration. Despite their ability to measure individual positions in broader networks, these centrality measures have not been fully explored in mental health studies, perhaps because of their complexity in calculation and their costs (i.e., investigators need to assess ties among all members of the

⁴ Thus, this explanation is similar to Fischer's (1982), which also deals with lack of diversity of support in dense egocentric networks. However, Fischer's point seems to be that not everyone has resources to take advantage of dense networks and that the cost of maintaining loosely connected networks may outweigh the advantages for those individuals.

⁵ Degree centrality is mathematically equivalent to egocentric network size, and thus I will not discuss it here. It should be noted, however, that there is some conceptual difference between the two; the former is a characteristic of (separate) egocentric networks, and the latter is viewed as a characteristic of individual positions in a broader network.

broader networks, instead of just measuring ties in each respondent's egocentric network). Consequently, we know very little about how individual positions in broader networks influence mental health. In the section on adolescents, I will discuss a couple of existing studies that incorporated centrality measures. In the next section, I will review studies that reported the association between another aspect of integration, behavioral integration, and mental health (Path c in Figure 1.1).

Behavioral Integration

By behavioral integration, I refer to interactions that take place in dyadic relationships or social groups. In the past, researchers measured behavioral integration by frequency of personal contact, number of phone calls, participation in social activities, and so on. Thus, whereas network integration emphasizes the structural aspect of integration, behavioral integration emphasizes the dynamic aspect. However, behavioral integration should not be thought of as independent of network integration, but it may reinforce and be reinforced by network integration. This is because new social ties may develop from social interaction among strangers and because social interaction is essential, if not necessary, to develop existing social ties. Conversely, social ties may initiate social interaction or increase its frequency, and role expectations associated with social ties often guide how people interact with each other.

This conceptual overlap between network and behavioral integration is also evident in measurement; in some network studies, a social tie is said to be present when certain types of interaction regularly occur or have occurred in a given period of time (e.g., a person is considered as a valid network member if the respondent talked to the person in last 30 days). Similarly, past studies used organizational memberships as an indicator for behavioral integration, although they could also be considered as a measure of network integration. Organizational membership assumes that the person engages in specific activities in specific contexts (e.g., attending a service and interacting with people at a church), but it also indicates relationships between the person and others in the group.

Past studies showed that both personal contacts and group memberships have positive effects on mental health (Lin, Ye, and Ensel 1999; Okun, Stock, and Haring 1984; Thoits 1982a; Umberson, Chen, House, Hopkins, and Slaten 1996; for reviews, also see Diener 1984; Lin and Peek 1999). For example, in Umberson and her colleagues' (1996) analysis of nationally

representative data on adults in the US (Americans' Changing Lives), frequency of attendance in formal meetings and participation in programs at social and religious organizations as well as frequency of informal or routine contacts (such as getting together at home and talking on a phone) were associated with fewer depressive symptoms.

As an explanation for the ability of behavioral integration to promote mental health, researchers generally argue or simply assume that mechanisms that link network integration and good mental health also apply to behavioral integration; intensive and frequent interactions with other individuals give people meaning and purpose in life as well as a sense of belonging and security. These positive thoughts and feelings in turn promote mental health.

However, there are some alternative explanations for why behavioral integration may improve mental health. First, as Rook (1990) argued, leisure and socializing activities distract people from stressors in their lives and prevent them from having negative thoughts about themselves (e.g., blaming oneself for failure). Second, Bradburn (1969) proposed that individuals often engage in novel experiences through social interactions (e.g., meeting new people and hearing about new things), and the desirable mental health outcomes result from these novel experiences, instead of just spending time with others. Supporting this argument, he presented results from a survey study, which showed that activities that involved interactions with other people did not increase a feeling of happiness any more than other activities that did not include such social elements.

As implied in broad measures of behavioral integration which can include both positive and negative interactions and activities (e.g., total frequency of personal contact, total number of organizational memberships), researchers have frequently assumed that social activities and interactions are beneficial, regardless of the contents. However, negative interactions such as arguments and receiving criticisms are likely to be harmful to mental health, although positive interactions such as receiving support contributes to good mental states (Rook 1984). Thus, studies that attempt to identify what types of interactions promote mental health may contribute to our understanding of why and how behavioral integration influences mental health. However, distinguishing between positive and negative interactions complicates conceptual and analytical models, and one may fail to answer a simpler but more fundamental question: "Overall, is interacting with other people good for mental health?" The broad question is more central to the

concept of social integration, and therefore I do not review studies that examine differential effects of various contents of interactions on mental health.

Affective/Cognitive Integration

When explaining how high degrees of network and behavioral integration result in good mental health, many researchers have argued that the process is mediated by certain thoughts and feelings which individuals develop about their relationships with others or about one's group (see Paths b-d and c-d in Figure 1.1). As I discussed in a previous section, many contemporary sociological researchers have relied on Durkheim's (1865/1966) argument that individuals develop emotional attachment to the group, which in turn promote mental health by fulfilling the need for belonging.

Social relationships also help individuals to understand their purpose and meaning in life. Drawing on the symbolic interactionist perspective to explain health benefits associated with social relationships, Thoits (1985) argued that social relationships specify what obligations and expectations people have for each other and that people develop a sense of who they are when they internalize those obligations and expectations. Knowing or at least not questioning the meaning of life is necessary to maintaining healthy mental states.

Some authors have developed more specific concepts that may account for the mental health advantage associated with high degrees of network and behavioral integration. For example, through social relationships and interactions, individuals may develop a sense that they matter to other people (Rosenberg and McCullough 1981; Taylor, Turner, Noymer, Beckett, and Elliott 2001). It is important to note that individuals do not necessarily have to receive positive responses from others in order to feel that they matter. Rather, a sense of mattering results from knowing one's impact on others' attention, actions, and obligations.

Affective/cognitive integration also relates to another well-studied concept, social support. Social support researchers have made a distinction between received support and perceived availability of social support; the former refers to past experiences of receiving resources from others, and the latter refers to the extent to which individuals think they can obtain resources from others when needed (Dunkel-Schetter and Bennett 1990). Availability of social support is conceptually similar to affective/cognitive integration in that both are subjective interpretations of individuals' social environments. Furthermore, some authors broadly define

social support to include relationship quality, emotional intimacy in particular (e.g., Cobb 1976), and accordingly, researchers often use questions such as “feel very close to” and “feel loved and cared for” as measures of perceived availability of emotional support (e.g., Turner and Marino 1994; Umberson et al. 1996), although these items do not necessarily measure specific resources to be exchanged.

The fact that there are various concepts of affective/cognitive integration may indicate that network and behavioral integration create various, and possibly diffuse, positive thoughts and feelings. Authors and investigators who define and utilize these concepts do not seem to claim that the concepts are completely distinct from each other. Empirically, these concepts are likely to be correlated with each other, and each specific concept probably does not uniquely explain a large portion of mental health benefit associated with high degrees of network and behavioral integration. My goal in this dissertation is not to identify relationships among these concepts but to examine the extent to which these positive thoughts and feelings, in general and as a whole, promote mental health and estimate the extent to which they mediate the effects of network and behavioral integration (as indicated in Figure 1.1).

There are few studies that directly measure constructs of affective/cognitive integration and examine their effects on mental health. However, findings from the existing studies show the expected pattern. For example, using several community and national data sets based on adolescent samples, Rosenberg and McCullough (1981) showed that adolescents’ sense of mattering to their parents was negatively associated with psychological distress (and positively associated with self-esteem). A more recent study based on a community sample of adults (Taylor and Turner 2001) similarly found that sense of mattering was negatively associated with psychological distress. Finally, researchers who used items such as “feel close” or “feel loved and wanted” as measures of perceived social support reported that they reduce psychological distress (e.g., Turner and Marino 1994; Umberson et. al 1996).

The existing concepts of affective/cognitive integration tend to describe thoughts and feelings about one’s relationships with specific others, but other concepts describe thoughts and feelings about one’s relationship to a group or organization as a whole. For example, in their analysis of data based on middle and high school students in Minnesota, Resnick, Harris, and Blum (1993) reported that adolescents who felt close to their schools had fewer internalizing problems (including high levels of psychological distress, poor body image, eating disorder, and

suicide thoughts and attempts) as well as fewer externalizing problems (such as delinquency and drug use). Resnick and his colleagues (1997) reported a similar finding from a more recent national survey, the National Longitudinal Study of Adolescent Health (Add Health). However, thoughts and feelings about groups and organizations are not usually simultaneously examined with those about specific relationships (that comprise groups and organizations), and it is not clear whether and how these two types of feelings and thoughts relate to each other and whether they independently promote mental health.

So far I have only discussed positive thoughts and feelings, but there may be negative ones that account for the association between lack of network and behavioral integration and poor mental health. Negative thoughts and feelings may not necessarily correlate with positive ones, and they may independently influence mental health. Loneliness, for example, is a negative emotion that specifically concerns lack of social relationships or intimacy and is found to be positively associated with depressive symptoms (Gore and Aseltine 1995).⁶

In sum, there are several concepts that tap thoughts and feelings about one's social environment including sense of belonging and security, mattering, purpose and meaning in life, and loneliness. These concepts, as indicators of affective/cognitive integration, are used to explain the ability of network and behavioral integration to promote mental health. Although this mediating process is rarely tested, some studies have reported the effects of affective/cognitive integration on mental health. The other half of the mediation process (paths from network and behavioral integration to affective/cognitive integration; i.e., Paths b and c in Figure 1.1) are discussed in the next subsection.

Links from Network and Behavioral Integration to Affective/Cognitive Integration

There is very little research that directly examines whether network and behavioral integration contribute to the development of affective/cognitive integration, and the existing studies show mixed results. First, consistent with expectations, students who are integrated into friendship networks are in fact more attached to school (Hansell 1985; Bearman and Moody 2003). (I will describe these studies in more detail later in the adolescent mental health section.)

⁶ However, the association between loneliness and depressive symptoms can also be interpreted as evidence that loneliness is a *symptom* of depression (American Psychiatric Association 1994; Radloff 1977). In order to avoid this possible conceptual overlap and measurement contamination, I will not include interpersonal symptoms of depression in the subsequent data analysis.

Contrary to expectations, however, the association between egocentric network size and feelings of loneliness was very weak in the study of Northern California residents by Fischer and Philips (1982), and there was no significant association in Stokes' (1985) study of college students. Fischer and Philips speculated that individuals with small networks might adapt to their social environments over time. Consistent with this argument, reviewing past studies of solitude (spending time without company) and mental health, Larson (1990) concluded that individuals come to cope with solitude better as they make transitions from childhood to adolescence and to adulthood. It is also possible that individuals have a need to be associated with specific individuals, such as a spouse or parents, and an absence of these individuals, rather than small network size, may be responsible for some people's feelings of loneliness (Weiss 1973, 1982). Research on the relationship between behavioral and affective/cognitive integration is even scarcer than that on the relationship between network and affective/cognitive integration. A study by Rook (1987) demonstrated that frequency of socializing activities had a strong negative effect on loneliness among college students and adults. Thus, loneliness may be more strongly associated with the behavioral aspect of integration than the network aspect. However, no strong conclusions can be made about the links from network and behavioral integration to affective/cognitive integration because of the very few studies conducted on this topic.

Social Integration at Aggregated Levels

Because of the emphasis on individual-level mental health outcomes, contemporary studies have commonly examined consequences of individual-level integration. However, there are other studies that examine the effects of social integration at higher levels (e.g., organizations, geographical areas) on individual mental states. These studies ask questions similar to those once asked in Durkheim's study of suicide rates in European countries and Faris and Dunham's study of mental disorder rates in Chicago neighborhoods: Is being a member of a socially integrated group or neighborhood good for mental health? However, these contemporary studies which I am about to discuss target individual mental health outcomes, whereas Durkheim and Faris and Dunham examined aggregate-level outcomes. Although focusing on individual-level mental health outcomes allows researchers to avoid ecological fallacy, which is often used to criticize the early aggregated analyses of social integration and mental health, the investigation needs to consider social integration at the individual level and at

the aggregated level simultaneously in order to separate the effects of social integration at the two levels. Thus, the more precise research question being asked in these contemporary studies is: Does social integration at the aggregated level promote mental health beyond individual-level integration? Or is being a member of a socially integrated group good for mental health, regardless of the degree to which one is integrated in the group?

Maton (1989) provided some evidence that social integration at the organizational level promotes mental health. He demonstrated that individuals who attended churches where members frequently exchanged support had higher levels of life satisfaction than those attending churches with infrequent support exchange, beyond individual-level receipt of support. Using another data set based on a sample of parents who had lost their children, Maton also showed that members of bereavement groups with cohesive climates (measured by aggregated individual members' perceptions of their groups) experienced a greater reduction in depression symptoms associated with their loss of children, compared to members of bereavement groups characterized by less cohesive climates.

Along with this line of research, there are a growing number of studies that have examined the effects of neighborhood characteristics on individual mental health outcomes. Some of the neighborhood characteristics investigated in these studies relate to social integration, and researchers commonly measure them by aggregating individual perceptions about how neighborhoods look and how people interact with each other. For example, using data based on Los Angeles neighborhood residents, Aneshensel and Sucoff (1996) showed that adolescents who lived in "cohesive" neighborhoods (measured by degrees to which residents knew each other and were friendly to each other) had fewer depressive symptoms. Similarly, in her analysis of a survey study of Illinois neighborhood residents, Ross (2000) measured "neighborhood disorder" by a 15 item scale, including questions about awareness of graffiti, crimes, drug use, and lack of a norm among residents to watch out for each other. She showed that people who lived in disordered neighborhoods had more depressive symptoms, after controlling for individual-level socio-demographic characteristics. These studies are often limited, however, because they rely on residents' perceptions of neighborhoods, and it is not clear whether the mental health consequences result from the degree of neighborhood integration per se or from residents' perceptions or even whether the perceptions are shaped by their mental states. This problem is serious particularly when there are only a small number of residents representing a

neighborhood, because the aggregated perceptions may not accurately describe the neighborhood.

Although there are some network variables that allow one to measure levels of overall integration in social networks, they have rarely been used in mental health studies. As a consequence, we know very little about whether and to what degree the network dimension of organizational-level integration influences mental health. A couple of studies demonstrated that dense and less hierarchical networks at the organizational level promote mental health. Because these studies specifically examine the effects of friendship networks on adolescent and child mental health, I will discuss them in a later section.

The Effects of Socio-Demographic Attributes on Social Integration

I have already pointed out that certain socio-demographic characteristics predict degrees to which individuals are integrated in egocentric networks (Path a in Figure 1.1); the middle-aged, women, the married, and those with higher levels of education and income tend to have larger egocentric networks, although the pattern may vary to some extent depending on how social ties are defined. However, because people with higher levels of income and education tend to have greater portions of egocentric network members who are not their family members or relatives, their egocentric networks tend to be less dense than those of people with lower levels of education and income (Fischer 1982). Other socio-demographic differences in egocentric network density have not been reported. One may find it counterintuitive that the same socio-demographic variables associated with higher egocentric network size and lower density at the same time, but egocentric network size and density tend to show moderate, negative associations, because it is generally more difficult to have network members who know each other when one has a large egocentric network.

There seems to be little research on distributions of behavioral integration, except by gender. Women more frequently participate in formal organizations and also have more informal contacts with others than men do (e.g., Umberson et. al 1996). In terms of affective/cognitive integration, Umberson and her colleagues (1996) have shown that women tend to perceive their social environments as more supportive than men do, except that wives perceive their spouses to be less supportive than husbands do. Mattering, another affective/cognitive integration construct, seems to be more strongly perceived by women, those

with higher SES status, and the married (Taylor and Turner 2001). In sum, except for egocentric network density, various measures of social integration show similar socio-demographic distributions, although research on behavioral integration and affective/cognitive integration is sparse.

The Effects of Network Composition on Affective/Cognitive Integration

In addition to persons' own socio-demographic backgrounds, those of network members may also influence the degree to which one feels positively about relationships with others (i.e., affective/cognitive integration; Path e in Figure 1.1). By using a phrase, network composition, I refer to socio-demographic distributions of network members. In Bearman and Moody's (2003) study of emotional attachment to school among adolescents, for example, the proportion of black students was related curvilinearly with school attachment. That is, students had an overall stronger sense of belonging to school when there were either very small or very large proportions of black students, indicating that racial homogeneity increased school attachment. This finding was elaborated by a finding from cross-level analysis that students were more strongly attached to school when their schools had more students who shared racial backgrounds with them. In other words, the effect of school composition on attachment depended on individual characteristics. (Rosenberg (1979) used a similar argument to explain why black students at black dominated schools tend to have higher self-esteem than black students at schools where there are some or many white students.) Bearman and Moody also reported similar effects of student homogeneity for sex and grade level, indicating that students also derived a sense of belonging to school from being surrounded by others of the same sex and grade level. The studies mentioned here only examined the effects of organizational or neighborhood composition, and we do not know whether the conditional effect of socio-demographic composition applies to egocentric networks.

A Conceptual Model: A Summary of Sociological Studies

Describing the conceptual model (Figure 1.1) again, I will briefly summarize my discussion so far. Network and behavioral integration reinforce each other and both influence depressive symptoms through affective/cognitive integration (Paths b-d and c-d). Each of the three elements of social integration can be conceptualized at both individual and

aggregated levels, which may contribute independently to the reduction of depressive symptoms. I have also discussed some antecedents of social integration. Socio-demographic characteristics influence degrees to which individuals are integrated (Path a), and network composition (characteristics of network members) may also influence affective/cognitive integration (Path e).

Although I acknowledge that affective/cognitive integration may reinforce network and behavioral integration in return, I did not include these paths in the model because my primary dependent variable is depressive symptoms and these paths are not likely to play important roles in explaining how social integration influences depressive symptoms. There are also alternative ways to conceptualize the relationships between the three components of social integration and depressive symptoms. First, there are some theoretical and empirical studies to show that good mental health facilitates social integration (Adams 1988; also see the negative effects of depression on volunteer activities in Thoits and Hewitt 2001). Second, a high degree of social integration is sometimes considered an indication of good mental health, and lack of social integration is considered a symptom of mental illness, including depression (American Psychiatric Association 1994). In other words, some researchers do not distinguish conceptually between social integration and mental health. Although I do not intend to demonstrate these alternative relationships in this study (and thus do not include these paths in the model), they may bias the estimates of the effects of social integration on depressive symptoms if not considered. I employ some techniques to reduce these biases as discussed in the methodology chapter.

Importance of Adolescent Mental Health

Because my subsequent data analysis focuses on depressive symptoms among adolescents (middle and high school aged individuals), I will devote the rest of this chapter to this specific age group. I will also limit my discussion to friendships as a relational context of social integration. As discussed below, friendships play an important role in adolescents' social lives and connect them to the larger society outside the home. I will use the phrase "friendship integration" to refer to the degrees to which adolescents are connected with friends in network, behavioral, and affective/cognitive dimensions. Although the primary argument made in the previous sections about the psychological benefit linked to high levels of integration seems to

apply to adolescents, developmental approaches need to be incorporated in order to understand the importance of friendships in adolescent development.

Before reviewing theories and research findings on adolescent friendships, I would like to point out a couple of general reasons why studying adolescent depression contributes to the broader body of literature on mental health. First, adolescent depression is understudied compared to adult depression. Early studies of adolescent depression were somewhat disconnected from those of adult depression because of researchers' assumption that adolescent depression is qualitatively different from adult depression (e.g., adolescents have not developed the ability to express complex feelings such as depressed mood). However, recent studies have shown that adolescent depression is similar to adult depression (see review in Compas, Connor, and Hiden 1998). In addition, studying depression in adolescence may contribute to our understanding of adult depression because rates of depression start to increase in adolescence (Kessler and Zhao 1999; Lewinsohn, Hops, Roberts, Seeley, and Andrews 1993) and adolescent depression is a strong predictor of adult depression (Harrington, Fudge, Rutter, Pickles, and Hill 1990; Kandel and Davies 1986; Kaplan, Robbins, and Martin 1983).

Second, depression is associated with other psychological and behavioral outcomes in adolescence, including poor academic performance, delinquent behavior, drug use, sexual behavior, eating problems, and suicidal thoughts and attempts (Colten, Gore, and Aseltine 1991; Kandel, Raveis, and Davies 1991). The interrelationships among these problems are in part due to shared causes and mutual influences (Jessor and Jessor 1977). Thus, advancing knowledge on the effects of social integration on adolescent depression may also help us understand the causes and consequences of other outcomes of adolescent development.

Developmental Approaches to Adolescent Friendships

During adolescence, individuals become more independent from their families and become connected to the larger society by developing intensive and intimate relationships with friends. On average, adolescents spend about 29 percent of their time (when they are awake) with friends, which is more than the time spent with their family (19 percent) and the time that they spend in class with their peers (23 percent) (Csikszentmihalyi and Larson 1984). With little influence from adults, adolescents create and maintain a society of their own, characterized by complex patterns of friendships and peer relations (Coleman 1961).

Many past studies that described characteristics of adolescent friendships and examined their impact on mental health were based on developmental approaches. Developmental psychologists generally emphasize normative changes in the life course and describe physical, psychological, and interpersonal characteristics shared by individuals who are in the same developmental stage (cf. Gore and Colton 1991). Human development is often viewed as a series of individual needs specific to these stages and tasks that individuals have to complete in order to meet these needs. Developmental problems such as emotional disturbance and antisocial behaviors in adolescence are seen as signs of failure in these tasks and thought to hinder adjustment in the next developmental stage (i.e., adulthood).

With these underlying assumptions, some developmental psychologists argue that friendships develop because of the need for companionship that emerges in childhood (e.g., Buhrmester 1996). Although number of friends may not increase to a great extent as individuals make the transition from childhood to adolescence, quality seems to change in order to meet an emerging need for emotional closeness. Specifically, friends are no longer just playmates as in childhood but become persons whom adolescents could trust and who understand them. Consistently, adolescent friendships involve intensive and intimate conversation, self-disclosure, and efforts to solve conflict that occurs in friendships (Buhrmester 1996). Individuals also come to choose their friends more carefully in adolescence because of their improved cognitive ability to predict others' behaviors and personality traits (Aboud and Mendelson 1996).

Like sociologists who study the effects of social integration on mental health, developmental psychologists argue that emotional closeness in friendships fulfills adolescents' need for intimacy and self-validation and emphasize positive consequences of friendships in adolescence (cf. Crosnoe 2000). Developmental psychologists also remind us that the contribution of friendships is not limited to mental health, but that friendships also provide unique opportunities to develop general social skills, which are necessary for adult life (e.g., communication and conflict solving skills). Related to this point, developmentalists often emphasize unique contributions of friendships to the acquisition of these social skills by pointing out the unique characteristics of friendships (e.g., equality, mutual dependency) that distinguish them from relationships with parents (Buhrmester 1996).

Some descriptive studies on adolescent friendships are useful for understanding how and why friendships may influence adolescent mental health. As in other age groups, adolescent

friendships tend to develop among individuals who are similar to each other in terms of socio-demographic and attitudinal attributes (Cohen 1977; Kandel 1978; Moody 1999). Activities among adolescent friends mostly consist of socializing or leisure activities such as going to movies and playing sports (Csikszentmihalyi and Larson 1984), and they enjoy these activities more than other activities with friends (Youniss and Smollar 1985). Therefore, adolescent friendship activities are generally more engaging and interactive than activities with their family members (i.e., household chores or watching TV together) (Csikszentmihalyi and Larson 1984). Talking to each other about daily events and personal concerns is another important friendship activity in adolescence, and they expect each other to demonstrate great degrees of intimacy, mutual understanding, and sincere sympathy in their communications (Youniss and Smollar 1985).

Friendships can also create stress in adolescents' lives. Because of high degrees of mutual disclosure and sympathy, adolescents may be emotionally affected by undesirable events and problems that their friends experience (Compas and Wagner 1991; Larson and Asmussen 1991), as some adults are (Kessler and McLeod 1984). Major transitions in adolescence (e.g., moving from middle to high schools and then to college or work) may disrupt friendships and undermine mental health (Aneshensel and Gore 1991). Adolescents may also get upset at their friends who do not live up to their expectations (Youniss and Smollar 1985).

In sum, many developmental psychologists tend to view friendships as a positive influence for psychological development in adolescence. However, these developmental psychologists link the mental health benefits specifically to the increasing need for intimacy in adolescence. Developmental psychologists also tend to emphasize that friendship is the first social relationship that individuals develop with others of equal status, which makes unique contributions to adolescent development including the acquisition of social skills in close relationships. In some cases, friendships may also be harmful to psychological development among adolescents.

The Effects of Friendships on Adolescent Mental Health

In this section, I will review studies that empirically demonstrated the effects of adolescent friendships on mental health. Some of these are based in sociological perspectives, and others are based in developmental perspectives. In addition to the theoretical differences

discussed above, these two bodies of literature have some methodological differences. Sociological studies of mental health tend to use large survey data sets, but measures of friendship and mental health outcomes are often limited in number and quality (e.g., completely relying on self-report). Studies in developmental psychology tend to be small and limited in terms of generalizability due to sample characteristics (e.g., convenience or local samples), but they often attend to multiple dimensions of friendships and sometimes include measures of more than one mental health outcome as well as those of other developmental outcomes (e.g., behavioral adjustment and educational attainment). The distinction between the two bodies of literature is not clear, however, because many researchers in these fields incorporate each other's theoretical and methodological approaches.

In the review below, I will mainly describe studies that examined depressive symptoms as the mental health outcome but also include those that targeted self-esteem, happiness, and satisfaction with school, all of which are important constructs of adolescent mental health and likely to correlate with depressive symptoms. Several studies based on child populations (elementary school students) are also included in the review because they are similar to adolescent studies in terms of study purposes and designs, although friendships may influence child and adolescent mental health somewhat differently because of different needs and skills between these two developmental groups, as mentioned above. As in the previous review section of adult studies, I will organize findings in adolescent research by the study focus on network, behavioral, or affective/cognitive aspects of friendships.

Network Integration

As in adult studies, egocentric network size is the most commonly used measure of network integration in adolescent friendship studies. Past findings are mostly consistent in that having larger egocentric networks contributes to better mental health outcomes. For example, in a recent small survey study, Field, Diego, and Sanders (2001) reported that high school seniors who had more friends showed fewer depressive symptoms (measured by CES-D). Another study of black adolescents showed a negative association between number of friends and self-esteem (Coates 1985). However, the relationship between number of friends and mental health does not seem to emerge in adolescence; it already exists in childhood. For example, Gest, Graham-Bermann, and Hartup (2001) reported that among seven and eight year old children, those with

fewer friends were more likely to be perceived as sad by their classmates (although this is not necessarily evidence for depression). Although number of friends shows a fairly consistent association with better mental health across adolescent (and child) studies, Hansell (1985) did not find such association in his study of ninth through twelfth graders, where psychological distress was assessed as an outcome. (I will discuss this study in more detail later in this section.)

Some indirect empirical support for the relationship between having more friends and better mental health comes from developmental studies that examined the consequences of popularity at school. In these studies, student respondents are asked to nominate others at the same school (or in the same class) whom they like. Using Scottish data collected in 1964 (the Aberdeen Child Development Survey), for example, Östberg (2003) recently showed that students who received many “liked” nominations from other students in the same class were less likely to be perceived by their teachers as worried, fearful, and unhappy. Similarly, a classic study of adolescents in US high schools by Coleman (1961) showed that students who received many nominations as members of “leading crowds” had higher self-esteem (measured by lack of desire to be someone different).

Although the leading crowd or liking nominations used in these studies are similar to friendship nominations in terms of measurement procedures, they seem to measure characteristics of peer relationships that are somewhat different from what friendship nominations measure. First, students are not necessarily friends with those whom they like or those who they think are members of the leading crowds. Second, measures of popularity and leading crowd memberships are commonly based on the number of nominations each student *receives*, whereas egocentric friendship network size is usually based on number of nominations each student *gives* (or number of mutual nominations). Because of these differences, the measures based on liking or popularity nominations are thought to reflect what other students, as a group, think about each student, indicating his or her position in the group hierarchy, whereas egocentric friendship networks tend to describe close and often egalitarian relationships, which are just a small part of this student hierarchy (Bukowski and Hoza 1989; Coleman 1961; Östberg 2003). Thus, it makes sense that these measures of popularity and egocentric friendship network

size have independent effects on emotional development, although they generally show a moderate, positive correlation with each other (Coleman 1961; Gest et al. 2001).^{7,8}

As in adult mental health studies, network variables that measure individual positions in broader networks have rarely been used in adolescent studies. An exception is the above mentioned study by Hansell (1985), which included two centrality measures. One measure is closeness centrality, which can be calculated by taking the average of the geodesic distance (the number of ties in the shortest paths) between the target individual and other individuals in the network (Lin 1976).⁹ Individuals who have more direct ties than indirect ties are thought to be more central in the network. The other centrality measure used in Hansell's study, reachability, represents the total number of individuals in the network whom one can reach through one's direct and indirect ties. However, these centrality measures were not significantly associated with distress level in Hansell's study (although closeness centrality was positively associated with school satisfaction and ability to cope with school related stressors).

Nonetheless, there are some reasons to believe that network centrality is important for adolescent mental health. First, as discussed below, studies have shown that some centrality measures are associated with school attachment (Bearman and Moody 2003), which is known to reduce depressive symptoms (Resnick, Harris, and Blum 1993; Resnick et. al 1997). Second, in the child study by Gest and colleagues (2001) mentioned above, students who received many nominations as members of informal peer groups were less likely to look as sad in the teacher reports. Although the group membership measure used in Gest and colleagues' study was not based on friendship nominations, some friendship network centrality measures (e.g., eigenvector centrality) might capture membership in peer groups and thus show an association with mental health outcomes.

⁷ The positive correlation between popularity and friendship network size may be partly attributed to a causal relationship between the two. Bukowski, Hoza, and Boivin (1993) specifically argue that popularity influences friendship formation because students first have to be liked by at least one other student in order to have a friend and because being popular generally gives more opportunities to develop friendships. Relating their argument to previous theories of friendship development, the authors also refer to Sullivan's (1953) claim that the need for intimate friendships develops in adolescence, after the need for peer acceptance and popularity has emerged.

⁸ In some popularity studies, researchers construct a variable for number of friends by counting number of mutually liked nominations (instead of using friendship nominations). It is not clear whether mutually liked nominations are valid measures of friendships, but having more mutually liked nominations contributes to emotional development (e.g., Bukowski, Hoza, and Boivin 1993; Östberg 2003).

⁹ When calculating centrality closeness scores, it is more common today to take the reciprocal of average geodesic distance so that higher values indicate higher degrees of closeness instead of lower degrees (Wasserman and Faust 1994).

There are few studies that investigated the associations between still other network properties and adolescent mental health, but the existing findings are not consistent. As with adult studies, a couple of adolescent studies that examined the effects of egocentric network density showed inconsistent effects. Coates' (1985) study of black adolescents showed no significant association between density and self-esteem. In contrast, higher density was associated with fewer distress symptoms in Hansell's (1985) study. In fact, density was the only network variable that showed a significant association with distress among more than a dozen network variables examined in the study. Hansell reported that the following network properties were not significantly associated with distress: number of reciprocated friendships, number of unreciprocated friendships, number of friends of one's friends (including three versions based on sent, received, and reciprocated nominations), and four network roles determined by block models (in addition to egocentric network size, reachability, and closeness centrality already mentioned above).¹⁰

However, we do not have sufficient evidence to believe that these network properties have no effect on adolescent mental health. Hansell's small sample (N=254) might not have allowed him to detect small effects that these network variables might have had on distress, and the results based on just one school cannot be generalized to other schools, where occupying certain network positions may have different meanings. Because some of these network variables showed significant associations with other measures of adolescent outcomes (e.g., satisfaction with school, general ability to cope with school stress), the failure to detect significant associations with distress might also have been due to the problems with the distress measure. The Senior Form of the Health Opinion Survey developed by Leighton (1969) and used in Hansell's study consisted of 28 items and mainly targeted physiological symptoms (e.g., sleeping problems, sweaty hands). The instrument is not widely used in current adolescent studies to my knowledge.

In sum, past findings are largely consistent with respect to the relationship between egocentric friendship network size and good mental health, including fewer depressive symptoms. There is not yet sufficient evidence to determine the degrees to which other network integration measures, such as egocentric network density and centrality, influence adolescent depression.

¹⁰ The network roles included primary, broker, sycophant, and isolate. See Burt (1976) for block model method.

Behavioral Integration

One would expect the behavioral aspects of friendships to have strong impacts on adolescent mental health because friendships often develop from common interests in certain activities (Coleman 1961) and involve frequent and intensive interactions. Consistently, some studies reported the positive effects of friendship activities on mental health. For example, with data based on a sample of high school students in New York state, Kandel and Davies (1982) found that adolescents who engaged in activities with friends more frequently (measured by five items including “getting together outside of school” and “attending parties”) were less likely to report depressive mood (measured by six items similar to the CES-D items). Similar findings were reported in smaller studies, including Vernberg’s (1989) study of middle school students and Coates’ (1985) study of black adolescents.

These findings are also consistent with Csikszentmihalyi and Larson’s (1984) investigation of mood fluctuations among adolescents. In their study, adolescents were asked to carry electric pagers, which signaled them at randomly selected hours to record their emotions and activity contexts, including people who were with them at the moment. Their analysis showed that adolescents felt happy and excited when they were interacting with friends. These temporary feelings during friendship activities may contribute to more stable emotional states. The authors also noted, however, that being with friends activates adolescents’ positive emotions in part due to the nature of friendship activities (i.e., leisure and social activities), which are generally pleasant and enjoyable. Thus, this argument parallels alternative explanations for the psychological benefit linked to behavioral integration in adulthood: Spending time with friends per se contributes relatively little to good mental health, but activity contents are more important in explaining mental health consequences.

There is also some evidence that friendship activities, intimate conversation in particular, might be harmful to mental health. Gore and Aseltine (1995) analyzed longitudinal data based on a sample of high school students in the Boston area and reported that those who increased frequencies of intimate conversation with friends over a course of one year also showed greater increases in depressive symptoms (measured by CES-D). (There were also contemporaneous associations between intimate conversation and depressive symptoms.) The researchers explained this unexpected finding by arguing that some of the items that measured conversation

frequency specified personal concerns as conversation topics so that the harmful effect might be attributed to these stressors. Even if this assumption is correct, however, the finding implies that talking to friends did not completely reduce the magnitude of stressors captured by the conversation measure, because there was a significant positive relationship between talking and depressive symptoms instead of no relationship.

The psychological harm associated with intimate and intensive conversation may also be due to stress contagion. That is, adolescents who talk to their friends about their concerns may be more exposed to their friends' stressors. Consistent with this argument, adolescents who experience more stressors indirectly through friends are more likely to develop depressive symptoms, compared to those who have little stress exposure from friends (Compas and Wagner 1991; Larson and Asmussen 1991). Despite the possible harm due to stress contagion, however, disclosing or sharing personal information with friends per se is generally associated with *fewer* depressive symptoms (e.g., Vermerger 1990).

Affective/Cognitive Integration

I have already discussed some adolescent studies that demonstrated the expected mental health benefit associated with some affective/cognitive integration constructs (including sense of mattering and school attachment) as well as studies that reported the psychological harm due to loneliness. In addition to general thoughts and feelings about one's social environment, those about specific friendships also seem to influence mental health development among adolescents. For example, emotional closeness to friends is associated with fewer depressive symptoms among adolescents as it is among adults. Buhrmester (1990) analyzed data based on a small sample of adolescents and showed that intimacy with friends was associated with fewer depressive and anxious symptoms, as well as with higher self-esteem (see a similar finding in Field et. al 2002). Also consistent with adult studies, some researchers have conceptualized perceptions of positive relationship quality as friendship support and demonstrated their beneficial effects on adolescent mental health. For example, in the above mentioned study of Boston area high school students, Gore, Aseltine, and Colton (1992) reported that adolescents who perceived higher levels of friendship support (measured by "friends make you feel that they care" and "friends express interest in how you are doing," thus also overlapping with sense of mattering) had fewer depressive symptoms.

Links from Network and Behavioral Integration to Affective/Cognitive Integration

There is some evidence that adolescents who are integrated in friendship networks think and feel more positively about their schools. Hansell (1985), for example, showed that number of friendship nominations received, closeness centrality, and egocentric network density were all positively associated with satisfaction with school, although number of friendship nominations sent and number of reciprocated friendships did not show any effects. Bearman and Moody's (2003) more recent study with Add Health data showed that number of friendship nominations received and Bonacich centrality were both positively associated with attachment to school. (Bonacich centrality was similar to number of friendship nominations sent, except that friendships were weighted so that among students who nominated the same number of friends, students whose friends had more friends [i.e., those connected to popular friends] received higher scores than other students whose friends had fewer friends.)

In addition to the associations with these school related thoughts and feelings, some researchers examined whether network integration is negatively related to loneliness—a negative feeling about lack or inadequacy of one's social environment. For example, Bukowski and colleagues' (1993) study of middle school students showed that those with many friends (defined as reciprocal friendship nominations) were less likely to feel lonely. However, such association was not found in Stokes' (1985) study of college students (a majority of whom were freshmen). The lack of association between egocentric network size and loneliness might have been due to study designs (e.g., a sample of college students as opposed to adolescents, not limiting network members to reciprocal friendships), but it is actually consistent with adult studies mentioned earlier, which indicated that people who feel lonely are not necessarily isolated in their networks. However, Stokes' study showed a significant negative relationship between egocentric density and loneliness, indicating that loneliness may result from having network members who are not friends with each other.

In sum, being integrated in friendship networks seems to promote attachment to school and possibly reduce loneliness. As with adult studies, there is little research on the link between behavioral integration and affective/cognitive integration.

Friendship Integration at the School Level

Adult studies have demonstrated that overall degrees of social integration at the organizational level may promote mental health beyond the effects of individual-level integration. Most adolescent friendships develop and are maintained at school, and friendship patterns at the school level may influence adolescent mental health. Although there is little research on this topic, some studies have provided indirect support for the argument. For example, schools where students are densely connected with each other as friends have higher levels of attachment to school (Bearman and Moody 2003). Because school attachment contributes to good mental health (including fewer depressive symptoms) among adolescents, school-level friendship density may also promote mental health. Research on school climates is also relevant here because school climates tap affective/cognitive integration at the school level. Although we do not know mental health consequences, students at schools with cohesive climates have higher levels of academic achievement (Gamoran 1996). This argument is sometimes used to explain the higher academic achievement among students at Catholic schools (Coleman and Hoffer 1987).

Although not directly related to the concept of social integration or friendship integration, Östberg's (2003) analysis of Scottish children showed that classes with no isolated students (those who received no "liked" nominations) and classes with no extremely popular students (those who received seven or more liked nominations) had overall lower averages of psychosomatic symptoms. The researcher interpreted the result to indicate that students have better mental health when they are part of networks that are less hierarchical in terms of popularity. Although the study focused on hierarchy within grade levels, the school-level popularity hierarchy may have a similar effect on the mental health of children and adolescents.

The Effects of Socio-Demographic Attributes on Friendship Integration

Certain individual socio-demographic attributes influence the degrees to which adolescents are integrated to friendships. Compared to males, females tend to have larger egocentric networks (Stokes and Levin 1986), perceive their friends to be more supportive (Bukowski, Newcomb, and Hoza 1987; Gore et al. 1992), perceive their friendships to be more intimate (Buhrmester 1990), and feel less lonely (Stokes and Levin 1986). These findings thus show that the greater level of integration among females found in adult populations already

exists in adolescence. However, there seems to be no gender difference in terms of time spent with friends (Csikszentmihalyi and Larson 1984).

Older adolescents spend more time with friends (Csikszentmihalyi and Larson 1984), indicating their stronger desire to be with friends and greater subjective importance placed on friendships. However, older adolescents do not necessarily have larger friendship networks, feel any more intimate with friends, or feel any less lonely, compared to younger adolescents (Brennan 1982; Buhrmester 1990). Related to the age effect on loneliness, one may expect that adolescents become more attached to school over time because older adolescents value friendships more and spend more time with friends and also because a large portion of adolescent friendships develop and are maintained within school. However, school attachment seems to decrease over time during adolescence (Bearman and Moody 2003). The pattern of these findings may indicate that adolescents develop independence from school (as well as home) as institutions and that they come to focus on their personal networks.

Unlike sex and age, there is very little information in the literature about how race, ethnicity, and socio-economic status may influence friendship integration among adolescents. Existing studies show that white adolescents and those with high socio-economic backgrounds tend to be more popular and have more friends at school (Coleman 1961; Moody 1999). These socio-demographic backgrounds have similar effects on school attachment: White students as well as those from high SES families tend to be more attached to school (Bearman and Moody 2003).

The Effects of Network Composition on Affective/Cognitive Integration

Examining socio-demographic characteristics is also important because in general they have strong impacts on how adolescent friendships develop. Past studies demonstrated that adolescents with similar socio-demographic attributes such as sex, grade level (which strongly correlates with age), race, ethnicity, and SES are likely to be friends with each other (Cohen 1977; Kandel 1978; Moody 1999). This pattern results mostly from adolescents' choosing friends who are similar to them, rather than from dropping friends who are not similar (Cohen 1977; Kandel 1978).

I pointed out earlier that strong emotional attachment may develop among adolescents who are surrounded by others who share their socio-demographic backgrounds. Previous studies

have mostly focused on the consistency between individual socio-demographic attributes and school-level composition, and it is not clear whether the same process operates for egocentric network composition. In other words, we need to ask whether having friends who are similar to oneself promotes affective/cognitive integration. Although similarities are important in friendship formation, they generally have little impact on relationship quality (Aboud and Mendelson 1996). Thus, the network composition may not have a strong effect at the egocentric level. In addition to the failure to address the impact of egocentric network composition, past studies have been limited to comparing black and white students when testing the mental health consequences of the consistency between individual racial backgrounds and network composition. Thus, it is not clear whether other adolescent groups (other racial/ethnic minority groups, adolescents from low SES families, sexual minorities) benefit from being surrounded by other peer students or friends who share attributes.

The Role of Friendships in Minority Adolescents' Mental Health

Although socio-demographic variables are treated only as statistical controls in many studies that examined the relationship between adolescent friendships and mental health, there is some substantive importance to examining socio-demographic characteristics, particularly those that distinguish minority adolescents from majorities. (I use “minorities” to refer to a broad category of adolescents who have socio-demographic attributes which are often associated with lower, stigmatized social status in adult life; I am thus not limiting it to racial and ethnic minorities.)

First, some minority groups (e.g., adolescents from low SES families) tend to have more mental health problems, and friendship integration may mediate the minority effect on adolescent mental health. In other words, some minority adolescents may experience difficulties developing friendships due to rejection from peers, which may in turn result in or exacerbate mental health problems. For minority adolescents who do not necessarily experience poorer mental health (e.g., black adolescents in terms of depression), friendships may be counterbalancing the psychological harm associated with their minority status. That is, certain minority adolescents might be able to maintain good mental health because they are more integrated in friendships than other adolescents (see Williams and Harris-Reid 1999 for a similar argument previously made for black adults). Second, friendships may be more meaningful to

minority students, if we assume that their living conditions are more stressful and require help from others. Extending this argument, minority adolescents should receive a greater mental health benefit for a given level of friendship integration. Third, as discussed above, the ability of similar friends and peers at school to increase affective/cognitive integration and promote mental health has been demonstrated only for black children and adolescents in previous research. However, having friends and peers who share minority status may have different meanings and thus have differential mental health consequences across minority groups. In short, examining minority attributes will contribute to our better understanding about how network composition influences affective/cognitive integration and mental health.

Summary and Hypotheses

In early sociological studies, the declining level of social integration was viewed as a problem associated with modernity and urbanization, and epidemiological patterns of mental disorders and suicide were seen as manifestations of this problem. Contemporary sociological research has mostly focused on individual-level analysis and demonstrated that socially isolated individuals have poorer mental health than those who are integrated. Early and contemporary sociological studies share assumptions that people have a need to belong to a society or social group and that the psychological damage due to social isolation results from their living conditions that do not meet this need. Drawing from these studies, I made distinctions among network, behavioral, and cognitive/affective aspects of social integration.

Developmental theories are useful and necessary in order to explain how friendships contribute to adolescents' mental health. Like sociologists who examine the relationship between social integration and mental health, developmental psychologists tend to view friendships positively and address the ability of friendships to contribute to psychological development among adolescents, but they emphasize that the need for intimacy unique to this age group motivates friendship formation and management.

From the sociological and developmental literature, I have derived the following hypotheses regarding whether and how friendship integration influences adolescent depressive symptoms.

Hypothesis 1: Higher degrees of integration into friendships should be associated with fewer depressive symptoms. In terms of the network dimension of friendship integration,

previous studies have demonstrated that adolescents who have greater numbers of friends (and adults who have more network members) have better mental health, but the effects of other aspects of networks (density, centrality) are not clear due to the very small number of studies that employed network measures other than egocentric network size and the inconsistent results across studies. There has been also very little research on the psychological impact of behavioral and cognitive/affective aspects of adolescent friendships, but the existing studies have consistently showed that these aspects of integration contribute to better mental health. Previous studies are mostly based on cross-sectional data, and the causal directions of observed relationships are derived only from theoretical arguments. This limitation applies to other studies which I use to support my other hypotheses.

Hypothesis 2: The effects of network and behavioral integration on depressive symptoms should be mediated by affective/cognitive integration. Although previous researchers have often assumed that cognitive/affective processes account for the psychological benefit associated with high levels of integration, the assumption has rarely been tested directly. However, there are some empirical studies that demonstrated the links between network integration and affective/cognitive integration, and other studies that supported the link between affective/cognitive integration and depressive symptoms (or other mental health outcomes). Therefore, these studies jointly support the path from network integration to affective/cognitive integration and to mental health, although there is little empirical evidence, which directly or indirectly supports the mediation effect of behavioral integration on mental health through affective/cognitive integration.

Hypothesis 3: Greater degrees of integration at the school level should be associated with fewer depressive symptoms beyond the effect of individual-level integration. Previous studies on adolescent friendships have focused on personal environments (egocentric networks, activities in which each individual engages, and individual perceptions and feelings about one's friends). As other adolescents and adults studies have demonstrated, however, the degree of integration at organizational and geographical levels (e.g., neighborhood) may influence mental health. School is particularly important as an organizational context for adolescent friendships, given that a majority of friendships develop within schools. However, there has been very limited research to test the mental health consequence of school-level integration.

Hypothesis 4: Certain socio-demographic attributes should predict the degrees to which adolescents are integrated into friendships. Specifically, minority attributes (black, Asian, Hispanic, and low socio-economic backgrounds) should be associated with lower degrees of integration. Some adult studies reported the socio-demographic patterns of social integration, but adolescent studies have paid little attention to these individual attributes. Demonstrating lower degrees of integration among minority adolescents is important because it may offer an explanation for their poor mental health.

Hypothesis 5: Having friends and peers who share one's socio-demographic attributes should promote affective/cognitive integration and good mental health. This hypothesis was originally developed by Rosenberg (1979) to contrast black students in black dominated schools and black students in other schools. It is likely that the principle applies to other socio-demographic groups, but there has been very little research. Also, we know little about whether the principle operates at a smaller context of egocentric networks. Adolescents may benefit from having friends, as well as school peers, who share socio-demographic attributes.

CHAPTER II

METHODS

Data and Sample

For data analysis, I used *the National Longitudinal Study of Adolescent Health* (Add Health) (Udry 1998). Add Health was designed to assess the health status and health related behaviors of adolescents in the US. Many previous studies that examined the relationships between friendship networks and adolescent mental health were based on convenience or small local samples, and most large surveys of adolescents only included a few friendship variables and lacked network data. To my knowledge, Add Health is the only nation-wide study that allows one to compute a variety of network variables and examine their effects on adolescent mental health. I will also take advantage of the longitudinal feature of Add Health by using multiple waves in the analyses.

A multi-stage stratified sampling technique was used to select respondents in Add Health. First, all high schools in the US were given unequal probabilities of selection, depending on region, degree of urbanization, proportion of white students, and enrollment size. In total, 80 high schools and 52 sister schools which sent students to those high schools (commonly middle schools) were selected. In 1994, questionnaires were administered at each school to students who were present on that day (*in-school survey*, N=90,118). About six months later, in-depth, structured interviews were conducted at respondents' homes (*in-home survey*, N=20,745). In 16 schools, all students on the school rosters were asked to participate in this in-depth survey.¹¹ For each of the remaining schools, about 200 students were selected from the school roster. The in-home sample was stratified by gender and grade level, and students in certain ethnic categories (black students from educated families, Chinese students, Cuban students, and Puerto Rican students) were oversampled.

¹¹ The sixteen schools included two large schools—one in a suburban area with racially diverse students and the other in a rural area with mostly white students. The remaining fourteen schools were included because of their small student enrollment.

I used the following restrictions to define my operational sample. I first excluded students at 27 schools which had response rates of 80 percent or lower on the in-school survey.¹² This is because the large number of missing cases in these schools did not allow me to construct reliable measures of network integration and composition, which required information on peers at school as well as information on target adolescents. I computed all independent variables with the remaining adolescents (N=71,084 in 105 schools). Of these, 12,842 adolescents participated in the in-home survey, where my dependent variable, depressive symptoms, was measured. My final operational sample consisted of 11,023 adolescents who had valid values for all variables used in the analyses.

Measures

Depressive Symptoms

As a measure of depressive symptoms, I used a modified version of the Center for Epidemiologic Studies Depression (CES-D) scale (Radloff 1977). The CES-D is frequently used as a screening device to detect clinically relevant levels of depression. (See Chapter I for a discussion of the validity of CES-D as measures of psychological distress, depressive symptoms, and clinical depression.) Nineteen questions asked how often during the past week respondents had certain feelings, thoughts, and physical conditions.¹³ Each question had four response categories (ranging from 0=“never or rarely” to 3=“most of the time or all of the time.”) (See Appendix 2.1 for the exact wording of the CES-D items and other measures.) Although the CES-D generally has good inter-item reliability, the items also form a few factors within the scale including a factor that represents interpersonal symptoms of depression (Radloff 1977). This was also true for the modified version of CES-D used in Add Health. Because these items

¹² Schools excluded from analysis due to low response rates might have been somewhat different from those in the operational sample. The average belonging score was significantly lower at the excluded schools ($t=5.65, p<.001$), although there was no significant difference in depressive symptoms. (Note that these contrasts are conservative, given that the average levels of belonging and depressive symptoms are based on students who participated in the study.) Similarly, students who were dropped in the listwise deletion procedure due to absence and uncompleted questionnaires might have had some unique attributes (e.g., less integrated to school, had more psychological and behavioral problems), although this hypothesis cannot be directly tested. The exclusion of these excluded schools and adolescents from analysis might have influenced the estimation of the relationship between integration and mental health.

¹³ The original CES-D scale consists of twenty items. Two items, “my sleep was restless” and “I had crying spells” were dropped, and an item, “I felt life was not worth living” was added. Also, two other items were worded differently in Add Health, including “I felt too tired to do things” (originally “I felt that everything was an effort”) and “it was hard to get started to do things” (originally “I could not get going”).

Table 2.1. Descriptive Statistics for Individual-Level Variables

Dependent Variable	Mean	SD	Socio-Demographic Attributes	Percent	Egocentric Network Composition	Mean	SD
Depressive Symptoms	8.86	6.25	Female	.52	Proportions on Same Sex	.60	.25
			Race/Ethnicity		Proportions on Female	.51	.27
			White	.72	Proportions on Same Race	.78	.29
			Black	.15	Proportions on White	.67	.38
			Hispanic	.08	Proportions on Black	.14	.30
			Asian	.04	Proportions on Hispanic	.10	.21
			Others	.02	Proportions on Asian	.04	.14
			Parents' Education		Proportions on Same Grade	.74	.28
			Less than High School	.08	Proportions on Grade 7	.16	.33
			High School Graduate	.33	Proportions on Grade 8	.16	.33
			Some College	.17	Proportions on Grade 9	.18	.31
			College Graduate	.29	Proportions on Grade 10	.17	.29
			Do Not Know/No Answer	.13	Proportions on Grade 11	.15	.26
			Single Parent Family	.25	Proportions on Grade 12	.15	.29
			Grade Level				
			Grade 7	.16			
			Grade 8	.17			
			Grade 9	.17			
			Grade 10	.17			
			Grade 11	.16			
			Grade 12	.16			
Integration Variables							
Total Number of Friends	7.30	3.22					
Number of Friends at School	5.75	3.29					
Number of Friends Outside School	1.29	2.04					
Number of Non-Participant Friends	.94	1.19					
In-Degree	4.79	3.83					
Popularity Categories							
Marginal	.37						
Average	.52						
Popular	.11						
Egocentric Density	.21	.20					
Friendship Reciprocity	.37	.31					
Closeness Centrality	7.68	8.00					
Eigenvector Centrality	4.50	6.60					
Friendship Activities	10.47	7.61					
Problem Discussions	3.14	2.80					
School Organization Participation	.85						
Belongingness to School	10.73	2.98					

N = 10,003

Standard deviations were computed only for continuous variables.

were very closely related to the concept of social integration and might contaminate measures of depressive symptoms and friendship integration, I excluded them from the scale after making sure that the shorter scale had an adequate reliability score ($\alpha=.84$). (See Appendix 2.2 for a more detailed description of factor analysis conducted with the 19-item and 15-item scales.) *Depressive symptoms* represented summed scores from the 15 items. The possible values ranged from 0 to 45. Adolescents had a CES-D score of 8.86 on average ($SD=2.25$). (The means and standard deviations of all individual-level variables are shown in Table 2.1.)

Network Integration

Measures of network integration were constructed from friendship nomination data included in the in-school questionnaire. In this section, adolescents were asked to list five closest male friends in the order of the best friend, the next best friend, and so on. The same question was asked for five closest female friends. Respondents were specifically told that they could nominate opposite-sex friends who were also their boyfriends or girlfriends.¹⁴ When respondents and their friends went to the same schools, friends' identification numbers were recorded. *Total number of friends* represents the sum of male and female friends calculated from the nomination lists. Adolescents nominated 7.3 friends on average. As subsets of total number of friends, I also computed *number of friends at school* and *number of friends outside school*.¹⁵ Further, as a subset of number of friends at school, I calculated number of friends who did not participate in the in-school survey (*number of non-participant friends*). This variable was used for two purposes. First, as discussed below, construction of egocentric network variables required nomination data from all network members, and egocentric network measures might have been biased, especially for adolescents who nominated many non-participants as friends. I entered number of non-participant friends in the analysis to reduce this bias. Second, having many non-participating friends might also have signaled that adolescents were surrounded by friends who did not conform to school norms (e.g., participating in the school-wide survey). Thus, I examined whether having a larger number of non-participant friends increased depressive

¹⁴ However, adolescents were not told that they could nominate same-sex friends who were also their boyfriends or girlfriends.

¹⁵ Number of friends at school and number of friends outside school did not necessarily sum up to the total number of friends. This is because number of friends at school only included those identifiable in the school rosters, whereas total number of friends included non-identifiable friends at school. Some friends could not be identified in the school rosters because they were new to the schools or only known by nicknames. The incompleteness of rosters also resulted from simple errors in the rosters.

symptoms of target adolescents. These network variables discussed so far were all based on the number of sent nominations, and their possible values ranged from zero to 10. These network variables can be thought of as different versions of out-degree (a centrality measure that represents the number of sent nominations).

Researchers have argued that number of received nominations (*in-degree*) measures an aspect of friendship networks different from what number of sent nominations (*out-degree*) measures. More specifically, in-degree is commonly treated as a measure of adolescents' positions in the popularity hierarchy at school (Coleman 1961; Moody 1999; Östberg 2003). With the Add Health data, in-degree showed a strong positive skewness, indicating the presence of some extremely popular students. Because of this skewed distribution, in-degree needed to be transformed. The transformation also made sense because in-degree positively correlated with out-degree despite the conceptual difference between the two measures just mentioned. Thus, using in-degree, I constructed an ordinal variable with the following three categories: (1) "popular" (students who had in-degree values in the top ten percentile or above within the school); (2) "average" (students who nominated or were nominated by "popular" students but were not "popular" themselves); and (3) "marginal" (other students). Because in-degree was function of school size (which determined the maximal possible value for in-degree) to some extent, within-school percentiles were more appropriate to identify "popular" students than percentiles based on the whole sample. The "popular" student category identified those on the top of popularity hierarchy, whom out-degree did not differentiate from students who were popular among several others but not at the school level. A distinction between "average" and "marginal" students was made with an assumption that being associated with or belonging to the same groups as very popular students gave students higher status in the popularity hierarchy even though they were not very popular themselves (Moody 1999).

In addition to these network variables based on out-degree and in-degree, which in some ways counted numbers of adolescents' direct friendships, I considered other network integration variables that indicated the extensiveness of adolescents' indirect ties and their positions in the school-wide networks. In selecting network variables, I used the following criteria: (1) they directly related to the concept of social integration and measured adolescents' connectedness to school friendship networks; (2) they were not collinear with out-degree, in-degree, or other network variables already selected for the analysis; and (3) they had enough variability so that

they were able to explain variation in depressive symptoms. There were four network variables that roughly met these criteria, including egocentric density, friendship reciprocity, eigenvector centrality, and closeness centrality. I calculated these network variables by manipulating adjacency matrices in UCINET 6.26. Adjacency matrices are square matrices with network members in rows and columns, and 0's and 1's in cells, indicating absence and presence of ties. I entered 0's in diagonal cells as is commonly done when calculating these network variables.¹⁶ Computation procedures for each measure are described below.

The first two measures described egocentric networks, which consisted of the target adolescent (ego) and his or her direct friends (alters). *Egocentric density* represented what percentage of the ties among alters were present, indicating the degree to which each adolescent's alters were friends with each other. Egocentric network density can be expressed in the following formula:

$$\text{Egocentric Density} = \frac{p}{a * (a - 1)} * 100 \quad [\text{Equation 2.1}]$$

where p is the number of friend pairs among alters and a is the number of alters. When calculating this variable, I considered as alters those who nominated *or* were nominated by the target adolescent. Similarly, I considered both sent nominations and received nominations as valid friendships among alters. However, egocentric density would have automatically decreased every time a respondent nominated students who did not participate in the in-school survey because these (possible) alters could not nominate other alters (or anyone else). Thus, I deleted non-participant alters from both denominator and numerator of the egocentric density formula. Also, when respondents had no or just one alter, the denominator would be zero. Instead of deleting these respondents from the analysis, I assigned them a density value of 0. With egocentric density, I intended to measure the extent to which respondents' alters were friends with each other, and by assigning 0 to these respondents, I indicated that they did not have any alters who were friends with each other. Egocentric density was expressed in percent, and the value ranged between 0 and 100.

¹⁶ Except for the cases mentioned below, I kept the matrices asymmetric and thus distinguished sent and received friendship nominations.

Friendship reciprocity measured another dimension of egocentric networks. To calculate friendship reciprocity, I simply divided number of mutually nominated friendships by number of friends that the target respondent nominated, as expressed in the following formula:

$$\text{Friendship Reciprocity} = \frac{m}{fs} \quad [\text{Equation 2.2}]$$

where m is number of alters who both nominated and were nominated by ego, and fs is total number of alters whom ego nominated. As in calculation of density, I excluded alters who did not participate in the in-school survey. Friendship reciprocity complemented out-degree and in-degree, each of which considered only one direction of friendship nominations, and the variable allowed me to examine whether mutuality added any psychological benefit to friendships. The variable was expressed in proportion so that the value ranged from 0 to 1.

The remaining two variables, eigenvector centrality and closeness centrality, measured adolescents' positions in school-wide friendship networks. For both measures, I hypothesized that adolescents who occupied more central positions would have had fewer depressive symptoms. Although I considered other centrality measures, they were not relevant to the concept of integration, nor were they highly correlated with other network variables used in the analysis. *Eigenvector centrality* identified clusters within schools and measured how closely each adolescent was located to the largest cluster in the school. The calculation process was analogous to conducting factor analysis with adjacency matrices, where one tries to find a column vector S such that the squared distance between the observed adjacency matrix and SS' (a product matrix of S and S -inverse) was minimized. Eigenvector centrality of each adolescent then corresponded to his or her factor loading on the factor with the largest eigenvalue, and the centrality score thus indicated the extent to which the adolescent's friendships with others contributed to the largest cluster in the school (see more details in Bonacich 1972). Because students in certain schools (e.g., those at small schools) were more likely to be members of or located closely to the largest clusters and receive higher eigenvector centrality scores, the final scores were normalized (i.e., divided by the largest possible score at each school) in order to facilitate the comparison of eigenvector centrality scores across schools. The final value ranged from 0 (the lowest possible value at the school) to 1 (the highest possible value).

Closeness centrality showed how closely each adolescent was located to others in the school network. As the first step to calculate closeness centrality, geodesic distance between

each possible pair of students was calculated within schools. *Geodesic distance* is the number of ties that one adolescent would have had to go through to reach another specific adolescent. Although there were multiple paths that linked one adolescent to another, geodesic distance was based on the shortest path. When two adolescents were not reachable to each other (e.g., when one or both adolescents had no friend or few friends who were disconnected from other components of the network), the true geodesic distance would be infinite. Instead, I assigned these cases the largest observed geodesic distance at the school in order to avoid computation problems in statistical analyses. The final closeness centrality score was the reciprocal of the average geodesic distance from each adolescent to all others in the same school. As with eigenvector centrality, closeness centrality was normalized at the school level and thus ranged from 0 to 1.

Behavioral Integration

To assess behavioral aspects of friendships, I used questions regarding whether adolescents engaged in five specific activities in the past week with each of the friends whom they named.¹⁷ These activities included talking on the phone, visiting at home, meeting after school, spending time together on weekends, and discussing problems. I separated problem discussion from other friendship activities for two reasons. First, the activity might have indicated that adolescents had problems and concerns, which would have influenced their mental health independent of the act of discussion itself. Intimate discussion might also have indicated exposure to their friends' problems, which could have undermined target adolescents' mental health (Compas and Wagner 1991; Haines and Hurlbert 1992; Kessler and McLeod 1984). Thus, *problem discussion* represented number of friends with whom respondents discussed personal problems, and *friendship activities* was sum of the remaining four activities in which respondents engaged with each friend. Because problem discussion and other friendship activities were asked specifically for friends that adolescents nominated, those with larger egocentric networks tended to engage in more activities. In order to create activity measures more independent of egocentric network size, I initially divided problem discussion and friendship activities by egocentric network size. However, these modified variables did not have any effects on

¹⁷ The questions were asked for both friends at school and those outside school. I included all information to construct friendship activity measures (i.e., not limiting to activities with school friends.)

depressive symptoms in a preliminary analysis, and thus I used the original versions of problem discussion and friendships activities (not divided by egocentric network size) in the following results chapters.

In addition to friendship activities, I included *school organization participation* as a behavioral integration measure. Students were provided with a list of 33 clubs, organizations, and athletic teams (e.g., French club, student council, basketball team) and asked to mark those in which they participated. I first computed the total number of organizations for each adolescent. Because the variable had a strong positive skew in the distribution, I dichotomized it to distinguish adolescents who participated in any organizations (coded as 1) and those who did not (coded as 0). Although participation in school organizations did not necessarily indicate engagement in friendship activities, close friendships might have developed among adolescents who belonged to the same organizations.

Affective/Cognitive Integration

There are several questions in the in-school survey that targeted students' feelings and thoughts about school and peers at school. I conducted exploratory factor analysis with possible items and selected three items that loaded on the same factor. These included "I feel close to people at this school," "I feel like I am a part of this school," and "I am happy to be at this school." For each question, adolescents chose from five response categories (ranging from 1="strongly disagree" to 5="strongly agree"). These three items showed adolescents' *sense of belonging to school* ($\alpha=.79$). These items measured adolescents' feelings toward school and peers at school but not toward their egocentric networks. There was no question in the in-school survey that targeted feelings and thoughts about egocentric networks or specific friends.

Socio-Demographic Attributes

Five socio-demographic variables were included in the analysis in order to test whether individual characteristics influenced friendship integration, and they were also treated as statistical controls when examining the effects of friendship integration on depressive symptoms. Most of the socio-demographic information was obtained in the in-school survey with some exceptions as noted below. *Sex* was a dichotomous variable with males coded as 0 and female as

Table 2.2. Descriptive Statistics of School-Level Variables

	<i>Mean</i>	<i>SD</i>
School-Level Integration Variables		
School Size/100	8.17	6.18
Response Rate	.85	.08
Density	.03	.06
In-Degree Centralization	3.54	.62
Closeness Centralization	1.14	1.03
Eigenvector Centralization	5.51	2.01
Mean Friendship Activities	9.35	2.06
Mean Problem Discussions	2.74	.67
Proportion Organization Participants	.86	.07
Mean Level of Belongingness to School	10.83	.55
School-Level Network Composition		
Proportion Female	.50	.06
Proportion White	.61	.30
Proportion Black	.18	.25
Proportion Hispanic	.12	.15
Proportion Asian	.05	.08
Proportion Grade 7	.22	.24
Proportion Grade 8	.22	.22
Proportion Grade 9	.16	.14
Proportion Grade 10	.15	.13
Proportion Grade 11	.13	.11
Proportion Grade 12	.11	.10

N=105

1. *Grade level* was a set of dummy variables ranging from grade 7 through grade 12.^{18,19} *Race and ethnicity* was a set of five dummy variables including white, black, Hispanic, Asian, and others. This variable was based on a question in the in-home survey, where respondents were forced to choose one category.²⁰ As proximal measures of socio-economic status, I included parents' educational level and family structure. I created five dummy variables for *parents' education* by taking the higher educational level of the mother's and father's. The dummy variables originally included "less than high school," "high school graduate," "some college," and "college graduate." However, there were a sizable number of students who did not know or did not report their parents' educational levels. Thus, in addition to the information from the in-school survey, I used the in-home survey and the parent survey, in which a parent of each respondent (mostly the mother) was asked to participate. This additional information did not reduce the number of missing cases to a great extent, and thus I included "do not know/no answer" as a (valid) category for parents' educational level. For family structure, students who lived with both parents received a value of 1, and others received 0.

School-Level Integration

My analyses included several variables as school-level measures of network, behavioral, and affective/cognitive integration. Their means and standard deviations are shown in Table 2.2. For network integration, school-level density indicated the overall connectedness of school friendships. The following formula was used to calculate density:

$$\text{School-Level Density} = \frac{P}{N * (N - 1)} \quad [\text{Equation 2.3}]$$

where P is the number of friend pairs and N is the total number of students at school. Those who did not participate in the in-school survey did not nominate any friend, and thus low response rates might attenuate density scores. For this reason, I excluded non-participant adolescents from both numerator and denominator of the formula. Density was expressed in percentage and thus ranged from 0 to 100.

¹⁸ Age was not included because of redundancy with grade level.

¹⁹ I constructed a set of dummy variables, instead of treating grade level as an interval variable, because in the analysis of network composition, I treat each grade level as a discrete category.

²⁰ Native American was one of the response categories in the original question, but I combined it with the "other" category because of the small number of adolescents who identified themselves as Native Americans.

Although not directly related to the concept of network integration, there are some school-level network characteristics that might have influenced depressive symptoms as discussed in Chapter 1. First, *school size* represents the total number of students enrolled at school. Adolescents at larger schools are more likely to have a greater number of students that they do not know personally, which might reduce emotional attachment to school and in turn increase depressive symptoms. School size is also treated as a control variable when examining the effect of school-level density on depressive symptoms; network density tends to be very small in large schools so that the psychological harm associated with loosely connected networks needs to be distinguished from the damage due to large network size.

Another set of network variables, centralization, shows how hierarchical the friendship network is in each school. As discussed in Chapter 1, schools with lesser degrees of hierarchy have lower averages of depressive symptoms among students (Östberg 2003). In network analysis, centralization generally refers to the variance of centrality scores among individual members in a given network, and high centralization indicates a great variability in centrality scores and thus a high level of hierarchy. Centralization can be calculated for any centrality measure, but I focused on those that I used as individual-level measures. Thus, *closeness centralization*, *eigenvector centralization*, and *in-degree centralization* represented within-school variances of closeness centrality, eigenvector centrality, and in-degree centrality respectively. Out-degree centralization was not used because of its redundancy with in-degree centralization. Between in-degree and out-degree centralization, I chose the former because received nominations, from which in-degree was calculated, tended to be more sensitive to population hierarchy than sent nominations as discussed in Chapter 1.

In order to measure overall degrees of behavioral and affective/cognitive integration at the school level, I aggregated individual-level measures by taking averages for continuous measures and computing a proportion for dichotomous measures. These aggregated measures included *mean friendship activities*, *mean problem discussions*, *proportion school organization participants*, and *mean level of belonging to school*.

Egocentric Network and School Composition

Network composition was included in order to examine whether the consistency between adolescents' attributes and network composition strengthened a sense of belonging to school and

reduced depressive symptoms. Measures of network composition were constructed at both egocentric and school levels. For egocentric network composition, number of friends with target attributes was divided by total number of friends at school. (I considered as friends those who nominated or were nominated by the target adolescent.) Similarly, for school network composition, number of students with target attributes was divided by total number of students at school. Attributes of egocentric and school network members were known only when they were participants in the in-school survey, and therefore I did not consider non-participants as valid network members and excluded them from the numerator and denominator of the network composition formula. The egocentric-level and school-level composition variables included proportions of females, whites, blacks, Hispanics, Asians, 7th graders, 8th graders, 9th graders, 10th graders, 11th graders, and 12th graders.²¹

School-Level Control Variables

I considered the following school characteristics as control variables: degree of urbanization, private vs. public school, special schools (e.g., magnet schools), and middle vs. high school. However, my preliminary analysis showed that these school characteristics did not show significant effects on depressive symptoms and thus did not bias estimated effects of key independent variables on depressive symptoms. Therefore, these variables are not included in the analyses presented in the following chapters.

Analysis Plan

I first obtained descriptive statistics, using STATA 7.0. I used weights to correct the statistics for oversampling and calculated standard errors using Taylor series estimation because of the nested data structure (i.e., students within schools). I then constructed multivariate models, where depressive symptoms measured in the in-home survey were regressed on integration variables measured in the in-school survey, allowing a six-month time lag between the independent and dependent variables. Some models examined the effects of school-level

²¹ Given the diversity within groups, it might make sense to examine network composition of Asian and Hispanic subgroups (e.g., Mexicans, Chinese). Because of the lack of previous studies that examined the relationship between network composition and mental health among Asian and Hispanic adolescents, however, I will use the broader racial/ethnic categories to obtain an overall pattern and avoid complicating the analyses in this dissertation. Also, such analyses of subcategories might not have been reliable with the Add Health data due to the small numbers of respondents, friends, and peers in each subcategory.

integration on (individual-level) depressive symptoms. I used hierarchical linear models to estimate these cross-level effects because they are superior to alternative models such as OLS regression in producing unbiased estimates in these cases (Raudenbush and Bryk 2002). Although some of my multivariate models did not include any school-level independent variables, I used hierarchical linear models throughout the analyses because it is easier to compare results across models. I conducted these analyses in HLM 5.04.

As the conventional exploratory step in hierarchical linear modeling, I ran a “null” model to see how much variance in depressive symptoms existed at the school level as opposed to the individual level (Raudenbush and Bryk 2002). A null model specified depressive symptoms as the dependent variable and included no individual-level or school-level predictor, except two random effect terms, one for the individual level and the other for the school level. This model showed an individual-level variance of 37.93 and a school-level variance of 1.45, indicating that schools accounted for only 3.7 percent of variance in depressive symptoms ($1.45/(37.93+1.45)*100=3.7$). Therefore, it was not likely that I could find school-level variables which would significantly predict adolescents’ depressive symptoms.

CHAPTER III

ANTECEDENTS OF FRIENDSHIP INTEGRATION

Overview

The main goal of this chapter is to identify socio-demographic antecedents of friendship integration among adolescents. The first part of the chapter investigates the extent to which adolescents' socio-demographic attributes influence degrees of friendship integration in the network, behavioral, and affective/cognitive dimensions (Path a in Figure 1.1). Only a limited number of studies have systematically examined the socio-demographic patterns of friendships in the adolescent population. The literature particularly lacks a study that simultaneously examines multiple dimensions of friendship integration. I expect the socio-demographic patterns to be consistent across the network, behavioral, and affective/cognitive aspects of friendship integration, although it is possible that the associations between socio-demographic backgrounds and friendship integration may vary to some extent depending on which measures are considered, as reported in previous studies (see Chapter 1).

Identifying socio-demographic antecedents of friendship integration has another important purpose: finding a possible explanation for the greater numbers of depressive symptoms experienced by minority adolescents. If their poorer mental health is due to their lower degrees of integration, we should observe negative associations between minority status indicators and degrees of integration. Finally, the socio-demographic patterns of friendship integration can be compared to those reported in previous adult studies. The comparison will show us whether socio-demographic attributes consistently or differently predict degrees of integration in adolescence and in adulthood.

In addition to socio-demographic attributes, network composition may influence friendship integration. More specifically, adolescents are likely to have a stronger sense of belonging to school when they have many friends and peers who share their socio-demographic characteristics (Path e in Figure 1.1). Past research on this topic has been limited to the examination of how school composition of white and black students influences a sense of belonging. Therefore, the analyses here will extend the literature by asking two additional

Table 3.1. Friendship Integration Variables Regressed on Socio-Demographic Backgrounds (Unstandardized HLM Coefficients)

	# Friends at School	Indegree	Density	Recipro- city	Close. Cent.	Eigen. Cent.
Sex (Female=1)	.61 ***	.49 ***	.02 ***	.09 ***	.07 *	.00
Race/Ethnicity (ref.=white)						
Black	-.54 ***	-.72 ***	-.02 *	-.08 ***	-.03	-1.25 **
Hispanic	-.52 **	-.21	.01	-.03	.01	-.50
Asian	-.58 **	-.68 **	.01	-.04	-.10	-1.07 ***
Others	-.15	-.22	.04	-.01	.00	-.90
Grade Level (ref.=Grade 9)						
Grade 7	-.15	-.56 *	.01	-.03	-.36 *	-.26
Grade 8	.05	-.01	.03 *	.00	-.36 **	.96
Grade 10	-.04	-.18	.00	.02	.02	-.86 *
Grade 11	-.45 **	-.26	.01	.03 *	-.08	-1.31 **
Grade 12	-.56 ***	-.36 *	.03 ***	.05 ***	-.09 *	-1.71 ***
Parents' Ed. (ref.=H.S. Graduate)						
Less than High School	-.41 **	-.46 **	.02	-.01	-.20 *	-.74 *
Some College	.25	.31 *	.01	.02	.03	.59 *
College Graduate	.30 **	.76 ***	.03 ***	.05 ***	.02	1.20 ***
Missing	-.65 ***	-.81 ***	-.01	-.05 ***	-.20 *	-1.24 ***
Single Parent Family	-.29 **	-.32 **	.00	-.02 *	.02	-.38 *
Intercept	5.72 ***	4.78 ***	.18 ***	.32 ***	8.30 ***	5.41 ***
<i>Intercept Variance</i>	.82	.97	0.00689	.00	73.28	12.75
<i>Degrees of Freedom</i>	104	104	104	104	104	104
<i>Chi Square</i>	959.18	853.23	2081.24 ***	550.02 ***	459373.38 ***	4198.23 ***
<i>Level 1 Error Variance</i>	9.62999	13.2378	0.03228	0.08868	1.5307	30.1139
<i>Deviance</i>	56503.86	59993.54	-6128.52	4850.99	36904.74	69208.83
<i># Parameters</i>	2	2	2	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

(Continues to the next page.)

$N = 11,023$ adolescents in 105 schools

Table 3.1 cont. Friendship Integration Variables Regressed on Socio-Demographic Backgrounds (Unstandardized HLM Coefficients)

	Friend. Act.	Problem Discuss.	School Org.	Belong. School
Sex (Female=1)	1.20 ***	1.79 ***	.00	-.20 **
Race/Ethnicity (ref.=white)				
Black	-2.64 ***	-.84 ***	.04 *	-.57 ***
Hispanic	-1.23 **	-.41 ***	-.03	-.01
Asian	-2.55 ***	-.67 ***	.02	.31
Others	.23	-.12	-.08	-.02
Grade Level (ref.=Grade 9)				
Grade 7	-1.80 ***	-.71 ***	.03	.39 *
Grade 8	-.64	-.25	-.01	.00
Grade 10	1.19 ***	.31 *	-.02	-.43 ***
Grade 11	1.95 ***	.39 ***	-.02	-.62 ***
Grade 12	1.82 ***	.51 ***	-.03	-.62 ***
Parents' Ed. (ref.=H.S. Graduate)				
Less than High School	-1.32 ***	-.30 *	-.05 **	-.26
Some College	1.00 **	.34 ***	.03 *	.29 *
College Graduate	.84 **	.32 ***	.07 ***	.38 ***
Missing	-.90 **	-.31 **	-.02	-.39 **
Single Parent Family	-.16	-.05	-.02	-.32 **
Intercept	9.81 ***	2.23 ***	.84 ***	11.12 ***
<i>Intercept Variance</i>	1.95	.18	.01	.29
<i>Degrees of Freedom</i>	104	104	104	104
<i>Chi Square</i>	485.82 ***	381.12 ***	559.31 ***	450.68 ***
<i>Level 1 Error Variance</i>	52.43	6.55036	0.1207	8.34593
<i>Deviance</i>	75086.88	52167.57	8246.40	54852.30
<i># Parameters</i>	2	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents in 105 schools

questions: (1) whether having similar friends in egocentric networks, as well as having similar peers in school-wide networks, contributes to a sense of belonging; and (2) whether having similar network members strengthens a sense of belonging in adolescent groups other than whites and blacks (e.g., Hispanics and Asians).

In the last section of this chapter, I will examine the extent to which integration variables correlate with each other. Because they all measure some aspects of friendship integration, I expect them to correlate positively with each other. The relationships between network and behavioral integration and affective/cognitive integration (Paths b and c in Figure 1.1) are particularly important because those relationships constitute a part of the mediation process that links network and behavioral integration to depressive symptoms.

The Relationship between Socio-Demographic Backgrounds and Friendship Integration

For this set of analyses, I ran a hierarchical linear model for each integration variable with socio-demographic characteristics simultaneously entered as predictors. The models shown in this section only include individual-level variables, and the unstandardized coefficients can be interpreted in ways similar to OLS regression coefficients (i.e., indicating amounts of change in the target integration variable for one unit change in the socio-demographic variables).²²

Table 3.1 presents the results from the hierarchical linear models. As the first column shows, females, whites, adolescents in lower grade levels, and those with educated parents and two-parent families had more friends at school.²³ These socio-demographic patterns largely applied to other integration variables. However, there were some notable exceptions. First, although female adolescents were more integrated as indicated by the network and behavioral dimensions, their levels of belonging to school were lower than males. This does not necessarily mean that female adolescents attached less affect to their social relationships at school because previous studies have consistently found that females feel emotionally closer to their friends (Buhrmester 1996) and feel less lonely (Stokes and Levin 1986). Instead, the result may indicate that female adolescents focused on their friendships and peer relationships without attaching

²² Because popularity categories and school organization participation were not continuous variables, I ran nonlinear models (hierarchical multilogit model and hierarchical logistic model respectively), in addition to the linear models (see Appendix 3.1 for the results). Because similar conclusions can be drawn from the linear and nonlinear models, I present the linear models in the main table (Table 3.1), which simplifies the presentation of the results.

²³ I am focusing on number of friends at school rather than total number of friends because, as shown in Chapter 4, the former is more strongly associated with depressive symptoms.

emotionally to school. Second, although racial and ethnic minorities had fewer friends, were less popular (i.e., had lower in-degree scores), and engaged in fewer friendship activities than whites, there were no significant differences between minority adolescents and white adolescents in terms of density, reciprocity, closeness centrality, and school organization participation. It should also be noted that racial/ethnic minorities' lower levels of belonging to school were limited to black adolescents; Hispanic and Asian adolescents were not any less attached to school than white adolescents.

Third, younger adolescents tended to have more friends at school and stronger sense of belonging to school, but they engaged in fewer activities with friends. The finding is actually consistent with the pattern documented in past studies (Buhrmester 1996; Csikszentmihalyi and Larson 1984; Bearman and Moody 2003); during late adolescence, individuals come to spend more time with their friends without necessarily increasing number of friends, and they also become emotionally distant from school as an organization. The results also showed no consistent grade-level patterns for in-degree and closeness centrality. As discussed later in this chapter, adolescents' direct friendships mostly developed within the same grade levels. Thus, scores in these centrality variables had great degrees of variability within grade levels, but there was no overall grade-level difference in school-wide networks.²⁴

Fourth, the effects of parents' educational backgrounds showed the most consistent pattern across integration variables among all the socio-demographic variables examined: Adolescents with educated parents were more integrated than those with less educated parents. Adolescents who did not know or gave no information about their parents' educational backgrounds tended to show a pattern similar to that of adolescents whose parents did not graduate from high school. Another socio-economic status indicator, single parent family, showed a pattern similar to that of parents' educational backgrounds, although the associations were less pronounced. It should be remembered that adults with low socio-economic status tend to have dense egocentric networks because they include high proportions of relatives (Fischer 1982). Such a relationship between socio-economic status and density was not observed in this analysis of adolescent friendships at school. Perhaps adolescents from low SES families do not

²⁴ The other centrality measure, eigenvector centrality, showed a clearer negative association with grade levels perhaps because younger adolescents had more friends (largely with each other) than older adolescents did, so eigenvector centrality gave higher values to these younger adolescents, who formed the largest cluster at school.

have their relatives in the same school, or even if they do, they may not necessarily consider them friends.

In summary, the sex and grade-level distributions of friendship integration are consistent with those reported in previous studies. In addition, although past studies have paid little attention, the current analyses showed that degrees of friendship integration vary across racial/ethnic and socio-economic backgrounds; with some exceptions mentioned above, whites and adolescents from high socio-economic backgrounds tend to be more integrated. The association between minority status and friendship integration is thus consistent with the epidemiological distribution of depressive symptoms, suggesting that the greater numbers of depressive symptoms among minority adolescent groups might be partly due to their lower degrees of integration. Whether friendship integration mediates the effects of minority status on depressive symptoms will be directly examined in Chapter 5.

Though still consistent with previous adolescent studies, some socio-demographic variables had conflicting associations with the integration variables (e.g., older adolescents' fewer number of friends but greater number of friendship activities). The findings therefore underscore the importance of conceptualizing social integration as a multi-dimensional construct and support the use of multiple indicators. The overall socio-demographic distributions of integration (not considering grade level) were also consistent with adult patterns, suggesting that the relationships between socio-demographic backgrounds and degrees of social integration start before adulthood.

The Relationship between Network Composition and Affective/Cognitive Integration

Egocentric Network Composition

The section above focused on socio-demographic characteristics of individual adolescents as antecedents of friendship integration. In this section, I shift the focus to the consistency between adolescents' and network members' socio-demographic characteristics. As pointed out in Chapter 1, adolescents with certain socio-demographic characteristics are concentrated at some schools, and adolescent friendships tend to develop among those who share similar attributes. However, there is still some variability in the degree to which adolescents are surrounded by friends and peers who share their socio-demographic attributes. In this section, I

test whether adolescents have a stronger sense of belonging when they have more friends and peers at school who share their attributes, as proposed by Rosenberg (1979). I will focus on sex, grade level, and race/ethnicity as the dimensions of network composition, because network composition for other dimensions (e.g., socio-economic status) cannot be estimated accurately with the Add Health data.

Table 3.2. Egocentric Network Composition by Individual Attributes

Proportions of Alters:	Adolescents with Target Attributes		Adolescents without Target Attributes	
	Mean	SD	Mean	SD
Male	.58	.27	.37	.23
Female	.62	.24	.39	.26
White	.85	.19	.21	.39
Black	.76	.34	.03	.11
Hispanic	.50	.51	.07	.13
Asian	.48	.56	.02	.08
Grade 7	.87	.17	.02	.09
Grade 8	.84	.19	.03	.09
Grade 9	.77	.27	.05	.12
Grade 10	.67	.30	.07	.14
Grade 11	.61	.33	.06	.13
Grade 12	.69	.30	.05	.12

N=11,023 adolescents.

All mean differences between adolescents with and without target attributes are significant at the .001 level.

Starting with egocentric network composition, there is a strong tendency for adolescents to have friends who shared socio-demographic attributes, confirming the pattern reported in past studies. Table 3.2 demonstrates this point by contrasting egocentric network composition between adolescents who had the target characteristic and those who did not. For example, male adolescents had significantly higher proportions of male friends (.58) than females (.37), and female adolescents had significantly higher proportions of female friends (.62) than male adolescents (.39). Grade level showed a similar pattern; adolescents tended to have friends who were in the same grade levels. For race and ethnicity, although the general principle of

Table 3.3. Belonging to School Regressed on Egocentric Network Composition (Unstandardized HLM Coefficients)

	Model 1	Model 2	Model 3	Model 4	Model 5
Sex (Female=1)	-.20 **	-.16 *	-.21 **	-.22 **	-.18 *
Race/Ethnicity (ref.=white)					
Black	-.57 ***	-.58 ***	-.52 ***	-.56 ***	-.52 ***
Hispanic	-.01	-.02	.20	.03	.22
Asian	.31	.31	.52 *	.27	.47
Others	-.02	-.02	.44	-.02	.38
Grade Level (ref.=Grade 9)					
Grade 7	.39 *	.44 **	.43 **	.30	.38 *
Grade 8	.00	.02	.02	-.06	-.03
Grade 10	-.43 ***	-.43 ***	-.45 ***	-.32 *	-.31 *
Grade 11	-.62 ***	-.63 ***	-.63 ***	-.44 *	-.42 *
Grade 12	-.62 ***	-.63 ***	-.64 ***	-.53 ***	-.55 ***
Parents' Ed. (ref.=H.S. Graduate)					
Less than High School	-.26	-.27	-.27	-.25	-.28
Some College	.29 *	.27 *	.29 *	.27 *	.25 *
College Graduate	.38 ***	.37 ***	.37 ***	.33 **	.30 **
Missing	-.39 **	-.39 **	-.40 **	-.37 **	-.37 **
Single Parent Family	-.32 **	-.33 **	-.30 **	-.29 **	-.27 **
Prop. Same Sex		-.89 ***			-1.36 ***
Prop. Same Race			.63 ***		.56 **
Prop. Same Grade				1.09 ***	1.33 ***
Intercept	11.12 ***	11.64 ***	10.60 ***	10.29 ***	10.42 ***
<i>Intercept Variance</i>	.29	.29	.27	.28	.27
<i>Degrees of Freedom</i>	104	104	104	104	104
<i>Chi Square</i>	450.68 ***	456.24 ***	435.73 ***	448.68 ***	434.62 ***
<i>Level 1 Error Variance</i>	8.35	8.30	8.33	8.27	8.17
<i>Deviance</i>	54852.30	54793.54	54826.46	54755.93	54613.52
<i># Parameters</i>	2	2	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents in 105 schools

homogeneous network composition applied, whites and blacks had much higher proportions of friends with the same racial/ethnic backgrounds than Hispanics and Asians did.²⁵

Despite this tendency for homogeneity, there was substantial variability in the degrees to which adolescents and their friends shared socio-demographic characteristics. I used multivariate models to test whether the consistency between adolescents' and friends' attributes was associated with a stronger sense of belonging to school. To simplify the analyses, I constructed a network composition variable, "proportion same grade level," for example, instead of including a set of separate composition variables such as "proportion 7th grade," "proportion 8th grade," and so on. Adolescents' socio-demographic characteristics were also entered in the models as controls. As shown in Table 3.3, having more friends in the same grade levels and having more friends with the same racial/ethnic backgrounds were both associated with a stronger sense of belonging to school, as expected (see Models 3 and 4). However, the opposite effect appeared for sex; having high proportions of same-sex friends was associated with a weaker sense of belonging to school (Model 2). In retrospect, there might have been different reasons why some adolescents had many opposite-sex friends and why others had many friends across grade levels or racial/ethnic groups. Having many opposite-sex friends might have indicated the adolescent's overall high popularity at school, whereas some adolescents might have had many friends across grade levels and racial/ethnic groups because they failed to find friends who were similar to them in these ways. Specifically, Coleman (1961) argued that some male adolescents attempt to gain popularity among male students by first getting attention from female students (becoming a "ladies' man"). A similar mechanism may operate for female adolescents; girls who have many male friends might also become popular among female peers. Thus, the popularity that some adolescents gained through cross-sex friendships might have contributed to their sense of belonging to school. Supporting this argument, with the Add Health

²⁵ However, this does not necessarily indicate that whites and blacks have a stronger tendency to *choose* friends of their own race. Rather, whites and blacks have greater opportunities to develop friends within the same racial categories because in many schools, they constitute larger proportions of the student body than other racial/ethnic groups. (Although the overall black student composition may not be very large, the concentration of black students in some schools contributes to greater opportunities for them to make friends with other black students.) Particularly, Asians' and Hispanics' tendencies to make friends outside of their race/ethnicity are not very strong once one considers the fact that there are not many students of the same race or ethnicity with whom they can be associated (Joyner 2000)

Table 3.4. Interaction Effects between Individual Backgrounds and Egocentric Network Composition on Belonging to School (Unstandardized HLM Coefficients, Analysis for Race and Ethnicity)

	Target=White		Target=Black		Target=Hispanic		Target=Asian	
	Model 1	Model 2	Model 1	Model 2	Model 2	Model 2	Model 2	Model 2
Sex (Female=1)								
Race/Ethnicity (ref.=white)								
Black	-.23 **	-.22 **	-.21 **	-.21 **				
Hispanic	.13	-.83 ***	-.52 ***	.05	-.52 ***		-.52 ***	
Asian			.20	.26	.56		.21	
Others			.52 *	.58 *	.55 *		.67 *	
Grade Level (ref.=Grade 9)			.44	.55	.51		.46	
Grade 7	.41 *	.44 **	.43 **	.43 **	.43 **		.43 **	
Grade 8	.01	.02	.02	.02	.01		.02	
Grade 10	-.45 ***	-.45 ***	-.45 ***	-.45 ***	-.44 ***		-.45 ***	
Grade 11	-.63 ***	-.63 ***	-.63 ***	-.63 ***	-.63 ***		-.63 ***	
Grade 12	-.63 ***	-.64 ***	-.64 ***	-.64 ***	-.64 ***		-.64 ***	
Parents' Ed. (ref.=H.S. Graduate)								
Less than High School	-.23	-.21	-.27	-.28	-.25		-.28	
Some College	.30 *	.28 *	.29 *	.29 *	.29 *		.29 *	
College Graduate	.39 ***	.36 ***	.37 ***	.37 ***	.36 ***		.37 ***	
Missing	-.36 *	-.35 *	-.40 **	-.40 **	-.39 **		-.40 **	
Single Parent Family	-.37 ***	-.34 **	-.30 **	-.29 **	-.30 **		-.29 **	
Prop. Same Race	.42 *	-.27	.63 ***	.78 ***	.76 ***		.66 ***	
Prop. Same Race		1.47 ***			-.79 *		-.32	
* Target Individual Race								
Intercept	10.65 ***	10.98 ***	10.60 ***	10.48 ***	10.50 ***		10.58 ***	
Intercept Variance	.28	.29	.27	.28	.27		.27	
Degrees of Freedom	104	104	104	104	104		104	
Chi Square	445.16 ***	463.50 ***	435.73 ***	441.61 ***	436.82 ***		436.34 ***	
Level 1 Error Variance	8.36	8.32	8.33	8.32	8.32		8.33	
Deviance	54864.70	54822.29	54826.46	54817.64	54819.25		54823.99	
# Parameters	2	2	2	2	2		2	

* $p < .05$; ** $p < .01$; and *** $p < .001$
N = 11,023 adolescents in 105 schools

data, the proportion of same-sex friends was *negatively* associated with number of friends at school and in-degree centrality.²⁶

The dimensions of network composition by sex, grade level, and race/ethnicity were not strongly correlated with each other so that their relationships with sense of belonging to school did not change very much when they were entered simultaneously in Model 5. (The coefficients for proportion of same-sex friends and proportion of friends in the same grade levels actually increased somewhat in Model 5).

Although the analyses above are useful to see the overall effects of egocentric network composition on sense of belonging, they do not show whether having similar friends matters more for some groups of adolescents than for others. Thus, in the next set of analyses, I investigated whether the associations between network composition and belonging depended on adolescents' socio-demographic characteristics. For grade level, for example, I examined whether having friends in the same grade contributed to sense of belonging to a greater or lesser degree among adolescents in certain grades, compared to those in other grades. To test this possibility, I entered in each model an interaction term between a target individual attribute and a corresponding network composition variable (e.g., grade 7*proportion same grade level) as well as main effect terms (e.g., grade 7, proportion same grade level). The results showed no significant sex difference in the association between proportion of same-sex friends and sense of belonging and no grade level difference in the association between proportion of friends in the same grade level and sense of belonging (not shown).

However, a significant racial/ethnic interaction was observed for the relationship between racial/ethnic composition of egocentric network and sense of belonging. As shown in Table 3.4, having friends who shared racial/ethnic backgrounds was more strongly and positively associated with sense of belonging among white adolescents than other adolescents (see interaction term in White-Model 2). The interaction term in Black-Model 2 was negative, indicating that the relationship between proportion of same race/ethnicity friends and sense of belonging was significantly weaker among black adolescents. Although the association was somewhat weak for Hispanic and Asian adolescents (as indicated by the negative coefficients for

²⁶ The bivariate correlation coefficients between proportion of same-sex friends and number of friends at school were -.12 for males and -.26 for females. Those between proportion of same-sex friends and in-degree centrality (a measure of popularity) were -.13 for males and -.27 for females. All coefficients were significantly different from 0 at the .001 level.

the interaction terms), the interaction terms were not significant, in part due to the small group sizes. Before interpreting and explaining these results, I will present the analyses of school composition because the results from those analyses seem to help us understand the pattern just observed for egocentric network composition.

School Network Composition

Table 3.5. School Network Composition by Individual Attributes

Proportions of Peers:	Adolescents with Target Attributes		Adolescents without Target Attributes		Sig. Mean Diff.
	Mean	SD	Mean	SD	
Male	.51	.09	.49	.03	
Female	.51	.03	.49	.09	
White	.78	.16	.35	.35	***
Black	.52	.33	.09	.13	***
Hispanic	.34	.33	.09	.10	***
Asian	.23	.23	.04	.06	***
Grade 7	.45	.11	.11	.19	***
Grade 8	.43	.11	.11	.18	***
Grade 9	.29	.05	.18	.14	***
Grade 10	.27	.05	.17	.12	***
Grade 11	.23	.06	.14	.11	***
Grade 12	.20	.04	.13	.10	***

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* $p < .05$; ** $p < .01$; and *** $p < .001$

These statistics are calculated by disaggregating school composition to the individual level.

As I did with egocentric network composition, I will first demonstrate the unequal socio-demographic distributions of adolescents' characteristics across schools (see Table 3.5). Because many schools had equivalent proportions of male and female students, there was no significant difference in the sex composition between schools that males and female adolescents attended. Adolescents were likely to attend school with more students in the same grade levels than those in other grade levels, but this probably reflected the division between middle and high schools (i.e., middle school students could not have high school students as peers). However, race and ethnicity showed a considerable degree of segregation at the school level; adolescents were much more likely to attend schools where higher proportions of students had the same racial/ethnic backgrounds as theirs. The racial/ethnic concentration seemed much stronger for

Table 3.6. Interaction Effects between Individual Attributes and School Composition on Belonging to School (Unstandardized HLM Coefficients, Analysis for Race and Ethnicity)

	Target=White			Target=Black			Target=Hispanic			Target=Asian		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Sex (Female=1)	-.21 **											
Race/Ethnicity (ref=white)	.23											
Black				-.20 **	-.20 **	-.20 **	-.20 **	-.20 **	-.20 **	-.20 **	-.20 **	-.20 **
Hispanic				-.62 ***	-.92 ***	-.62 ***	-.57 ***	-.57 ***	-.57 ***	-.57 ***	-.57 ***	-.58 ***
Asian				-.02	-.01	-.02	.00	-.08	-.08	-.01	-.01	-.02
Others				.30	.32	.30	.32	.33	.33	.31	.31	.47
				-.02	-.01	-.02	-.01	.01	.01	-.02	-.02	-.02
Grade Level (ref=Grade9)												
Grade 7	.39 *	.40 *	.39 *	.39 *	.39 *	.39 *	.39 *	.39 *	.39 *	.39 *	.39 *	.39 *
Grade 8	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Grade 10	-.44 ***	-.44 ***	-.44 ***	-.43 ***	-.43 ***	-.43 ***	-.43 ***	-.43 ***	-.43 ***	-.43 ***	-.43 ***	-.43 ***
Grade 11	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***
Grade 12	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***	-.62 ***
Parents' Ed. (ref=H.S. Graduate)												
Less than High School	-.22	-.23	-.23	-.26	-.26	-.26	-.25	-.26	-.26	-.26	-.26	-.26
Some College	.29 *	.29 *	.29 *	.29 *	.29 *	.29 *	.29 *	.29 *	.29 *	.29 *	.29 *	.29 *
College Graduate	.39 ***	.39 ***	.39 ***	.38 ***	.37 ***	.38 ***	.38 ***	.38 ***	.38 ***	.38 ***	.38 ***	.38 ***
Missing	-.36 *	-.36 **	-.36 **	-.39 **	-.39 **	-.39 **	-.39 **	-.39 **	-.39 **	-.39 **	-.39 **	-.39 **
Single Parent Family	-.37 ***	-.37 ***	-.37 ***	-.32 **	-.32 **	-.32 **	-.32 **	-.32 **	-.32 **	-.32 **	-.32 **	-.32 **
Target School Composition	.01	-.36	-.36	.25	-.20	-.20	-.20	-.20	-.20	-.20	-.20	-.20
Target School Composition												
* Target Individual Race		.76 *	.76 *	.96 ***	.96 ***	.96 ***	.96 ***	.96 ***	.96 ***	.96 ***	.96 ***	.96 ***
Intercept	10.89 ***	11.02 ***	11.02 ***	11.09 ***	11.13 ***	11.13 ***	11.14 ***	11.15 ***	11.15 ***	11.13 ***	11.13 ***	11.12 ***
Intercept Variance	.29	.28	.28	.29	.28	.28	.29	.29	.29	.29	.29	.29
Degrees of Freedom	103	103	103	103	103	103	103	103	103	103	103	103
Chi Square	453.00 ***	442.22 ***	442.22 ***	443.67 ***	439.16 ***	439.16 ***	450.63 ***	447.51 ***	447.51 ***	450.77 ***	450.77 ***	453.17 ***
Level 1 Error Variance	8.37	8.36	8.36	8.35	8.34	8.34	8.35	8.35	8.35	8.35	8.35	8.35
Deviance	54878.29	54874.96	54874.96	54854.05	54847.69	54847.69	54853.76	54830.78	54830.78	54852.85	54852.85	54848.42
# Parameters	2	2	2	2	2	2	2	2	2	2	2	2

* p<.05; ** p<.01; and *** p<.001
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whites and blacks than for Hispanics and Asians. Perhaps, the small population sizes of Hispanic and Asian students in US schools limited the degrees to which Hispanics and Asians could be concentrated.

Using hierarchical linear models, I then examined whether adolescents had a stronger sense of belonging when their socio-demographic characteristics were shared by other students at school. Because sex and grade-level composition of school networks did not have significant effects (and did not interact with individual attributes) (not shown), my discussion here focuses on race/ethnic composition. I first examined the main effects of school composition on belonging. As shown in each Model 1 of Table 3.6, controlling for individual-level variables, racial/ethnic composition per se was not significantly associated with a sense of belonging to school. Next I added an interaction term between target school composition variable and target individual race/ethnicity in each Model 2. The results showed that white students in white dominated schools felt they belonged at school more strongly than white students at non-white dominated schools. Similarly, black students' sense of belonging was higher when they attended schools with high black student body. A similar finding from the Add Health data was previously reported by Bearman and Moody (2003). The finding, particularly about black adolescents, also supports one of the explanations that Rosenberg (1979) offered for the higher self-esteem among black students in black dominated schools, compared to those in mixed or white dominated schools—a stronger sense of belonging among black adolescents in black dominated schools contributes to their self-esteem.

However, Asian and Hispanic adolescents did not have a stronger sense of belonging at schools with higher proportions of Asians and Hispanics respectively. Although it is possible that these adolescents did not derive a sense of belonging from presence of peers who shared their racial/ethnic backgrounds, the lack of significant effects may also be due to the small sizes of these groups. That is, the school composition of Hispanic and Asians students might not have been high enough to make the presence of other Hispanic or Asian students meaningful to these adolescents.

So far, my analyses separately examined the effects of egocentric network composition and school network composition. In the next set of analyses, I consider egocentric and school composition simultaneously. These analyses are necessary because when adolescents had high proportions of friends who shared their attributes, they also attended schools where many

Table 3.7. Interaction Effects among Individual Attributes, Egocentric Network Composition, and School Network Composition on Belonging to School (Unstandardized HLM Coefficients, Analysis for Race and Ethnicity)

	Target=White			Target=Black		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Sex (Female=1)	-.22 **	-.22 ***	-.22 **	-.20 **	-.19 **	-.19 **
Race/Ethnicity (ref.=white)	-.55 *	-.72 ***	.52			
Black				-.61 *	-.81 **	-.34
Hispanic				.00	.00	.00
Asian				.33	.33	.33
Others				.02	.02	.03
Grade Level (ref.=Grade 9)						
Grade 7	.44 **	.44 ***	.44 **	.40 *	.39 *	.39 *
Grade 8	.02	.02	.03	.00	.00	.00
Grade 10	-.45 ***	-.45 ***	-.44 ***	-.43 ***	-.43 ***	-.43 ***
Grade 11	-.63 ***	-.63 ***	-.63 ***	-.62 ***	-.62 ***	-.62 ***
Grade 12	-.64 ***	-.64 ***	-.63 ***	-.62 ***	-.62 ***	-.62 ***
Parents' Ed. (ref.=H.S. Graduate)						
Less than High School	-.20	-.21	-.21	-.25	-.26	-.26
Some College	.28 *	.28 ***	.28 *	.29 *	.29 *	.29 *
College Graduate	.36 ***	.35 ***	.35 ***	.37 ***	.37 ***	.36 ***
Missing	-.35 *	-.35 ***	-.36 *	-.39 **	-.40 **	-.39 **
Single Parent Family	-.33 **	-.33 ***	-.33 **	-.31 **	-.31 **	-.31 **
Prop. Target Race Egocentric	.49	.75 ***	.79 *	-.65	-.61	-.61
Prop. Target Race Egocentric * Target Individual Race	.73 *	.47	-1.73	.63	.42	-.34
Prop. Target School Race		-.83 **	-.97 **		-.01	-.08
Prop. Target School Race * Target Individual Race		.58	-1.29		.84	-.37
Prop. Target School Race * Prop. Target Egocentric Race * Target Individual Race			3.13 **			1.81 *
Intercept	10.69 ***	11.02 ***	11.05 ***	11.15 ***	11.13 ***	11.14 ***
<i>Intercept Variance</i>	.30	.28	.27	.29	.28	.28
<i>Degrees of Freedom</i>	104	103	103	104	103	103
<i>Chi Square</i>	471.50 ***	437.06 ***	433.64 ***	449.61 ***	435.03 ***	436.60 ***
<i>Level 1 Error Variance</i>	8.32	8.32	8.30	8.34	8.34	8.34
<i>Deviance</i>	54818.18	54812.19	54787.88	54848.58	54844.15	54840.39
<i># Parameters</i>	2	2	2	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

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continuing to the next page

Table 3.7 cont. Interaction Effects among Individual Attributes, Egocentric Network Composition, and School Network Composition on Belonging to School (Unstandardized HLM Coefficients, Analysis for Race and Ethnicity)

	Target=Hispanic			Target=Asian		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Sex (Female=1)	-.20 **	-.20 **	-.20 **	-.20 **	-.20 **	-.20 **
Race/Ethnicity (ref.=white)						
Black	-.57 ***	-.57 ***	-.57 ***	-.57 ***	-.57 ***	-.57 ***
Hispanic	-.06	-.08	.35	-.01	-.02	-.02
Asian	.32	.33	.32	.19	.39	.77 *
Others	.00	.01	.01	-.04	-.04	-.04
Grade Level (ref.=Grade 9)						
Grade 7	.39 *	.40 *	.39 *	.39 *	.39 *	.39 *
Grade 8	.00	.00	-.01	.00	.00	.00
Grade 10	-.43 ***	-.43 ***	-.43 ***	-.43 ***	-.43 ***	-.43 ***
Grade 11	-.62 ***	-.62 ***	-.63 ***	-.62 ***	-.62 ***	-.62 ***
Grade 12	-.62 ***	-.62 ***	-.62 ***	-.61 ***	-.61 ***	-.61 ***
Parents' Ed. (ref.=H.S. Graduate)						
Less than High School	-.26	-.26	-.26	-.26	-.26	-.25
Some College	.29 *	.29 *	.29 *	.29 *	.29 *	.29 *
College Graduate	.38 ***	.38 ***	.37 ***	.38 ***	.38 ***	.38 ***
Missing	-.39 **	-.39 **	-.39 **	-.39 **	-.39 **	-.39 **
Single Parent Family	-.32 **	-.32 **	-.31 **	-.32 **	-.32 **	-.32 **
Prop. Target Race Egocentric	-.32	-.30	-.30	.43	.38	.39
Prop. Target Race Egocentric * Target Individual Race	.34	.28	-.95	-.07	.32	-1.44
Prop. Target School Race		-.18	-.32		-.06	-.15
Prop. Target School Race * Target Individual Race		.20	-1.58		-1.73	-4.14 *
Prop. Target School Race * Prop. Target Egocentric Race * Target Individual Race			3.70 **			7.06 ***
Intercept	11.15 ***	11.16 ***	11.18 ***	11.11 ***	11.12 ***	11.12 ***
<i>Intercept Variance</i>	.28	.29	.28	.29	.29	.29
<i>Degrees of Freedom</i>	104	103	103	104	103	103
<i>Chi Square</i>	447.21 ***	445.93 ***	437.28 ***	449.46 ***	452.83 ***	452.37 ***
<i>Level 1 Error Variance</i>	8.35	8.35	8.34	8.35	8.34	8.34
<i>Deviance</i>	54852.25	54850.72	54840.65	54850.48	54844.76	54836.31
<i># Parameters</i>	2	2	2	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

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students had the same attributes. Therefore, simultaneously including egocentric network composition and school composition in the analyses would help me determine whether the two composition variables have independent effects on sense of belonging and which level of composition has a stronger association with belonging. Furthermore, it is possible that egocentric network composition and school composition interact in their associations with sense of belonging. In other words, meaning of egocentric network composition may depend on school composition. This possibility was examined in hierarchical linear models with three-way interactions. Because sex and grade level did not show significant school composition effects in the previous analyses, my discussion here focuses on racial/ethnic composition only.

As shown in Table 3.7, the first models (Model 1) only included interaction terms between egocentric network composition and individual attributes, and these models replicated the results reported earlier (Table 3.4); having friends of the same race/ethnicity contributed to a sense of belonging to school to a greater degree among white students, and this interaction effect was observed only among white students.²⁷ This interaction for white adolescents disappeared, however, when I controlled for the interaction between school-level composition of white students and individual-level white race (White-Model 2). This model also indicated that the interaction between school-level composition of white students and being white was no longer significant when the interaction for egocentric composition was considered. Similarly, the previously observed interaction effect between black school composition and black race (Table 3.6) disappeared after the interaction for egocentric network composition was controlled (Black-Model 2). Thus, the stronger sense of belonging among white and black adolescents who have high proportions of white and black peers respectively might be in part attributed to egocentric network compositions. In short, this set of analyses demonstrated that attending to one level of composition may exaggerate its relationship with sense of belonging. It should be noted, however, that there were not many adolescents whose egocentric and school networks differed in composition (e.g., students who attended black dominated schools and had very low proportions of black friends), and the results reported here might not accurately predict levels of belonging of adolescents in these situations.

²⁷ In addition, the previous analyses showed that the relationship between egocentric network composition and belonging was significantly weaker among blacks, compared to others.

In the next set of models (Model 3), I added three-way interactions among individual race/ethnicity, egocentric network composition, and school composition in order to test whether the relationship between having a high proportion of friends of the same race/ethnicity and sense of belonging depended on school-level composition. A significant positive three-way interaction was found for each racial/ethnic category, indicating that having a high proportion of friends who shared racial/ethnic backgrounds strengthened a sense of belonging to a greater degree when the race or ethnicity also made up a higher proportion of the student body at school. I interpret this finding to suggest that having friends of the same backgrounds might have placed adolescents close to the center of school-wide networks when the racial/ethnic group had a majority or at least noticeable number of students at school. On the other hand, developing such friendships at school where there were very few students with the same racial/ethnic backgrounds might have placed adolescents in racial/ethnic enclaves, which probably did not promote their sense of belonging *to school*.

These three-way interactions among individual race/ethnicity, egocentric network composition, and school composition observed among all racial/ethnic groups are useful for interpreting the previous finding on egocentric network composition. In the beginning of this section, my analyses showed that the positive relationship between having many friends of the same race/ethnicity and a strong sense of belonging was limited to white students. This finding might be partly explained by the fact that white adolescents were most likely to be the dominant group at school—the situation in which having friends with the same race/ethnicity promoted a sense of belonging to school. On the other hand, black, Hispanic, and Asian adolescents might not have had sufficient numbers of peers in the same racial/ethnic categories at school so that developing personal friendships with similar others might not have contributed substantially to their sense of belonging to school.

The Relationship between Network and Behavioral Integration and Affective/Cognitive Integration

My analyses so far have focused on the antecedents of friendship integration. Before closing, I will briefly discuss the extent to which the three aspects of friendship integration are related to each other. Although those three aspects are conceptually unique to some extent, I expected them to correlate with each other at least moderately because network and behavioral

Table 3.8. Bivariate Correlations among Integration Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Total # of Friends	-												
2. # of Friends at School	.77 ***	-											
3. In-Degree	.26 ***	.37 ***	-										
Popularity Categories													
4. Marginal	-.40 ***	-.52 ***	-.38 ***	-									
5. Average	.29 ***	.38 ***	-.05 *	-.80 ***	-								
6. Popular	.15 ***	.19 ***	.68 ***	-.27 ***	-.36 ***	-							
7. Egocentric Density	.07 **	.08 **	.10 ***	-.11 ***	.11 ***	.00	-						
8. Friendship Reciprocity	.21 ***	.19 ***	.51 ***	-.12 ***	-.07 ***	.29 ***	.27 ***	-					
9. Closeness Centrality	.13 **	.20 ***	.18 **	-.12 ***	.12 **	.00	.32 **	.12 **	-				
10. Eigenvector Centrality	.29 ***	.40 ***	.54 ***	-.40 ***	.15 ***	.40 ***	.25 ***	.19 ***	.50 ***	-			
11. Friendship Activities	.50 ***	.31 ***	.26 ***	-.20 ***	.08 ***	.17 ***	.06 *	.23 ***	-.05 *	.12 ***	-		
12. ProblemDiscussions	.46 ***	.34 ***	.24 ***	-.18 ***	.08 ***	.16 ***	.00	.21 ***	-.02	.10 **	.55 ***	-	
13. School Org. Participation	.08 ***	.13 ***	.14 ***	-.15 ***	.09 ***	.08 ***	.07 ***	.05 ***	.10 ***	.16 ***	.06 ***	.06 ***	-
14. Belonging to School	.15 ***	.26 ***	.18 ***	-.22 ***	.13 ***	.13 ***	.07 ***	.06 ***	.07 **	.19 ***	.08 ***	.06 ***	.22 ***

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents

integration were hypothesized to reinforce each other and to influence affective/cognitive integration (Path b and c in Figure 1.1). Testing the relationships of network and behavioral integration with affective/cognitive integration is particularly important because past researchers have frequently used affective/cognitive integration to explain the mental health benefit associated with network and behavioral integration, although these relationships have rarely been tested directly. The second half of the mediation process (i.e., the relationship between affective/cognitive integration and depressive symptoms; path d in Figure 1.1) will be examined in Chapter 4.

I first examined the bivariate correlations among network and behavioral integration variables. As shown in Table 3.8, most of the integration measures were positively correlated with each other (except for “marginal popularity,” which indicated a lower degree of network integration and thus was negatively correlated with other integration variables, as expected). Network variables tended to show particularly high correlations with each other because they were constructed from the same network data (e.g., total number of friends at school, closeness centrality, and eigenvector centrality). Similarly, friendship activities and problem discussions were highly correlated with each other and with some network measures (e.g., number of friends and number of friends at school) because questions for those behavioral integration measures were specifically asked for friends whom adolescents nominated. Interestingly, school organization participation was only weakly associated with network integration measures and other behavioral integration measures that targeted activities with friends. Thus, although adolescents who were well integrated in friendship networks were more likely to be members of clubs, athletic teams, and other school organizations, friendships and organizations seemed to constitute somewhat independent domains of adolescents’ lives at school.

In the next set of analyses, I used multivariate models to examine the extent to which each of the network and behavioral integration variables influenced a sense of belonging, independent of each other. Because total number of friends and its subset, number of friends at school, were highly correlated with each other, I only included the latter, which was more strongly related to depressive symptoms (see Chapter 4). The results from the multivariate models are summarized in Table 3.9. Most of the network and behavioral integration variables had positive effects on sense of belonging even when they were simultaneously entered in Model 2, but there were some exceptions. First, closeness centrality was not related to sense of

Table 3.9. Sense of Belonging Regressed on Network and Behavioral Integration Variables (Unstandardized HLM Coefficients)

	Model 1	Model 2	Model 3
Sex (Female=1)	-.20 **		-.28 ***
Race/Ethnicity (ref.=white)			
Black	-.57 ***		-.49 ***
Hispanic	-.01		.14
Asian	.31		.41
Others	-.02		.15
Grade Level (ref.=Grade 9)			
Grade 7	.39 *		.42 **
Grade 8	.00		-.02
Grade 10	-.43 ***		-.36 **
Grade 11	-.62 ***		-.45 **
Grade 12	-.62 ***		-.43 **
Parents' Ed. (ref.=H.S. Graduate)			
Less than High School	-.26		-.09
Some College	.29 *		.17
College Graduate	.38 ***		.14
Missing	-.39 **		-.16
Single Parent Family	-.32 **		-.21 *
# Friends at School		.17 ***	.17 ***
Popularity Category (ref.=marginal)			
Average		.46 ***	.43 ***
Popular		.94 ***	.88 ***
Egocentric Density		.59 **	.60 **
Reciprocity		-.18	-.14
Closeness Centrality		-.01	-.02
Eigenvector Centrality		.03 ***	.02 ***
Friendship Activities		.00	.00
Problem Discussion		-.04 *	-.02
School Organization Participation		1.38 ***	1.34 ***
Intercept	11.12 ***	8.26 ***	8.64 ***
<i>Intercept Variance</i>	.29	.37	.30
<i>Degrees of Freedom</i>	104	104	104
<i>Chi Square</i>	450.68 ***	595.61 ***	515.87 ***
<i>Level 1 Error Variance</i>	8.35	7.54	7.44
<i>Deviance</i>	54852.30	53784.7334	53644.1624
<i># Parameters</i>	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents in 105 schools

belonging in the bivariate analysis, and it remained insignificant in the multivariate model. Reciprocity and friendship activities were significantly related to sense of belonging at the bivariate level, but these associations disappeared in the multivariate model. Finally, problem discussion was positively associated with sense of belonging in the bivariate analysis, but the relationship became negative in the multivariate model. Problem discussion might have strengthened sense of belonging because it helped adolescents recognize that they had friends with whom they could exchange emotional support, but this aspect of problem discussion was likely to be explained by number of friends at school and friendship activities, which were also included in the multivariate model. The reason why problem discussion showed a negative relationship with sense of belonging, rather than no relationship, may be that problem discussion was positively associated with depressive symptoms in the bivariate analysis whereas sense of belonging was negatively associated with depressive symptoms (as will be shown in Chapter 4). (Nonetheless, the negative relationship between problem discussion and sense of belonging was not very strong, and it was no longer significant when adolescents' socio-demographic characteristics were controlled in Model 3.)

The relationships of other network and behavioral integration measures with sense of belonging did not change very much when the socio-demographic variables were added to Model 3.²⁸ Thus, the results from the multivariate analyses were overall consistent with the expectation that adolescents with high degrees of network and behavioral integration have a stronger sense of belonging, and this finding supported the possibility that network and behavioral integration reduce depressive symptoms through affective/cognitive integration.

Summary

In the first section of this chapter, I showed that minority adolescents (racial/ethnic minorities and those from lower socio-economic families) tended to be less integrated, suggesting that the lower degrees friendship integration may explain the greater numbers of depressive symptoms experienced by these adolescents. The results also confirmed the sex and grade-level (or age) patterns reported in previous studies, although the relationship between these

²⁸ Though not a main focus of this chapter, the effects of socio-demographic characteristics, parents' education in particular, became much smaller and non-significant in Model 3 compared to Model 1, suggesting that the weaker sense of belonging among adolescents with less educated parents can be partly explained by their lower degrees of network and behavioral integration.

two attributes and friendship integration depended on what aspects of friendship integration were considered. By and large, the socio-demographic distributions of integration (excluding the grade-level pattern) were similar to adult patterns of social integration, indicating that socio-demographic attributes start to influence degrees of social integration very early in life and continue to have effects in adulthood, as individuals develop various types of relationships beyond the school setting (e.g., spouses, neighbors, co-workers).

The chapter also demonstrated that network composition influences affective/cognitive integration. Having friends in the same grade level was related to a stronger sense of belonging to school, consistent with the assumption that adolescents become emotionally attached to school when surrounded by friends who are similar to them (at least on this attribute). The opposite association was observed between sex composition and sense of belonging. A sense of belonging was weaker among adolescents with high proportions of same-sex friends. This contradictory association seemed to be due to the fact that having more opposite-sex friends signaled overall popularity at school, instead of failure to develop friendships within same-sex groups. The relationship between racial/ethnic composition and belonging was complex and depended on racial/ethnic categories: white adolescents had a stronger sense of belonging when they had more white friends, but this effect was not observed for other racial/ethnic groups. I argued that the key to understanding the difference between white and minority adolescents may be the size of each group at school, which may change the meaning of having homogeneous friendship circles. Because schools generally did not have large proportions of black, Hispanic, and Asian students, these minority adolescents might not have necessarily developed a strong sense of belonging through friendships with other students who shared their backgrounds. Consistent with this speculation, the ability of similar friends to promote a sense of belonging was greater when schools had more students who shared the adolescents' racial/ethnic backgrounds. This principle applied to all four racial/ethnic groups.

Finally, the integration measures were positively correlated with each other, as expected, but only moderately or weakly, indicating that they measure unique aspects of friendship integration. The positive associations of network and behavioral integration with affective/cognitive integration were consistent with past researchers' assumption that network and behavioral integration contribute to mental health through promoting positive thoughts and feelings—an assumption that will directly tested in Chapter 4.

CHAPTER IV

THE RELATIONSHIP BETWEEN FRIENDSHIP INTEGRATION AND DEPRESSIVE SYMPTOMS

Overview

In this chapter, I will examine the extent to which network, behavioral, and affective/cognitive aspects of friendship integration are associated with depressive symptoms among adolescents. The first section of this chapter is used to identify which of network integration measures are significantly associated with depressive symptoms. One of the shortcomings of previous studies is the limited number of network variables included in the analysis and the heavy reliance on number of friends (or egocentric network size) as a network integration measure. In order to overcome this limitation, I consider additional network variables that measure other characteristics of egocentric networks and adolescents' positions in the school-wide networks. The network measures in past studies were also limited to individual-level measures, but I include school-level network characteristics, which will allow me to examine the relationship between school-level network integration and depressive symptoms.

In the second section, I will examine the degrees to which the behavioral and affective/cognitive aspects of friendship integration are associated with depressive symptoms. The analyses include both individual- and school-level measures of behavioral and affective/cognitive integration. As indicated with Paths b-d and c-d in Figure 1.1, I proposed that network and behavioral integration influence depressive symptoms through affective/cognitive integration. I will estimate the strength of this mediation process by examining to what extent affective/cognitive integration reduces the effects of network and behavioral integration on depressive symptoms.

The Relationship between Network Integration and Depressive Symptoms

Among various network variables, I started my analyses with number of friends because it is the most frequently used network integration measure and also because it made sense to first focus on direct relationships between adolescents and their friends. Several versions of the measure were examined in this set of analyses. I then considered other network variables that

measured relationships *among* one’s friends (egocentric density), mutuality of friendship nominations (reciprocity), and adolescents’ relative positions in school-wide networks (closeness centrality and eigenvector centrality). In the last set of analyses of this section, I examined whether characteristics of school-level networks were associated with depressive symptoms.

Number of Friends and Popularity Categories

Table 4.1. Bivariate Correlations between Number of Friends and Depressive Symptoms

Total Number of Friends	-.03 *
Number of Friends at School	-.07 ***
Number of Friends Outside School	.06 ***
Number of Non-Participant Friends	.05 **

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents in 105 schools

As discussed in Chapter 2, I used several ways to count number of friends. Table 4.1 presents a bivariate correlation coefficient between each of these network variables and depressive symptoms. Total number of friends that adolescents nominated was significantly associated with fewer depressive symptoms, as expected, although the correlation was very weak. Interestingly, other measures that counted subsets of friends had somewhat stronger associations with depressive symptoms. Number of friends at school was negatively related to depressive symptoms, but numbers of friends outside school and non-participant friends were *positively* associated with depressive symptoms. As I pointed out in Chapter 2, having large numbers of these friends might have indicated adolescents’ failure to develop normative friendships within school as well as their connections to adolescents with psychological and behavioral problems. Moreover, unlike friendships within school, those outside school were not likely to promote mental health through a sense of belonging to school.²⁹ Because considering friends both inside and outside school would have attenuated the relationships between number of friends and depressive symptoms, I focused on friends within school in the following analyses. My approach here is also consistent with previous child and adolescent studies that

²⁹ The two variables were in fact negatively correlated ($r = -.18$; $p < .001$).

restricted friendship nominations to students at the same school (Gest, Graham-Bermann, and Hartup 2001; Hansell 1985; Östberg 2003).

I took a closer look at the relationship between number of friends at school and depressive symptoms by computing the average CES-D score for each number of friends at school. In this analysis, I was particularly interested in whether number of friends at school had a linear relationship with depressive symptoms. As some researchers have argued, one close relationship may be enough to provide a mental health benefit linked to network integration, and having many relationships might not necessarily contribute more to mental health (see reviews in Baumeister and Leary 1995; Cohen and Wills 1985). If this argument applies to the relationship between adolescent friendships and depressive symptoms, mean differences in depressive symptoms should be larger when comparing adolescents with small numbers of friends (zero versus one, in particular) than when comparing adolescents with large number of friends.

Table 4.2. Mean CESD Scores by Number of Friends at School

# of Friends at School	CESD Scores	Standard Error	# of Obs. ^(a)
0	9.58	.26	1,197
1	9.47	.45	449
2	9.57	.38	533
3	9.48	.53	763
4	8.87	.29	893
5	8.70	.22	1,299
6	8.90	.29	860
7	8.88	.31	880
8	8.11	.28	1,039
9	8.70	.44	1,270
10	8.37	.21	1,841

N=11,023

^(a) weighted observations

As Table 4.2 shows, however, a straight line seems to approximate the relationship between number of friends at school and depressive symptoms; as number of friends at school increased, average depressive symptoms tended to decrease gradually. If a straight line were used to describe the relationship, the slope would be $-.11$, indicating that an increase in number of friends by 9 corresponded to a one point reduction in CES-D score—a very small change

considering that the CES-D score (with my modified version of the measure) could vary between 0 and 45.³⁰

One needs to consider the following issues when interpreting the linearity of the relationship between number of friends at school and depressive symptoms. First, friendship nominations were limited to ten in total in the Add Health study, and there were a substantial number of adolescents who nominated exactly ten friends (16.7 %), which indicated that some of these adolescents had more than 10 friends but were not allowed to nominate them all. Thus, the relationship between number of friends and depressive symptoms might have shown a curve after ten friends if there had been no restriction in the number of nominations. Similarly, the limits for same-sex and opposite-sex friend nominations (five for each) might have influenced the observed relationship. However, these measurement limitations did not necessarily undermine the ability to test the importance of having a friend, as opposed to having no friend, because a change in slope would have been observed before number of friends reached five (or ten) if the claim were true.

Second, my dissertation focuses on adolescents' friendships at school, whereas past studies that emphasized the importance of having one network member mostly targeted adult populations and included spouses and other family members and relatives as network members. In fact, those studies often emphasize the importance of significant others (spouses and unmarried domestic partners) and very close (adult) friends whose presence provides mental health benefits equivalent to significant others. Therefore, it is possible that the linear relationship between number of friends (or number of egocentric network members in general) and depressive symptoms is unique to adolescents and that the relationship becomes non-linear in the later stages of the life course, especially when adolescents make transitions to adulthood and significant others come to occupy special positions in egocentric networks.

My analyses so far focused on number of friends each adolescent nominated, but number of nominations each adolescent *received* measured a different aspect of friendship integration and was likely to have a unique association with depressive symptoms. More specifically, number of received nominations (or in-degree) is assumed to reflect adolescents' popularity within school (Bukowski and Hoza 1989; Coleman 1961; Östberg 2003). As described in

³⁰ The slope is based on a hierarchical linear model which included number of friends at school as the only predictor of depressive symptoms. The intercept was 9.39. Both slope and intercept were significantly different from 0 at the .001 level.

Chapter 2, I trichotomized number of received nominations to identify “popular” adolescents (in the top 10 percentile in received nominations within school), “average” students (associated with popular students), and “marginal” students (not classified above). Mean CES-D scores for these popularity categories are shown in Table 4.3. As expected, marginal adolescents had significantly more depressive symptoms than other students. However, the difference between popular and average students was very small and not significant. The lack of difference in depressive symptoms between these two categories may indicate that there is a limit in the extent to which popularity can reduce depressive symptoms or that being very popular entails some costs (e.g., time spent to maintain relationships, providing support, loss of privacy). The finding is consistent with the possibility that I suggested earlier—as number of friends increases, it reaches a limit of mental health advantage—although number of friends and popularity measure somewhat different aspects of friendship networks.

Table 4.3. Mean CESD Scores by Popularity Category

Popularity Category	Mean CESD	Stand. Error	# of Obs. ^(a)
Marginal	9.49	.19	4,124
Average	8.48	.14	5,730
Popular	8.47	.27	1,169

N=11,023

^(a) weighted observations

Additional Network Integration Variables

I also examined the relationships between other aspects of network integration and depressive symptoms, using additional network variables. Egocentric density measured the degree to which adolescents’ friends were friends with each other and thus indicated how cohesive adolescents’ egocentric networks were. As expected, adolescents who had dense networks had slightly fewer depressive symptoms, as shown in the small negative correlation coefficient between the two variables (see Table 4.4). I tested whether having more mutually perceived friendships (reciprocity) was associated with fewer depressive symptoms, with an assumption that such friendships had greater degrees of emotional intimacy. However, reciprocity was not significantly associated with depressive symptoms in my analysis. Past studies that reported the mental health advantage associated with reciprocated relationships

tended to ask adolescents (and children) to nominate students that they liked, instead of students whom they considered as friends (e.g., Östberg 2003). Therefore, greater emotional intimacy in reciprocated relationships and its consequences for depressive symptoms might have been less clear in my analysis, which focused on reciprocity of relationships, where relationships, reciprocated or unreciprocated, were already perceived as friendships by target adolescents.

Table 4.4. Bivariate Correlations between Additional Network Integration Variables and Depressive Symptoms

Egocentric Density	-.04 **
Friendship Reciprocity	-.01
Closeness Centrality	-.07 **
Eigenvector Centrality	-.09 ***

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents in 105 schools

The two remaining network variables measured how central each adolescent was to the school-wide network. Closeness centrality emphasized proximity in the network space (lengths of friendship paths) between the target adolescent and others in the same school, and eigenvector centrality focused on adolescents' connections to the largest cluster at school. These centrality measures were negatively associated with depressive symptoms, as expected, although once again these associations were weak.

These additional network measures were moderately or weakly correlated with each other and with number of friends at school (see Table 3.8), so I used multivariate models to test whether they were independently associated with depressive symptoms. The multivariate models also included adolescents' socio-demographic characteristics as controls. As shown in Table 4.5, popularity categories still significantly influenced depressive symptoms after socio-demographic attributes were controlled (Model 3), but adding number of friends at school as a predictor reduced the coefficients for popularity categories to non-significant (Model 4). Eigenvector centrality still had a significant association with fewer depressive symptoms when socio-demographic variables and other network variables were controlled, but closeness centrality was no longer associated with depressive symptoms (Model 5). When all network variables and socio-demographic variables were entered simultaneously, none of the network variables (other than number of friends at school) showed significant relationships with depressive symptoms (Model 6).

Table 4.5. Depressive Symptoms Regressed on Network Integration Variables (Unstandardized HLM Coefficients)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Sex (female=1)	1.75 ***	1.83 ***	1.75 ***	1.81 ***	1.74 ***	1.80 ***
Race/Ethnicity (ref=white)						
Black	.72 *	.62	.68 *	.62	.68 *	.63
Hispanic	1.53 ***	1.44 ***	1.49 ***	1.44 ***	1.51 ***	1.45 ***
Asian	1.58 ***	1.50 **	1.54 **	1.50 **	1.53 **	1.51 **
Others	-.43	-.45	-.48	-.47	-.45	-.44
Grade Level (ref=Grade 9)						
Grade 7	-1.16 ***	-1.17 ***	-1.19 ***	-1.18 ***	-1.12 ***	-1.15 ***
Grade 8	-.66 **	-.67 **	-.67 **	-.67 **	-.55 *	-.63 *
Grade 10	.07	.05	.05	.05	.02	.03
Grade 11	.39	.32	.35	.32	.32	.30
Grade 12	-.05	-.15	-.08	-.14	-.13	-.17
Parents' Ed. (ref.=H.S. Graduate)						
Less than High School	1.48 ***	1.42 ***	1.43 ***	1.41 **	1.45 ***	1.42 ***
Some College	-.46	-.43	-.44	-.43	-.44	-.42
College Graduate	-1.19 ***	-1.13 **	-1.13 ***	-1.12 **	-1.14 ***	-1.11 ***
Missing	1.15 ***	1.05 **	1.07 ***	1.03 **	1.09 ***	1.05 ***
Single Parent Family	.64 **	.58 **	.62 **	.59 **	.62 **	.59 **
# Non-Participant Friends	.19 *	.38 ***	.21 *	.36 ***	.18	.35 **
# Friends at School		-.16 **		-.13 ***		-.14 ***
Popularity Category (ref=marginal)						
Average			-.74 ***	-.34		
Popular			-.58 *	-.09		
Egocentric Density					-.57	-.60
Reciprocity					.23	.34
Closeness Centrality					.01	.01
Eigenvector Centrality					-.05 ***	-.02
Intercept	7.66 ***	8.40 ***	8.11 ***	8.47 ***	7.91 ***	8.39 ***
Intercept Variance	.70	.69	.69	.69	.67	.68
Degrees of Freedom	104	104	104	104	104	104
Chi Square	309.31 ***	307.26 ***	307.22 ***	307.13 ***	288.54 ***	301.14 ***
Level 1 Error Variance	36.02	35.83	35.91	35.82	35.94	35.82
Deviance	70911.01	70856.76	70879.82	70853.76	70897.16	70864.05
# Parameters	2	2	2	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

N=11,023 adolescents in 105 schools

In short, the most important aspect of friendship network integration seems to be number of friends at school. Although most other network variables considered in this section had expected bivariate associations with depressive symptoms, they were generally very weak and often correlated with number of friends at school and socio-demographic attributes, which more strongly influenced depressive symptoms.

School-Level Network Integration

Up to this point, my analyses have only considered individual-level network integration. In this set of analyses, I extended the scope of the investigation and examined whether school-wide network integration was negatively related to depressive symptoms. School-level network variables included school size, density, in-degree centralization, closeness centralization, and eigenvector centralization. Although school size did not necessarily indicate a degree of school-level integration, I expected adolescents at larger schools to have more depressive symptoms because they might have felt alienated due to the large number of students whom they did not know personally. With school density, I examined whether students attending at more cohesive schools (i.e., where students were connected with each other to greater degrees) had fewer depressive symptoms. In-degree centralization, closeness centralization, and eigenvector centralization all measured degrees of popularity hierarchy in school-level networks, each focusing on a unique aspect of hierarchy in the networks. I hypothesized that schools with high degrees of hierarchy would undermine a sense of belonging among students, which would in turn increase depressive symptoms.

Table 4.6. Bivariate Correlations among School-Level Network Variables

	1	2	3	4
1. School Size /100	-			
2. School Density	-.39 ***	-		
3. In-Degree Centralization	-.30 **	.31 **	-	
4. Closeness Centralization	-.63 ***	.76 ***	.32 ***	-
5. Eigenvector Centralization	-.75 ***	.62 ***	.11	.84 ***

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 105$ schools

These school-level network variables were moderately or highly correlated with each other (see Table 4.6). As reported for various types of social networks, size and density had a

negative association. Three centralization measures were positively correlated with each other, as expected. Interestingly, large schools had lesser degrees of hierarchy, as seen in the negative correlations between school size and the three centralization measures. Friendship networks at larger schools might have been divided into multiple clusters, so students who were popular in one group might not have been popular in other groups. Consistent with this argument, Moody (2001) reported that friendship networks tend to be racially segregated at larger schools. Schools with dense friendship networks also showed higher levels of hierarchy, but some portion of this association was due to small school size; schools with dense networks tended to be more hierarchical because they had fewer students.

Table 4.7. Bivariate Associations between School-Level Network Integration Variables and Depressive Symptoms (Unstandardized HLM Coefficients)

School Size /100	.06 ***
School Density	-5.12
In-Degree Centralization	-.64 **
Closeness Centralization	-.45 ***
Eigenvector Centralization	-.19 **

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents in 105 schools

Based on four HLM's with one school variable in each model. Intercepts for these models are: 8.21 (size); 8.90 (density); 11.03 (in-degree centralization); 9.27 (closeness centralization); and 9.79 (eigenvector centralization).

I first used bivariate models to examine the relationship between each of the school-level network variables and individual-level depressive symptoms. Each hierarchical linear model included the target school-level variable as the only predictor. The unstandardized coefficients from these models are presented in Table 4.7. School size was positively associated with depressive symptoms, consistent with the expectation that bigger schools are more alienating. Although school density had a negative coefficient, the association with depressive symptoms was not significant. The results also showed that, contrary to expectation and a previous finding (Östberg 2003), the three centralization measures were *negatively* associated with depressive symptoms.

Before attempting to interpret the relationships between these school-level network characteristics and depressive symptoms, I conducted multivariate analyses to consider these

Table 4.8. Depressive Symptoms Regressed on Selected School-Level Network Integration Variables (Unstandardized HLM Coefficients)

	Model 1	Model 2	Model 3
Sex (female=1)	1.83 ***		1.83 ***
Race/Ethnicity (ref.=white)			
Black	.62		.63
Hispanic	1.44 ***		1.44 ***
Asian	1.50 **		1.51 **
Others	-.45		-.44
Grade Level (ref.=Grade 9)			
Grade 7	-1.17 ***		-1.15 ***
Grade 8	-.67 **		-.65 *
Grade 10	.05		.05
Grade 11	.32		.32
Grade 12	-.15		-.15
Parents' Ed. (ref.=H.S. Graduate)			
Less than High School	1.42 ***		1.42 ***
Some College	-.43		-.43
College Graduate	-1.13 ***		-1.13 ***
Missing	1.05 ***		1.05 ***
Single Parent Family	.58 **		.58 **
# Non-Participant Friends	.38 ***		.38 ***
# Friends at School	-.16 ***		-.16 ***
School Size/100		.05 *	.01
School Density		-1.62	-.38
Indegree Centralization		-.44 *	.11
Intercept	8.40 ***	9.98 ***	7.93 ***
<i>Intercept Variance</i>	.69	1.27	.72
<i>Degrees of Freedom</i>	104	101	101
<i>Chi Square</i>	307.26 ***	439.81 ***	305.01 ***
<i>Level 1 Error Variance</i>	35.83	37.92	35.83
<i>Deviance</i>	70856.76	71507.60	70862.61
<i># Parameters</i>	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents in 105 schools

variables simultaneously and to control for adolescents' socio-demographic characteristics. As mentioned in Chapter 2, I considered other school characteristics such as sector (public or private) and location (urban or rural) as controls. Because these characteristics were not significantly associated with depressive symptoms in preliminary analyses, however, they were not included in the models presented here. Among the three centralization measures, I only entered in-degree centralization because closeness centralization and eigenvector centralization were highly correlated with in-degree centralization, and each variable was only weakly related to depressive symptoms. (Using closeness or eigenvector centralization measures did not change the overall findings.) The results are summarized in Table 4.8. When school size, density, and in-degree centralization were simultaneously entered in Model 2, their coefficients became smaller than in the bivariate models, but school size and in-degree centralization were still significantly associated with depressive symptoms. The coefficients dropped further in size in Model 3, which controlled for adolescents' socio-demographic backgrounds and number of friends at school (the only individual-level network integration variable which showed a consistent and unique association with depressive symptoms in the prior analysis), and none of the school-level variables was significantly related to depressive symptoms in this full model.

In short, as expected, students at small, cohesive schools had fewer depressive symptoms. Contrary to expectation, students who attended schools with high degrees of popularity hierarchy also had fewer depressive symptoms. This relationship was partly due to the fact that hierarchical school networks tended to be smaller and more cohesive, but additional explanations are needed because the relationship remained significant after school size and density were controlled. The literature on the mental health consequences of network hierarchy is very scarce and does not offer any clear substantive explanations. Overall, the associations between school-level network variables and depressive symptoms are very weak, and they disappeared when individual-level variables were considered. This finding parallels the literature on urbanization, which suggests that characteristics of social relationships in urban cities (e.g., large population size and low network density) have little effect on sense of alienation and mental health especially when compared to the effect of personal networks (Fischer 1982; Freudenburg 1986). Combining the results from the previous analyses in this section, the simplest network measure, number of friends at school had the strongest relationship with depressive symptoms, and considering other aspects of egocentric and school-level networks did not add much to our

understanding of how friendship networks influence depressive symptoms among adolescents. Given this conclusion, I will use number of friends at school as the only network measure of friendship integration in the following analyses.

The Relationship between Network, Behavioral, Affective/Cognitive Integration and Depressive Symptoms

Up to this point, my analyses have focused on the relationships between network aspects of friendship integration and depressive symptoms. This section moves the chapter forward by considering behavioral and affective/cognitive aspects of integration. I will first examine the relationships of behavioral and affective/cognitive integration with depressive symptoms. The second goal of this section is to investigate the extent to which affective/cognitive integration mediates the effects of network and behavioral integration on depressive symptoms.

Table 4.9. Bivariate Correlations between Behavioral and Affective/Cognitive Integration with Depressive Symptoms

	With Depressive Symptoms
Friendship Activities	.02
Problem Discussion	.09 ***
School Organization Participation	-.12 ***
Belonging to School	-.28 ***

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents

Table 4.9 presents the bivariate correlation coefficients between three behavioral integration variables (friendship activities, problem discussion, and school organization participation) and depressive symptoms as well as the correlation between belonging to school (the only affective/cognitive integration variable in this dissertation) and depressive symptoms. As expected, adolescents who participated in school organizations and those who had a strong sense of belonging to school experienced fewer depressive symptoms. Among all integration measures considered in this dissertation, belonging to school showed the strongest correlation with depressive symptoms, which is consistent with my argument that affective/cognitive integration has a more direct influence on depressive symptoms than network and behavioral integration.

Surprisingly, however, participation in friendship activities was not significantly related to depressive symptoms. This finding was not only contrary to expectation, but it was also inconsistent with past studies that reported fewer depressive symptoms among adolescents who frequently engage in friendship activities (Kandel and Davies 1982; Vernberg 1990). In retrospect, the measure in this study might not have been sensitive to the aspect of friendship activities that contributes to adolescent mental health. The items used to construct this variable were dichotomous and only indicated whether or not the adolescent engaged in certain activities, and therefore the total activity score might have indicated the *variation* or *extensiveness* rather than the frequency of activities, which past studies have emphasized.

Another behavioral integration variable, problem discussion, was positively associated with depressive symptoms, as I suspected. Talking about personal problems signaled that either adolescents or their friends experienced stressors, which might have increased depressive symptoms, independent of the act of discussion. It is also possible that talking about negative experiences exacerbated negative emotional responses to the stressors, instead of alleviating them. It should be remembered, however, that problem discussion was positively associated with other measures of behavioral integration and those of network and affective/cognitive integration, indicating that problem discussion was an important element of behavioral integration. Thus, the results suggest that not all friendship activities promote mental health, but some activities may entail apparent costs.

Using multivariate models, I tested whether network, behavioral, and affective/cognitive integration were uniquely associated with depressive symptoms, and whether those associations were independent of adolescents' socio-demographic backgrounds. In this set of multivariate analyses, I also investigated the extent to which affective/cognitive integration mediated the associations between network and behavioral integration and depressive symptoms. The results are shown in Table 4.10. Having fewer friends at school, frequently discussing personal problems, and not participating in school organization all significantly contributed to depressive symptoms, when the other and background variables were controlled (Model 5).³¹ When belonging to school was added in Model 7, the coefficients for number of friends and school organization participation became much smaller (68.4% and 47.4% reductions respectively),

³¹ I did not include other network and behavioral integration variables because they were not significantly related to depressive symptoms as shown in the previous analyses.

Table 4.10. Depressive Symptoms Regressed on Behavioral and Affective/Cognitive Integration (Unstandardized HLM Coefficients)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Sex (female=1)	1.75 ***	1.83 ***	1.50 ***	1.75 ***	1.46 ***	1.63 ***	1.30 ***
Race/Ethnicity (ref=white)							
Black	.72 *	.62	.85 **	.78 *	.84 *	.39	.57
Hispanic	1.53 ***	1.44 ***	1.58 ***	1.48 ***	1.46 ***	1.56 ***	1.58 ***
Asian	1.58 ***	1.50 **	1.66 ***	1.61 ***	1.63 ***	1.82 ***	1.91 ***
Others	-.43	-.45	-.42	-.55	-.55	-.39	-.44
Grade Level (ref=Grade 9)							
Grade 7	-1.16 ***	-1.17 ***	-1.05 ***	-1.10 ***	-.96 ***	-.95 ***	-.77 **
Grade 8	-.66 **	-.67 **	-.62 *	-.66 **	-.60 *	-.68 **	-.61 *
Grade 10	.07	.05	.02	.04	-.04	-.16	-.23
Grade 11	.39	.32	.33	.36	.20	.07	-.04
Grade 12	-.05	-.15	-.12	-.09	-.32	-.38	-.53 *
Parents' Ed. (ref=H.S. Graduate)							
Less than High School	1.48 ***	1.42 ***	1.52 ***	1.39 ***	1.39 ***	1.36 ***	1.36 ***
Some College	-.46	-.43	-.51 *	-.42	-.46	-.30	-.35
College Graduate	-1.19 ***	-1.13 ***	-1.25 ***	-1.08 ***	-1.09 ***	-.97 ***	-.98 ***
Missing	1.15 ***	1.05 ***	1.19 ***	1.11 ***	1.06 ***	.95 ***	.96 ***
Single Parent Family	.64 **	.58 **	.65 **	.60 **	.55 **	.47 *	.44 *
# Non-Participant Friends	.19 *	.38 ***	.13	.18 *	.33 **	.27 **	.27 **
# Friends at School		-.16 ***			-.19 ***		-.06 *
Problem Discussion			.14 ***		.22 ***		.21 ***
School Organization Participation				-1.61 ***	-1.52 ***		-.80 ***
Belonging to School						-.54 ***	-.51 ***
Intercept	7.66 ***	8.40 ***	7.39 ***	9.01 ***	9.41 ***	13.54 ***	13.86 ***
Intercept Variance	.70	.69	.70	.70	.68	.43	.44
Degrees of Freedom	104	104	104	104	104	104	104
Chi Square	309.31 ***	307.26 ***	311.54 ***	309.20 ***	306.86 ***	239.73 ***	242.71 ***
Level 1 Error Variance	36.02	35.83	35.89	36.01	35.31	33.71	33.38
Deviance	70911.01	70856.76	70875.17	70913.45	70699.55	70160.03	70067.37
# Parameters	2	2	2	2	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$
N = 11,023 adolescents in 105 schools

whereas the coefficient for belonging to school changed very little due to the two behavioral integration variables (6.9 % reduction; compare Models 6 and 7).³² Thus, the results are consistent with the expectation that network and behavioral integration reduce depressive symptoms through promoting affective/cognitive integration.^{33, 34} However, both coefficients for number of friends and school organization participation were still significant in the full model so that some portions of the effects of these two variables on depressive symptoms were independent of belonging.

To summarize the findings in this section, participants in school organizations had fewer depressive symptoms as expected, but friendship activities were not related to depressive symptoms, which might have been due to the unique measures used in the Add Health study. Problem discussion was positively associated with depressive symptoms, indicating the possible presence of stressors, stress contagion from friends, and/or exacerbation of negative responses through discussions. As expected, a sense of belonging to school was negatively related to depressive symptoms, and it also mediated the association between number of friends and depressive symptoms and that between organization participation and depressive symptoms to some extent.

The Relationship between School-Level Integration and Depressive Symptoms

This section adds school-level variables to the investigation of the relationship between friendship integration and depressive symptoms. I have already presented the analyses of school-level network integration variables in the previous section, and I will focus on behavioral and affective/cognitive aspects of school-level integration here. The question asked in this section, then, is: Did adolescents have fewer depressive symptoms when they attended schools

³² The changes in coefficients were calculated as follows: $[(-.19)-(-.06)]/(-.19)*100=68.4\%$ for number of friends at school; $\{(-1.52)-(-.80)\}/(-1.52)*100=47.4\%$ for school organization participation; and $\{(-.54)-(-.51)\}/(-.54)*100=6.9\%$ for sense of belonging.

³³ Problem discussion was negatively associated with belonging but positively associated with depressive symptoms. Therefore, belonging could not mediate the relationship between problem discussion and depressive symptoms.

³⁴ I previously reported a preliminary finding that the mediation effect was very weak (Ueno 2001). The following are possible reasons why I detected the stronger mediation effect in this dissertation. First, I have a bigger sample size with the current longitudinal specification (in-home 1 depressive symptoms regressed on in-school integration) than with the previous specification (in-home 2 depressive symptoms regressed on in-home 1 integration). Second, the time lag was shorter in the current longitudinal specification (6 months versus 1 year). Third, integration variables, network variables in particular, contained fewer errors in the current analyses because they did not have the problem associated with two different versions of friendship nomination questionnaire (10 versus 2).

with overall high levels of friendship and organizational activities or a strong sense of belonging (controlling for individual-level integration)?

Table 4.11. Bivariate Associations between School-Level Behavioral and Affective/cognitive Integration Variables and Depressive Symptoms (Unstandardized HLM Coefficients)

Mean Friendship Activities	-.01
Mean Problem Discussions	-.12
Proportion School Organization Participation	-9.43 ***
Mean Belonging to School	-1.32 ***

* $p < .05$; ** $p < .01$; and *** $p < .001$

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Based on four HLM's with one school variable in each model. Intercepts for these models are: 8.86 (friendship activities); 9.09 (problem discussion); 16.83 (school organization participation); and 23.08 (belonging to school).

Before building multivariate models, I examined the bivariate relationship between each school-level integration variable and depressive symptoms. For each school-level variable, I constructed a hierarchical linear model that specified the target integration variable as the only predictor for depressive symptoms. The results are summarized in Table 4.11. (The correlations among the school-level integration variables are also shown in Appendix 4.1.) As expected, adolescents who attended schools with overall high levels of organization participation and belonging to school had significantly fewer depressive symptoms. School-level friendship activities was not significantly associated with depressive symptoms, but this makes sense given the lack of significant relationship between individual-level friendship activities and depressive symptoms as presented in the previous section. Diverging from the individual-level analysis, however, school-level problem discussion was not related to depressive symptoms, indicating that although adolescents might have been negatively affected by (discussion of) their own or friends' problems, they were not influenced by other peers' personal problems or by the negative school climates created by their (intensive conversations about) personal problems.

Adolescents who participated in organizations and had a strong sense of belonging to school were likely to be at schools with overall high levels of integration in these respects, and individual-level integration might have accounted for the relationship between school-level integration and depressive symptoms. Also, adolescents with certain demographic backgrounds might have been selected into schools with high levels of integration. Thus, individual-level integration and adolescents' socio-demographic characteristics were controlled in the

Table 4.12. Depressive Symptoms Regressed on Selected Individual- and School-Level Integration Variables (Unstandardized HLM Coefficients)

	Model 1	Model 2	Model 3
Sex (female=1)	1.30 ***		1.29 ***
Race/Ethnicity (ref.=white)			
Black	.57		.55
Hispanic	1.58 ***		1.56 ***
Asian	1.91 ***		1.89 ***
Others	-.44		-.45
Grade Level (ref.=Grade 9)			
Grade 7	-.77 **		-.71 *
Grade 8	-.61 *		-.55 *
Grade 10	-.23		-.24
Grade 11	-.04		-.04
Grade 12	-.53 *		-.53 *
Parents' Ed. (ref.=H.S. Graduate)			
Less than High School	1.36 ***		1.35 ***
Some College	-.35		-.35
College Graduate	-.98 ***		-.98 ***
Missing	.96 ***		.96 ***
Single Parent Family	.44 *		.44 *
# Non-Participant Friends	.27 **		.27 **
# Friends at School	-.06 *		-.06 *
Problem Discussion	.21 ***		.21 ***
School Organization Participation	-.80 ***		-.78 ***
Belonging to School	-.51 ***		-.51 ***
Prop. School Organization Participation		-4.86 *	-.78
Mean Belonging to School		-1.01 ***	-.09
Intercept	13.86 ***	23.88 ***	15.44 ***
<i>Intercept Variance</i>	.44	.84	.45
<i>Degrees of Freedom</i>	104	102	102
<i>Chi Square</i>	242.71 ***	328.27 ***	241.27 ***
<i>Level 1 Error Variance</i>	33.38	37.93	33.38
<i>Deviance</i>	70067.37	71477.28	70065.36
<i># Parameters</i>	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents in 105 schools

multivariate models (see Table 4.12). When these variables were added, school-level organization participation and sense of belonging were not significantly related to depressive symptoms. Thus, degrees of integration at the school level seemed to have little impact on depressive symptoms once individual-level variables were taken into account.

Summary

The results supported the general proposition that adolescents have fewer depressive symptoms when they are integrated with friends and peers at school. Some important findings also elaborated this overall result. First, number of friends was the strongest predictor of depressive symptoms among network variables. Although other network variables generally showed significant relationships with depressive symptoms in the expected directions, the associations were very weak especially when number of friends was controlled. These findings do not necessarily add any new information to the existing literature, but they provide verification for previous studies that relied on number of friends as the only network measure. This information is also important in terms of reducing costs of future studies because measuring number of friends only requires nominations by respondents, whereas nominations by other members of egocentric or whole networks are necessary to construct other network measures. Also, a straight line approximated the relationship between number of friends and depressive symptoms, and thus the result did not support the argument derived from adult studies that people benefit from having one relationship but gain little from having a large number of relationships.

Second, a sense of belonging to school was more strongly related to depressive symptoms than other integration variables examined in this dissertation, and it also mediated the effects of number of friends and organization participation on depressive symptoms. This finding provides empirical support for the mechanism that links network and behavioral integration to mental health, which has been presumed but rarely been tested before.

Finally, school-level variables did not have any effect on depressive symptoms once individual backgrounds and integration levels were controlled. This finding therefore indicates that adolescents' immediate environment is much more important than larger contexts as far as the mental health consequences are concerned. However, this does not mean that larger contexts do not play any role in adolescent mental health. First, school and other contexts might be an

important factor for individual-level integration. For example, as I demonstrated in Chapter 3, racial/ethnic composition of school seems to change the meaning of having friends with certain racial/ethnic backgrounds.

CHAPTER V

MINORITY STATUS, FRIENDSHIP INTEGRATION, AND DEPRESSIVE SYMPTOMS

Overview

By reinterpreting the findings presented in the previous chapters and conducting additional analyses, I will use this chapter to discuss what role friendship integration plays in the relationship between minority status and depressive symptoms among adolescents. Among socio-demographic variables, I focus on those that distinguish minority adolescents from others (race/ethnicity and socio-economic status indicated by parents' educational level and family structure). As discussed in Chapter 1, past developmental studies that examined the effects of friendship integration on mental health have paid little attention to socio-demographic characteristics and frequently lacked a sociological view which links lower social positions among minorities to their mental health problems. Sociological studies that addressed the effects of minority status on social integration and mental health, on the other hand, tend to be limited to the adult population. I attempt to tie together these bodies of literature by examining the effects of minority status on friendship integration and depressive symptoms.

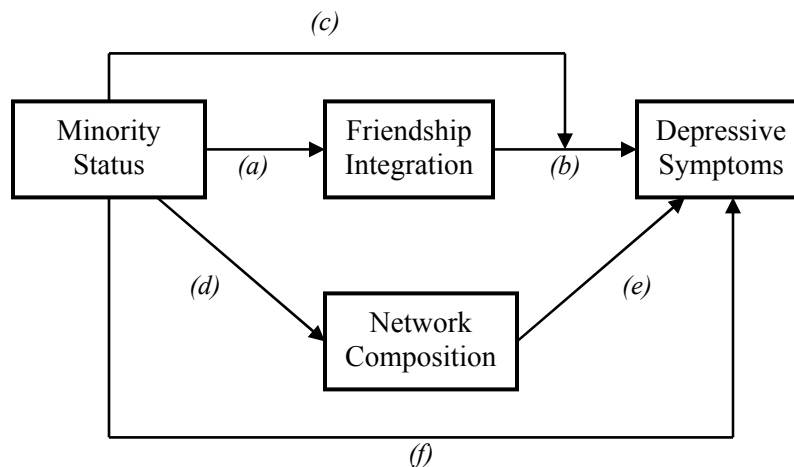


Figure 5.1. Proposed Roles of Friendship Integration and Network Composition in the Relationship between Minority Status and Depressive Symptoms

The investigation consists of three parts, which are summarized in a conceptual model (Figure 5.1).³⁵ First, I examine the extent to which friendship integration accounted for the gap between minority and other adolescents in depressive symptoms. In other words, I test the possibility that minority adolescents had more depressive symptoms because they were less integrated into friendship networks at school (see Path a-b in Figure 5.1). Second, as I argued in Chapter 1, friendships might have been more meaningful to minority adolescents than to other adolescents because they might have perceived higher risks of isolation at school and needed more support from friends in order to cope with the stigma associated with minority status. If this argument were true, the relationship between number of friends at school and depressive symptoms should be stronger among minority adolescents than other adolescents (see Path c Figure 5.1). In the third section, I examine whether depressive symptoms among minority adolescents were influenced by their network composition (see Path e in Figure 5.1). I expect that having friends and peers who share minority attributes will have conflicting effects on depressive symptoms. On one hand, the presence of other minority friends and peers in their networks may reduce the stigma associated with minority status and provide effective social support in dealing with the stressors that they share. If these mechanisms operate, minority adolescents who are surrounded by minority friends and peers should have fewer depressive symptoms than more isolated minority adolescents. On the other hand, if minority adolescents led more stressful lives due to their and their family members' lower positions in society, being associated with other minority adolescents might have exacerbated depressive symptoms through the greater exposure to friends' and peers' stressors. Most of previous studies have examined the consequences of network composition for belonging and self-esteem, and this section extends the literature by considering a possible mental health outcome in depressive symptoms.

Does Friendship Integration Explain the Greater Numbers of Depressive Symptoms Experienced by Minority Adolescents?

If friendship integration mediates the relationship between minority status and depressive symptoms, minority status should be negatively associated with both various measures of

³⁵ This conceptual model includes specific paths tested in this chapter, but it parallels the general conceptual model (Figure 1.1) with the following modifications: (1) "minority status" replaces "socio-demographic characteristics" because this chapter focuses on adolescents' attributes that specifically indicate their minority status; and (2) a path from network composition to the affective/cognitive aspect of integration was dropped because the relationship was very weak among (racial/ethnic) minority adolescents as shown in Chapter 3.

friendship integration and depressive symptoms. Among the integration variables, I will focus on those which had significant associations with depressive symptoms in the expected directions in the previous analyses (number of friends at school, school organization participation, and sense of belonging to school) (see Chapter 4), because only those variables will be able to mediate the relationship between minority status and depressive symptoms. Of the three integration variables, number of friends at school showed the most consistent association with minority status; blacks, Hispanics, Asians, and adolescents who had parents with lower educational levels and those who were from single-parent families had significantly fewer friends at school, compared to majority adolescents (whites, adolescents with educated parents and two-parent families) (as shown in Chapter 3, analyses summarized in Table 3.1). A similar pattern was observed for school organization participation and belonging to school, but these associations were not consistent across minority groups. For example, Asians and Hispanics were not necessarily less likely to participate in school organizations, and blacks were actually more likely to participate than whites. Also, Asian and Hispanic adolescents' sense of belonging was not significantly weaker than white adolescents'.

The positive effect of minority status on depressive symptoms also revealed a disadvantage of being a minority adolescent. Reviewing the previous analysis summarized in Table 4.10, all minority groups had significantly greater numbers of depressive symptoms than majority adolescents (Model 1). If minority adolescents had more depressive symptoms due to their lower degrees of friendship integration, the associations between minority status and depressive symptoms should become weaker when integration variables are controlled. Comparing Models 1 through 7 in Table 4.10, the positive coefficient for black race showed the largest reduction in Model 6. This seems to be because black adolescents were less attached to school than whites (and Hispanics and Asians) and because belonging had the strongest relationship with depressive symptoms among all integration variables. The coefficient for Hispanics did not change very much across models, suggesting that friendship integration contributes very little to explaining their greater numbers of depressive symptoms. Asian adolescents showed a somewhat different pattern from those of black and Hispanic adolescents. The coefficient for Asians *increased*, particularly in the models which included belonging as a predictor. This seemed to be because Asian adolescents tended to have a somewhat stronger sense of belonging (although the difference from white adolescents was not significant). Thus,

Asian students had more depressive symptoms to start with, but if their levels of belonging had been equal to other adolescents', they would have experienced even more depressive symptoms. Finally, the patterns of coefficient changes for adolescents with uneducated parents and in single-parent families were consistent with expectations: the coefficients gradually became weaker as more integration variables were added to the models, indicating that friendship integration partly explained the greater numbers of depressive symptoms those adolescents experienced.

In short, lower degrees of friendship integration seem to be one of the reasons for greater numbers of depressive symptoms experienced by blacks and students from low socio-economic backgrounds. Although the mediation effect through friendship integration was weak to modest, given many possible processes which may link minority status and adolescent depression, this finding on the mediation effect should draw the attention of researchers.³⁶

Do Minority Adolescents Benefit More from Friendships?

Friendships might have been more meaningful to minority adolescents if they perceived a greater risk of isolation at school. If this assumption is true, the ability of friendships to reduce depressive symptoms should be stronger among minority adolescents than among other adolescents. In order to test the differential effects of number of friends at school on depressive symptoms among minority adolescents and other adolescents, I used hierarchical linear models that included interactions between target minority attribute and number of friends at school, main effect terms for these variables, and other socio-demographic predictors of depressive symptoms as controls. Each interaction was entered in a separate model because they were correlated with each other. The results showed, however, that none of the interactions was significant, suggesting that the relationship between number of friends and depressive symptoms was not any stronger for any minority group (not shown).³⁷

³⁶ In the strongest case (black adolescents), friendship integration variables explained only 21 percent of the gap in depressive symptoms between blacks and whites, $(.72-.57)/.72*100=21.1$.

³⁷ I also tested whether minority status interacted with other integration variables, but those interactions were mostly not significant, and several interactions which were significant had signs opposite to what I expected. (Analyses of interaction effects are summarized in Appendix 5.1.) For example, a negative interaction was observed for Asian and school organization participation, indicating that the ability of school organization participation to reduce depressive symptoms was weaker for Asians. Perhaps, adolescents in majority groups (e.g., whites) might have placed strong importance on school-related activities because they knew that they could excel in that domain, whereas some minority adolescents might have consciously or unconsciously denied the significance of their activities at school in order to protect their self-esteem and emotional states. In one of the studies discussed in Chapter 1, Coleman (1961) reported that some adolescents who cannot be popular at school shift their attention to

The pattern is not only contrary to expectation, but it also contradicts the finding that I reported in a previous paper, which focused on sexual minority adolescents (Ueno 2003); the relationship between number of friends and depressive symptoms was stronger among adolescents with gay, lesbian, and bisexual orientations, than among other adolescents. It is possible that stressors experienced by racial/ethnic minorities and adolescents with low socioeconomic backgrounds were different from those experienced by sexual minorities, and having more friends per se might not have helped racial/ethnic minorities and those with low socioeconomic backgrounds to cope with their unique stressors. Another possible explanation is that minority adolescents need not just friends, but *minority* friends, in order to improve their mental states. This possibility is tested in the next section.

Does Having More Minority Network Members Reduce Depressive Symptoms among Minority Adolescents?

In this section, I investigate whether network composition was related to depressive symptoms differently among minority adolescents compared to other adolescents. Because reliable network composition variables cannot be estimated for socio-economic status, I will focus on racial and ethnic composition and its relationships with depressive symptoms. In Chapter 3, I examined the relationship between network composition and sense of belonging to school, which provided the starting point of this investigation. First, adolescents had a stronger sense of belonging to school when they had more friends who shared racial/ethnic backgrounds with them. However, this association was limited to white adolescents with high proportions of white friends. In other words, having other *minority* friends was not related to a stronger sense of belonging among racial/ethnic minorities. In the analyses of school composition, black adolescents as well as white adolescents showed the expected positive relationships between proportions of students with the same racial backgrounds at school and a sense of belonging, but the associations were weak and disappeared when egocentric network composition was controlled. Thus, network composition at the egocentric and school levels had no or very little effect on minority adolescents' sense of belonging. However, when minority adolescents had high proportions of minority friends *and* attended schools where there were many students with the same race or ethnicity, their sense of belonging was stronger. In short, these findings in

popular cultures and academic activities. The current dissertation suggests that such tendency might be stronger for minority adolescents.

Chapter 3 imply that the effect of network composition on depressive symptoms specifically through belonging is likely to be very small and limited to those with high proportions of minority friends who attended schools with many minority peers.

However, network composition may influence depressive symptoms among minority adolescents through other mechanisms. First, the presence of minority friends and peers might not necessarily influence minority adolescents' feelings toward friends or school, but it might reduce the stigma associated with minority status. Second, as I argued in the previous section, minority adolescents might be able to provide more effective social support to each other for the stressors that they share. (Thus, this mechanism applies to egocentric composition but does not directly relate to school composition.)

These mechanisms assume the advantages of being associated with other minority adolescents, but there are some reasons to believe that the mental states of minority adolescents might also be damaged by their associations with other minority adolescents. Adolescents are exposed to their friends' or peers' stressors through interactions (Compas and Wagner 1991; Larson and Asmussen 1991), and the rate of stress contagion might be greater when they interact with other minority adolescents, who are more likely to be in disadvantaged positions. However, even if the proportion of minority network members and depressive symptoms are positively related, minority adolescents should not be affected by the presence of minority friends any more than majority adolescents are because there is no reason to believe that the rate of stress contagion is greater among adolescents with the same backgrounds.

To summarize my expectations, having more minority network members (as a main effect) may increase depressive symptoms, but the interaction between proportion of minority network members and adolescents' minority status should be negative because for minority adolescents, having minority network members should be associated with fewer depressive symptoms (or reduce the positive relationship between proportion of minority network members and depressive symptoms if such a main-effect relationship exists). As in Chapter 3, I will conduct analyses treating black, Hispanic, and Asian adolescents as separate minority groups because the proposed mechanisms (effective social support and reduction of stigma) assume that minority adolescents benefit from having network members who share specific racial/ethnic backgrounds. The analyses were also repeated for majority adolescents (i.e., whites) for comparison purposes.

Table S.1. Depressive Symptoms Regressed on Egocentric Network Composition (Unstandardized HLM Coefficients, Analysis for Race and Ethnicity)

	Target=White				Target=Black		Target=Hispanic		Target=Asian	
	Model 1		Model 2		Model 1	Model 2	Model 2	Model 2	Model 2	Model 2
Sex (female=1)	1.75 ***		1.74 ***		1.77 ***	1.77 ***	1.78 ***	1.77 ***	1.77 ***	1.77 ***
Race/Ethnicity (ref.=white)	-1.04 ***	.29								
Black				.75 *				.72 *		.73 *
Hispanic				1.57 ***				.14		1.52 ***
Asian				1.59 ***				1.49 **		.33
Others				-.34				-.64		-.50
Grade Level (ref.=Grade 9)										
Grade 7	-1.15 ***		-1.19 ***		-1.15 ***			-1.15 ***		-1.16 ***
Grade 8	-.62 *		-.64 *		-.63 *			-.62 *		-.63 *
Grade 10	.07		.06		.07			.06		.07
Grade 11	.38		.38		.38			.37		.38
Grade 12	-.04		-.03		-.05			-.05		-.04
Parents' Ed. (ref.=E.S. Graduate)										
Less than High School	1.51 ***		1.49 ***		1.46 ***			1.35 ***		1.47 ***
Some College	-.48		-.47		-.46			-.44		-.47
College Graduate	-1.23 ***		-1.19 ***		-1.22 ***			-1.19 ***		-1.23 ***
Missing	1.16 ***		1.15 ***		1.14 ***			1.09 ***		1.13 ***
Single Parent Family	.59 **		.55 **		.65 **			.67 **		.64 **
Prop. Egocentric Same Race	.17		1.13 *		.15			-.35		-.09
Prop. Egocentric Same Race * Target Race			-2.03 ***					2.87 **		2.70 **
Belonging to School										
Intercept	8.75 ***		8.28 ***		7.70 ***			7.59 ***		7.91 ***
Intercept Variance	.79		.80		.73			.72		.71
Degrees of Freedom	104		104		104			104		104
Chi Square	337.31 ***		344.66 ***		319.64 ***			316.77 ***		312.03 ***
Level 1 Error Variance	36.09		36.02		36.05			36.05		36.03
Deviance	70939.27		70920.52		70921.52			70917.54		70907.17
# Parameters	2		2		2			2		2

* $p < .05$; ** $p < .01$; and *** $p < .001$
N = 11,023 adolescents in 105 schools

I first examined the relationship between egocentric network composition and depressive symptoms, using hierarchical linear models that included interactions between target egocentric network composition and target minority category (e.g., proportion black friends*black). Each interaction term was entered in a separate model to avoid multicollinearity problems. The models also included the main effect terms of these interactions as well as a set of socio-demographic variables as controls. The results are shown in Table 5.1. Before discussing the interaction effects, I should note that none of the racial/ethnic composition variables was significantly associated with depressive symptoms when the socio-demographic characteristics of adolescents were controlled in each Model 1. This finding thus did not support the possibility of stress contagion through minority friends. The interaction terms were added to each Model 2, but none of the relationships showed the expected benefit of having similar friends. Rather, Asian friends and Hispanic friends had opposite effects for Asian adolescents and Hispanic adolescents respectively; for these minority adolescents, having similar friends were harmful to their mental health. After presenting the analyses of school composition, I will discuss some possible explanations.

The relationship between school composition and depressive symptoms was examined using a method similar to that just used for egocentric network composition; I entered interaction terms between the target school composition and the target race/ethnicity of adolescents. The results are shown in Table 5.2. As each Model 1 shows, after controlling for individual-level socio-demographic variables, none of the racial/ethnic composition variables had a significant effect on depressive symptoms. Therefore, as with egocentric network composition, this finding did not support the idea of stress contagion from minority peers. Further, the coefficients in each Model 2 show that interactions between school composition and adolescents' race/ethnicity were not significantly related to depressive symptoms, except for Asians; Asian adolescents had more depressive symptoms when they attended schools with higher proportions of Asian students. Thus, this finding paralleled the analyses of egocentric network composition, which showed the greater depressive symptoms among Asian adolescents with higher proportions of Asian friends.

In the final set of analyses, I simultaneously examined interactions between egocentric network composition and adolescents' racial/ethnic backgrounds, between school composition and adolescents' backgrounds, and interactions among all three. I will discuss the results only briefly because they did not add much to the findings already presented. (The results are

Table 5.2. Depressive Symptoms Regressed on School Composition (Unstandardized HLM Coefficients, Analysis for Race and Ethnicity)

	Target=White		Target=Black		Target=Hispanic		Target=Asian	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Sex (female=1)	1.75 ***	1.75 ***	1.77 ***	1.77 ***	1.77 ***	1.77 ***	1.77 ***	1.77 ***
Race/Ethnicity (ref=white)								
Black		-46	.97 *	1.65 **	.71 *	.73 *	.73 *	.73 *
Hispanic			1.54 ***	1.52 ***	1.29 ***	.94	1.45 ***	1.50 ***
Asian			1.59 ***	1.55 **	1.39 **	1.45 **	1.33 **	.33
Others			-.43	-.45	-.57	-.51	-.50	-.47
Grade Level (ref=Grade 9)								
Grade 7	-1.16 ***	-1.17 ***	-1.16 ***	-1.15 ***	-1.16 ***	-1.15 ***	-1.14 ***	-1.15 ***
Grade 8	-.63 *	-.63 *	-.63 *	-.62 *	-.63 *	-.62 *	-.61 *	-.61 *
Grade 10	.08	.08	.07	.07	.07	.07	.07	.07
Grade 11	.39	.39	.38	.38	.38	.38	.38	.38
Grade 12	-.03	-.03	-.04	-.04	-.03	-.04	-.05	-.05
Parents' Ed. (ref=H.S. Graduate)								
Less than High School	1.51 ***	1.52 ***	1.47 ***	1.48 ***	1.43 ***	1.42 ***	1.46 ***	1.46 ***
Some College	-.48	-.48	-.47	-.46	-.47	-.47	-.47	-.47
College Graduate	-1.23 ***	-1.23 ***	-1.22 ***	-1.20 ***	-1.22 ***	-1.22 ***	-1.24 ***	-1.24 ***
Missing	1.15 ***	1.16 ***	1.14 ***	1.14 ***	1.12 ***	1.12 ***	1.14 ***	1.14 ***
Single Parent Family	.58 **	.58 **	.65 **	.65 **	.64 **	.64 **	.64 **	.64 **
Target School Composition								
Target School Composition	-26	.18	-1.05	-.07	1.96	1.37	2.55	1.37
*Target Individual Race								
*Target Individual Race		-.87		-2.13		1.50		5.30 *
Intercept	8.98 ***	8.83 ***	7.96 ***	7.86 ***	7.64 ***	7.68 ***	7.73 ***	7.77 ***
Intercept Variance	.78	.76	.70	.69	.69	.72	.71	.73
Degrees of Freedom	103	103	103	103	103	103	103	103
Chi Square	334.59 ***	330.94 ***	304.45 ***	304.49 ***	308.51 ***	315.31 ***	309.78 ***	315.96 ***
Level 1 Error Variance	36.09	36.10	36.05	36.04	36.04	36.03	36.05	36.03
Deviance	70938.29	70937.36	70915.98	70907.06	70913.03	70907.49	70914.76	70903.84
#Parameters	2	2	2	2	2	2	2	2

* $p < .05$; ** $p < .01$; and *** $p < .001$

N=11,023 adolescents in 105 schools

summarized in Appendix 5.2.) First, when these two interactions were entered in hierarchical liner models simultaneously, they remained insignificant for white, black, and Hispanic adolescents.³⁸ Of the two interactions found significant for Asians in the previous analyses, the interaction between proportion of Asian friends and adolescents' Asian background remained significant, whereas the one between school composition of Asian students and Asian background was no longer significant. This finding suggested that the positive interaction for school composition was due to the fact that Asian students at schools with high proportions of Asian students tended to have many Asian friends. In the last set of models, I tested whether the relationship among adolescents' race/ethnicity, egocentric composition, and depressive symptoms depended on school composition by entering three-way interactions. However, none of these three-way interactions was significant.

To summarize the analyses of network composition and depressive symptoms, having many minority friends was not necessarily related to more depressive symptoms, (with the exception of Asian students). Also, proportions of minority friends did not interact with adolescents' minority status, so that minority adolescents did not necessarily benefit from having friends who shared their backgrounds. Perhaps once friendships were developed, friends' racial/ethnic backgrounds had little to do with the meaning and quality of those friendships. The results were also inconsistent with the hypothesis that minority adolescents can provide uniquely effective social support to each other for the stressors that they share. It should be noted, however, that I only examined the racial/ethnic composition of egocentric networks and that other dimensions of minority status may have significant impacts on how egocentric networks influence mental health. In another paper, for example, I demonstrated that among sexual minority adolescents, having more sexual minority friends was related to fewer depressive symptoms and seemed to buffer the psychological damage associated with interpersonal problems (Ueno 2003).

Asian adolescents showed a pattern opposite to what I expected; they experienced more depressive symptoms when surrounded by Asian friends. It is not likely that this harm resulted from stress contagion due to associations with Asian students; if stress contagion were operating,

³⁸ In Table 5.1, I show that having friends with the same ethnic background is harmful to Hispanic adolescents' mental health. However, this effect was not significant in Appendix 5.2 (Hispanic-Model 1). The discrepancy is likely due to how interaction terms were constructed (i.e., proportion same ethnicity*Hispanic versus proportion Hispanics*Hispanic).

having more Asian friends should be positively associated with depressive symptoms among all racial/ethnic groups (i.e., the main effect of Asian friends should be positive). Instead, the relationship between proportion of Asian friends and depressive symptoms was limited to Asian adolescents. I propose two possibilities that may explain this finding. First, it might have been normative for Asian adolescents to make friends with non-Asians because Asians constitute a very small proportion of the student body in most schools. At the same time, Asian adolescents may also perceive little advantage in having Asian friends because they may not have much in common with each other in terms of life conditions (e.g., socio-economic backgrounds) and cultures (e.g., languages, religions) unless they share national origins. Generally, Asian immigrants, particularly certain subgroups such as Japanese, tend to assimilate very quickly to the American culture, so it is possible that some Asian adolescents make conscious decisions to develop friends with non-Asian adolescents. If developing friendships with non-Asian students were normative for these reasons, deviation from the norm (i.e., having many Asian friends) might be seen as a failure and therefore undermine their well-being. Second, some Asian adolescents who fail to make friends with non-Asian students might become selected into groups of Asian friends. For example, limited English skills could prevent these Asian adolescents from assimilating in American schools. These problems that motivate mutual friendships among Asian adolescents might be in part responsible for their greater depressive symptoms. (This argument thus assumes that the positive relationship between having Asian friends and depressive symptoms among Asian adolescents is spurious.) However, it is difficult to explain why such selection might occur only among Asians but not among other minority groups.

Summary

The general goal of this chapter was to investigate the role of friendship integration in the association between minority status and depressive symptoms. As shown in the first section, lower degrees of friendship integration among minority adolescents seemed to explain their greater numbers of depressive symptoms to some extent, but for two reasons, friendship integration only provided a limited explanation. First, the overall mediation effect was not very strong, which shows that there are other mechanisms linking minority status and greater numbers of depressive symptoms. Second, the mediation process did not apply to Hispanics and Asians,

who had more depressive symptoms but were not necessarily integrated to lesser degrees than whites.

The chapter also demonstrated that the relationships between friendship integration and depressive symptoms were quite similar among minority adolescents and other adolescents (i.e., white adolescents and those in high socio-economic families), and that number of friends was not necessarily more strongly related to with depressive symptoms among minority adolescents. Also, limiting the scope to racial/ethnic minorities, having friends and peers who shared minority backgrounds did not seem to help minority adolescents reduce their greater numbers of depressive symptoms, and among Asians, such networks were associated with greater numbers of depressive symptoms rather than fewer symptoms. This unexpected finding for Asian adolescents requires further investigation.

CHAPTER VI

DISCUSSION

In this chapter, I will interpret the findings from the previous chapters and identify theoretical implications, study limitations, and propose directions for future research. The chapter is divided into the following four topical areas: (a) the relationships among the three components of social integration and their effects on mental health; (b) the role of social contexts; (c) minority individuals' social environment and mental health; and (d) similarities and differences between adolescents and adults. In order to contextualize each section in the overall conceptual model (Figure 1.1), I will refer to specific paths in the model.

The Relationship among the Three Components of Social Integration and Their Effects on Mental Health

Theoretical Implications

This dissertation demonstrated an important assumption that previous researchers have held: the three components of integration (network, behavioral, and affective/cognitive) correlate with each other. For many indicators, the correlations were weak or moderate, indicating that these components are related but not identical. Establishing the associations of network and behavioral integration with affective/cognitive integration (Paths b and c in Figure 1.1) was particularly important in order to examine another assumption in the literature: the effects of network and behavioral integration on mental health are mediated by affective/cognitive integration. This hypothesis was also supported in the analysis, although the current study design did not allow me to determine the causal direction, as I will discuss later.

Another important finding is that egocentric network size is positively correlated with mental health, consistent with many previous studies (Path b-d in Figure 1). In addition, the use of various network measures in this dissertation allowed me to examine whether other indicators of network integration (reciprocity, density, and centrality) are associated with depressive symptoms. Although these dimensions showed bivariate associations with depressive symptoms in the expected directions, they were very weak. Further, eigenvector centrality and closeness

centrality were very highly correlated with egocentric network size, so considering students' relative position in school-wide networks did not add much value in terms of predicting mental health outcomes. Therefore, the usefulness of these centrality measures needs to be reexamined under conditions where there is less redundancy between centrality and egocentric network size. For the study of adolescent social integration and mental health, however, researchers may rely on the much simpler measure of egocentric network size and forgo detailed network properties.

Although I found a significant, negative relationship between egocentric network size and depressive symptoms, it was very small. There are several possible factors which may account for this small effect. First, friendships involve negative experiences as well as positive ones. For example, by adolescence, individuals develop clear expectations for their friends (e.g., mutual respect, honesty, availability for company and support, Youniss and Smollar 1985), and the pressure to meet those expectations may be overwhelming when one has many friends (i.e., role overload). Also, the failure to meet each other's expectations may create conflict among adolescent friends. Given the strong importance that adolescents place on friendships (Csikszentmihalyi and Larson 1984), they may experience emotional stress from worrying about losing friends due to these problems. These negative aspects of friendships may be particularly common among adolescents, who are still developing skills to manage social relationships. Following this argument, it is possible that the benefit of social integration may be smaller in adolescence than in later life stages. I will return this possibility in the last section of this chapter.

The small mental health consequence of having fewer friends may also reflect individual efforts to compensate for their relative disadvantage. In order to protect self-image, people often develop cognitive strategies to play down the subjective significance of negative personality traits (Rosenberg and McCullough 1981). Socially isolated individuals may thus learn to deny or ignore their lack of social lives. These cognitive strategies may be effective especially because social integration, in its network and behavioral manifestations, influences mental health mostly through individual perceptions of social environments, as I demonstrated in Chapter 4. In addition, those who reduce the subjective importance of having social activities may shift their focus to other activities. For example, Coleman (1961) demonstrated that students with few friends tend to become absorbed in popular culture and fascinated with cars—hobbies that do not require company. In order to understand exactly how these counterbalancing mechanisms

operate, future research may investigate how individuals who have small networks and little social contact perceive and explain their lack of social lives.

Limitations and Future Research

Measurement and Data Issues

There are some limitations with the current integration measures. First, as described in Chapter 2, a few factors undermined the quality of friendship nomination data in Add Health. For example, nominations were limited to five male and five female friends, and the data did not include friendship nominations from students who were absent when the survey was given. These limitations might have resulted in underestimation of certain network indicators (e.g., egocentric network size), and they might have affected some students' data more than others'. Friendship activities, a behavioral integration measure, was based on friendship nomination, and thus shared these possible sources of error and bias. Additionally, in response to each question for friendship activity, adolescents only reported whether they engaged in certain activities with friends or not. Therefore, these items did not measure the frequency of activities, which previous studies emphasized as a protective factor for adolescent mental health (Kandel and Davies 1982; Vernberg 1990). Similarly, the total amount of time spent with friends might be another important dimension, as adolescent friends could spend hours engaging in one type of activity on one occasion. The importance of these dimensions (frequency and total time spent) may apply to participation in school organizations, which was measured dichotomously (i.e., participated or not) in Add Health.

As a measure of affective/cognitive integration, I relied on adolescents' sense of belonging to school. It made sense to measure students' feelings about school because a large portion of their social lives take place at school, and it is likely that many social activities outside school involve friends that they have developed at school. However, their feelings specifically about friends may influence mental health, independent of those about school. The distinction may be particularly important for adolescents who have few friends at school and many friends outside. Also, when egocentric network composition is very different from school composition, adolescents may not develop strong attachments to school (because their friends do not connect them to school as a whole, as seen in Chapter 3), but they may still benefit from having a niche at school. The need to examine the independent effects of feelings about friends and organizations

as a whole applies to studies of other contexts and populations. For example, in order to examine the effects of social integration through religious organizations, one needs to address members' feelings about close members as well as those about organizations.

There are other aspects of affective/cognitive integration that were not measured in Add Health (e.g., sense of security, feelings of being loved and wanted). Including measures for these concepts might not necessarily increase the ability to explain how network integration (and behavioral integration) promotes mental health because, as shown in Chapter 4, sense of belonging alone can explain a big portion of the effect that egocentric network size has on depressive symptoms. However, future research should examine to what degree these affects and cognitions correlate with each other, which will indicate whether network and behavioral integration create these thoughts and feelings independently or influence the way in which people perceive their social environments in general.

Relational Quality

I have mentioned that negative aspects of friendships may counterbalance the advantage of having large egocentric networks. Following this argument, one should be able to explain more variance in mental health outcomes by examining relationship quality. For example, individuals who have many relationships with positive quality (e.g., support) and few relationships with negative quality (e.g., conflict) should have better mental health. Rook's (1984) study of older adults supported this hypothesis. This body of literature is not useful by itself because it does not directly concern social integration. In fact, we know very little about the relationship between social integration and relationship quality, beyond the fact that the numbers of positive and negative relationships are only weakly correlated (Rook 1984). There are at least some individuals who maintain a large number of positive relationships without interpersonal strains, and future research may investigate what contributes to the development of such desirable social environments. Personality traits such as gregariousness and openness to others as well as social status (i.e., the ability to choose desirable relationship partners and avoid undesirable ones) are likely to be important factors.

Causal Directions

Throughout this dissertation, I interpreted the relationship that I observed between social integration and mental health as the effect of the former on the latter. However, there are some reasons to believe that mental health could influence social integration in return. When individuals' mental health problems are known to others through visible behavioral symptoms, for example, people may not be willing to associate with them. With increasing understanding of psychological problems in the general public, people may not intentionally discriminate against those with mental problems, but they may perceive certain symptoms as undesirable for potential relationship partners (e.g., negative moods or not being “fun”). In addition, social isolation of individuals with psychological problems may also result from their own avoidance of other people due to fear of rejection (Link, Cullen, Struening, Shrout, and Dohrenwend 1989). These processes could explain why poor mental health results in lower degrees of network integration. Even when those with psychological problems have egocentric networks of adequate size, their poor health may undermine the ability to perform activities that are expected in their relationships (i.e., low behavioral integration). For example, physical fatigue and lack of energy are common among people with depression (American Psychiatric Association 1994). Similarly, depressed people may perceive their environments negatively, so they may not be able to “feel” integrated even when they have many friends and frequently engage in social activities.

The current study design did not allow me to separate out these reverse effects of mental health problems on social integration. As explained in Chapter 2, I regressed Time 2 (in-home survey) depressive symptoms on Time 1 (in-school survey) integration variables. Because I did not control for depressive symptoms at Time 1 in the model, any impact of Time 1 depressive symptoms on Time 2 integration variables would have inflated the observed relationship between Time 1 integration and Time 2 depressive symptoms, assuming integration and depressive symptoms correlated with each other at Time 1. My decision to use the present longitudinal specification was largely based on data availability—depressive symptoms were measured at Time 2 only. However, even if mental health measures were available in both Times 1 and 2, the time lag (six months) might not have been appropriate. We know very little about how long it takes for a change in the social environment to start influencing mental health and how long the effect will last. Therefore, the alternative specification might not have produced interpretable

results. Survey data with many measurement points and experimental studies are necessary to answer these questions.

Use of Multiple Outcome Measures

Like other contemporary mental health studies in sociology, my dissertation focused on depressive symptoms as a mental health outcome. However, it is possible that social integration has other mental health consequences. For example, isolated individuals may have strong feelings of anxiety due to the lack of social relationships that protect them from potential stressors. Also, because people often expect each other to be sociable, a failure to develop a circle of friends may undermine one's self-esteem as well as sense of mastery. Related to this issue of multiple psychological outcomes, some authors have argued that social relationships are an important factor for positive well-being, such as feelings of happiness and life satisfaction (e.g., Bradburn 1969; Diener 1984). Therefore, these authors suggest that social integration should be related to positive *well-being* more strongly than to mental health *problems*, assuming that positive well-being is not just a lack of emotional problems. Due to the lack of adequate mental health measures other than the CES-D in Add Health, I was not able to include these mental health constructs. Future research needs to examine the relative significance of each construct as an outcome of social integration.

Extending this line of research, one may also investigate the effects of social integration on behavioral outcomes. Social isolation not only indicates one's lack of protective resource, it may also reflect experiences of rejection from others and other interpersonal problems, which can increase stress responses. Whereas some individuals express their stress emotionally, others engage in disruptive behaviors such as violence and substance use (Aneshensel, Rutter, and Lachenbruch 1991). Examination of behavioral outcomes is complex due to the fact that social integration relates to other determinants of behavioral problems. For example, socially isolated individuals may experience little social control (e.g., monitoring and enforcing of social norms), which would further increase the chance of engaging in disruptive behaviors (Hughes and Gove 1981). Also, network composition, particularly the degree to which other network members engage in disruptive behaviors, is likely to influence whether social integration increases or decreases behavioral problems (Sampson and Laub 1993; Sutherland and Cressey 1978). To complicate the matter further, the level of social integration may influence network composition

over time; socially isolated individuals may drift into a circle of deviant friends. In addition to testing these separate hypotheses, theoretical work is necessary to tie them together, integrating the mental health and deviance literatures.

The Role of Context

Theoretical Implications

I examined two possible ways in which school contexts may influence adolescent depressive symptoms. First, the overall level of integration at school (measured by density) had only a weak association with depressive symptoms. This finding is consistent with Fischer's (1982) study of Northern Californians, where living in urban areas surrounded by many strangers did not necessarily increase mental health problems. The overall small effects of social contexts across studies may indicate people's ability to create supportive egocentric networks, regardless of context, as well as their efforts to move to places that fit their lifestyles (Fischer 1982; Freudenburg 1986). Although there are some studies that reported mental health problems with social disorganization in other contexts such as neighborhoods (e.g., Aneshensel and Sucoff 1996; Faris and Dunham 1939; Ross 2000), they suffer from methodological limitations (e.g., reliance on individual perceptions about neighborhoods; see Chapter 1).

Second, egocentric and school composition is another dimension of context examined in this dissertation. Consistent with previous studies, the analysis showed that friendships develop along socio-demographic boundaries; adolescents are more likely to have friends who are similar in terms of sex, grade level, and race/ethnicity (Path e in Figure 1.1). Further, focusing on race/ethnicity as an example, I demonstrated that having friends with similar backgrounds strengthens a sense of belonging (Path e in Figure 1.1), as expected. However, this relationship between egocentric network composition and belonging depends on school context; having similar friends is associated with a stronger sense of belonging only when schools have adequate proportions of students in their own racial/ethnic categories. This contextual contingency seems to explain the overall weak effects of egocentric network composition among Asians and Hispanics, who make up very small portions of the student body in many schools. Regarding the effects of network composition, it should be remembered that having similar friends does not necessarily reduce depressive symptoms. In contrast to a sense of belonging, which is directly

connected to one's social life, depressive symptoms may be too distal from network composition.

There were two adolescent groups that showed different patterns of network composition and mental health outcomes. First, in another paper based on the Add Health data (Ueno 2003), I demonstrated that sexual minorities (gay, lesbian, and bisexual adolescents) are no more likely than other adolescents to have sexual minority friends, indicating that sexual orientation does not follow the friendship homophily principle. The lack of mutual friendships among sexual minorities may result from their efforts to hide their sexual orientations, which makes them invisible to each other (Smith and Smith 1998). Even if they know each other, they may not necessarily develop friendships in order to remain closeted and reduce the risk of victimization and discrimination. Thus, this example suggests that when minority individuals perceive that friendships with other minority members might increase stigma, they do not necessarily seek out such friendships, and they may even intentionally avoid other minorities.

The second exception is Asian adolescents. Like other racial/ethnic groups, Asian adolescents are more likely to have friends of their own background. However, when surrounded by other Asian students in egocentric networks or at school, Asian adolescents have more depressive symptoms, whereas black and Hispanic adolescents in similar situations do not suffer any negative (or positive) consequences. I argued in Chapter 3 that Asian adolescents who develop friendships with Asian peers may have unique needs. For example, recent immigrants with limited English skills might be able to communicate only with students from the same countries. These circumstances that motivate friendships with other Asians may account for their greater number of depressive symptoms. With some exceptions (Joyner and Kao 2000; Moody 2001), there is little research that identifies determinants of friendship choice within and across socio-demographic categories. As the meaning and purpose of friendships may differ across minority groups, there may be a unique set of factors that influence friendship choices for each group. This area of research does not directly relate to my dissertation on social integration, but it may be important to control for these determinants of friendship choices, as they might otherwise bias the estimation of the effects of network composition on affective/cognitive integration and mental health.

Limitations and Future Research

To examine how contexts influence adolescent mental health, I used school-level measures of friendship network structure and composition. My decision to set network boundaries to schools was based on how the network data were collected in Add Health (i.e., students were allowed to nominate anyone at the same school). However, because students interact mostly with others in the same grade (and they are probably expected to do so), students' positions within grade levels may have stronger impacts on mental health than their positions in school-wide networks. With this re-definition of network boundary, calculation of centrality scores would be more consistent with the friendship pattern observed in the Add Health data (i.e., friendship clusters by grade level). The alternative version of eigenvector centrality, for example, would measure each student's distance from the dominant friendship group in the grade level, instead of distance from the largest group at the whole school. In short, future research may examine how changing definitions of network boundaries influences our ability to demonstrate the effects of network integration on mental health.

Future research may extend the examination of network composition in a few ways. First, my dissertation focused on friends' socio-demographic characteristics as dimensions of composition, but friends' behaviors and attitudes may also be considered as dimensions of network composition. For example, it is likely that adolescents who have common academic interests and career expectations with their friends have a stronger sense of belonging. However, when investigating behavioral dimensions of network composition, one needs to consider the fact that network members are likely to influence each other. That is, network members may encourage or discourage each other from engaging in certain behaviors through modeling and creating group norms, for example, which further increases the homogeneity of the network. This argument is often used to explain friends' influences on delinquency and substance use (Sampson and Laub 1993). As is obvious from this example of behavioral problems, sharing interests with friends does not necessarily promote mental health if it increases the chance of stress exposure; as a member of a delinquent circle, adolescents may be introduced to certain stressors (e.g., injury, conflict with others).

Second, I computed network composition variables in my dissertation considering school friends' attributes only. For both socio-demographic and behavioral dimensions, future studies should examine whether including friends outside school changes the current results. As I

reported in Chapter 4, number of friends outside school is positively associated with depressive symptoms, whereas number of friends at school has a negative association. As an explanation, I have suggested that these two components of egocentric networks may have unique composition. Specifically, friends outside school may be more likely to have behavioral and emotional problems, which might explain the mental health disadvantage associated with outside friends. This hypothesis needs to be empirically tested. It would also be important to investigate whether the same dimensions of network composition have different effects on mental health within and outside school.

A third way to extend the examination of network composition is to test whether the findings can be replicated for other social contexts and populations. It is particularly interesting to investigate how widely one might observe the three-way interaction between individual attributes, egocentric composition, and contextual composition. Applying the finding to workplaces, for example, black workers who have many black colleagues should feel more attached to their companies when there are many black employees in the companies. To test the three-way interaction, researchers need to collect information on network composition at both egocentric and contextual levels—a consideration that needs to be made when designing future studies.

Advancing this line of research on network composition and mental health, future studies may examine how one's egocentric network composition differs *across* social contexts and how the pattern influences mental health. People may have unique circles of friends and acquaintances in different contexts, and network composition may differ in terms of socio-demographic, behavioral, and attitudinal characteristics. For example, a Hispanic person may mostly interact with Hispanic neighbors, although her friends at work may be all (non-Hispanic) whites. One may intuitively expect that consistent network composition across contexts would contribute to better mental health through creating a sense of familiarity and comfort. However, the effect may be counteracted by the disadvantage of limited diversity in social resources (Hirsch 1980; Wilcox 1981).

Social Integration and Mental Health among Minority Individuals

Theoretical Implications

As mentioned in Chapter 1, minority adults are generally less integrated than majorities, and the analysis in Chapter 3 showed that this pattern already exists in adolescence (Path a in Figure 1.1). The finding may therefore help us understand how minority individuals become isolated. More specifically, with the current finding, we can eliminate explanations that rely on adult life conditions (e.g., limited opportunities to meet others and lack of power associated with less prestigious occupation and income), although these processes in adulthood may reinforce the pattern of integration that already exists in adolescence. One of the most important principles of friendship formation is homophily, and it may explain the enduring demographic pattern of social integration. That is, in both adolescence and adulthood, social relationships develop among people who share attributes, and minority individuals have a smaller chance of establishing relationships due to the smaller pool for potential network members. Stigma may be another reason for their lower levels of integration; their minority status makes them less attractive as potential network members. In order to attribute the adolescent pattern to this process, however, we must assume that stigma for minority groups already exists in adolescence. The demographic pattern of integration may also result from early socialization. Parents with low socioeconomic status, for example, might not teach their children to develop extensive networks and encourage popularity at school, as much as parents with higher status do. This socialization explanation might help us interpret one of the exceptions to the general pattern of minorities' lower level of integration: Asian adolescents have a *stronger* sense of belonging to school, consistent with the racial group's strong emphasis on education in the early socialization (Ogbu 1991; Shih 1998).

The stability of the socio-demographic distribution in social integration across life stages has another implication for how we interpret the relationship between social integration and adult mental health. Previous adult studies were mostly based on cross-sectional data (e.g., Umberson et al. 1996), and the mental health benefit found in these adult studies may in fact reflect the enduring effect of the social environment in early life stages or the cumulative effect over the life course. (With the possible reverse effect of mental health on social integration mentioned earlier, the relationship between social integration and adult mental health may also be a product of a persistent interplay between social integration and mental health over time.) I have already

addressed the need for longitudinal studies as a way to determine the causal direction, but those that extend across life stages will be particularly important.

Limitations and Future Research

To simplify my analyses of racial/ethnic minority groups, I used broad categories which combined adolescents with different national origins (e.g., Koreans, Vietnamese, and many others in the Asian category). However, the distributions of social integration and mental health and the relationships between the two variables may vary across subcategories. Narrower categories based on nationality may also be useful for examining the effects of network composition on affective/cognitive integration and mental health. Given the diversity within the racial group in terms of culture and socio-economic status, Asian adolescents, for example, may feel attached only to others who share national origins. The proportion of each subgroup to the whole population is likely to be very small, and researchers may need to limit the analyses to certain subgroups or to oversample individuals in certain geographical locations (where there are an adequate number of individuals in each subcategory).

One might pursue another important question by defining racial/ethnic categories more broadly. A racial/ethnic minority category that includes all non-white individuals might be used to test the assumptions that these individuals are sympathetic to each other's minority status and that increased diversity due to the presence of any non-white individuals should reduce the stigma of being non-white.

The analysis did not support my expectation that having many friends who share minority status will reduce depressive symptoms, although it strengthens a sense of belonging in some cases. Before we conclude that there is no mental health consequence, however, I would like to suggest that friendships based on mutual minority status may benefit individuals who have particular needs. For example, when individuals experience stressors that are common and unique to their minority groups, peer minority members may be able to provide the most useful assistance with the stressors. Consistent with this argument, I have demonstrated in another paper that among sexual minorities, having sexual minority friends reduces the psychological damage associated with interpersonal problems (a stressor often experienced by this adolescent group), although overall number of friends (mostly consisting of sexual majorities) does not have the same ability to lessen the psychological harm (Ueno 2003). In short, network composition

may show stronger effects when one tests the mental health benefit against stressors that increase the need for friendships among minorities.

Similarities and Differences between Adolescent and Adult Populations

Theoretical Implications

Targeting the adolescent population, this dissertation has extended previous studies of social integration and mental health, which have mostly focused on the adult population. Although the findings from this dissertation were largely consistent with previous adult studies, there were a few important differences. First, the effects of social integration on mental health appear to be smaller among adolescents than those reported in adult studies. For example, for egocentric network size, the bivariate correlation with depressive symptoms was only $-.07$, which is much weaker than what some adult studies have found (e.g., $.28$ with a measure of happiness in Phillips 1981).

A methodological difference may explain this discrepancy because adult studies tended to define egocentric networks narrowly. For example, in his analysis of General Social Survey data, Burt (1987) considered as network members only individuals with whom respondents discussed personal matters (because GSS asked questions only about these individuals). Similarly, many adult studies that have focused on the concept of social support counted the number of potential support givers. If network members were defined more broadly in adult studies, the effects of egocentric network size might be smaller and comparable to my current finding. In fact, Lin, Ye, and Ensel (1999) used weekly contacts as a criterion for network members and found only a small correlation of $-.10$ between egocentric network size and depressive symptoms.

The difference in effect size may, of course, indicate real differences in mental health consequences between adolescence and adulthood. It is possible that people come to value their social lives more as they grow older and start developing social relationships other than those with parents and school friends. Because of their higher cognitive skills and more experience in the social world, adults may also better understand the advantages (and disadvantages) of having social relationships. Before continuing to speculate about why egocentric network size (and other aspects of integration) may have stronger effects among adults, one should note that the

effect sizes are not perfectly consistent even within age groups (see Chapter 2). Thus, the first task in this line of research will be to confirm age differences in effect sizes.

The linearity of the relationship between egocentric network size and depressive symptoms was another point on which my dissertation and previous adult studies diverged. Previous studies have emphasized the importance of having one network member and the declining mental health benefit of having additional network members in the adult population. However, this pattern was not found in my dissertation; among adolescents, the relationship between egocentric network size and depressive symptoms was approximately linear. Because many previous adolescent studies only reported correlation or regression coefficients without addressing the linearity of the relationships, it is not clear whether linearity is unique to the Add Health data or consistent with these previous adolescent studies. Even if we assume that egocentric network size is in fact linearly related to adolescent depressive symptoms, the discrepancy with adult studies may be due to the difference in network measurement that I mentioned earlier. That is, when one only considers intimate or supportive relationships, as many previous researchers have, the additional advantages of having many network members may be small, because the closest relationship is likely to provide a substantial benefit, which overlaps considerably with what additional relationships can provide. Related to this argument, I have pointed out that the curvilinear effect of egocentric network size observed in previous studies may be attributed to the presence or absence of a spouse or significant other, who is likely the most important network member among adults. Marital and other romantic relationships are different from friendships in many respects (e.g., greater degrees of emotional intimacy and commitment) and may contribute more to mental health, although these relationships may also create obligations and conflict, which may counteract the mental health advantages.

Yet another possible explanation for the changing mental health consequences across life stages is that friendships (and social relationships in general) have different meanings in adolescence and adulthood. It should be remembered that friendship is closely tied to popularity in adolescence, and it is a major source of self-esteem (Coleman 1961). Adolescents who have many friends develop strong identities as popular persons, and those who do not may feel a need to find ways to overcome their lack of recognition from peers. Developmental researchers have argued that the need for emotional closeness emerges in adolescence, and it likely becomes

stronger in adulthood (Bukowski and Hoza 1989; also see Fehr 1996, Chapter 1). Adults' shifting focus on relational quality may thus reduce the additional mental health benefit of having large networks beyond significant others and very close friends.

Limitations and Future Research

In order to directly examine whether social integration may influence adolescents and adults differently, one needs to use data that include both age groups. Many measures of social integration used in this adolescent study are applicable to adults, although social environments for adolescents and adults are very different in terms of social roles that connect network members, contexts where social relationships develop, and types of social activities. These fundamental differences in social environments will be important for understanding how social integration influences mental health for the two age groups.

Conclusion

In this dissertation, I asked a fundamental question which has interested many sociologists: Does social integration contribute to healthy mental states? Previous sociological studies have been limited to the adult population, but I extended the literature to the adolescent population and examined whether and to what extent their friendships influenced depressive symptoms. The results were generally consistent with my hypotheses: Integration into friendship networks is associated with better mental health, and the relationship is largely mediated by a sense of belonging. However, the relationship between integration and mental health is very weak, and it is unlikely that social integration would have visible consequences in mental functioning in daily life. Also, beyond personal or egocentric networks, positions in social networks have very little effects on mental health even within the limited context of school. Thus, due to the small range of social environment that actually matters to mental states, the concept of *social* integration may be too broad to describe the desirable social condition. I also demonstrated that associations with others who share attributes and backgrounds may help people perceive their social environment positively. However, this effect of network composition seems complex because each group has unique motivations to become associated with similar others and derive different meanings from those associations. In addition to network composition, researchers need to use other concepts such as relational quality and costs

of social involvement in order to fully explain how one's social environment influences mental health.

Appendix 2.1. Measures

Depressive Symptoms (in-home, $\alpha=.84$)

How often was each of the following things true during the past week? (0 "never or rarely"; 1 "sometimes"; 2 "a lot of times"; 3 "most of the time or all of the time")

1. You were bothered by things that usually don't bother you.
2. You did not feel like eating; your appetite was poor.
3. You felt that you could not shake off the blues, even with help from your family and your friends.
4. You felt that you were just as good as other people. (*reversed*)
5. You had trouble keeping your mind on what you were doing.
6. You felt depressed.
7. You felt you were too tired to do things.
8. You felt hopeful about the future. (*reversed*)
9. You thought your life has been a failure.
10. You felt fearful.
11. You were happy. (*reversed*)
12. You enjoyed life. (*reversed*)
13. You felt sad.
14. It was hard to get started doing things.
15. You felt life was not worth living.

Network Integration Variables (as individual-level and school-level variables, in-school)

List your closest male friends. List your best male friend first, then your next best friend, and so on. Girls may include boys who are friends and boyfriends. (The question was repeated for closest female friends.)

See text for information about how each network variable was calculated.

Problem Discussions (in-school)

Darken the oval under the name if: (repeated for each friend named)

You talked with him/her about a problem in the last seven days.

Summed number of friends with whom R discussed problems.

Other Friendship Activities (in-school)

Darken the oval under the name if: (repeated for each friend named)

1. You went to his/her house in the last seven days.
2. You met him/her after school to hang out or go somewhere in the last seven days.
3. You spent time with him/her last weekend.
4. You talked with him/her on the telephone in the last seven days.

Summed number of activities with each friend

School Activity Participation (in-school)

Here is a list of clubs, organizations, and teams found at many schools. Darken the oval next to any of them that you are participating in this year, or that you plan to participate in later in the school year. (The list included 33 clubs, organizations, and athletic teams.)

(As a follow-up question,) If you do not participate in any clubs, organizations, or teams at school, fill in this oval.

Recorded as: 0 not participating; 1 participating in any

Appendix 2.1 cont. Measures

Belonging to School (in-school, $\alpha=.79$)

How strongly do you agree or disagree with each of the following statements? (1="strongly disagree"; 2 "disagree"; 3 "neither agree or disagree"; 4 "agree"; 5 "strongly agree")

1. I feel close to people at this school.
2. I feel like I am a part of this school.
3. I am happy to be at this school.

Sex (in-school)

What sex are you?

Recoded as: 0 female; 1 male

Grade Level (in-school)

What grade are you in?

I constructed 6 dummy variables including: 7th grade, 8th grade, 9th grade, 10th grade, 11 grade, and 12th grade.

Race/Ethnicity (as an individual attribute, in-home)

1. Are you of Hispanic or Latino origin?
2. Which one category best describes your racial background? (white, black or African American, Asian or Pacific Islander, American Indian or Native American, or other)

I used the first question to identify Hispanic respondents, regardless of their answers to the second question. Native American and others were combined.

Race/Ethnicity (as network composition, in-school)

1. Are you of Hispanic or Spanish origin?
2. What is your race? If you are of more than one race, you may choose more than one. (*White, black or African American, Asian or Pacific Islander, American Indian or Native American, or other*)

I used the first question to identify Hispanic respondents, regardless of their answers to the second question. Native American and others were combined.

Parents' Education Level

1. How far in school did she/he go? (in-school)

For respondents whose parents participated in the parent survey:

2. How far did you/your current spouse/partner go in school?

When there was a difference between parents' and adolescent respondents' reporting, I used parents' reporting. If parents did not give valid answer, I used adolescents' reporting. Between mother's and father's, I took the higher education level.

I constructed 5 dummy variables including: less than high school; high school graduate; some college; college graduate; and do not know/no answer.

Family Structure (in-school)

1. Do you live with your biological mother, stepmother, foster mother, or adoptive mother?
2. Do you live with your biological father, stepfather, foster father, or adoptive father?

Recoded as: 0 live with both parents; 1 live with no or single parent.

Appendix 2.2. CES-D Scale in Add Health

A modified version of CES-D scale was used in Add Health. Two items from the original scale, “my sleep was restless” and “I had crying spells” were not included in the modified scale. Also, two other items were worded differently in Add Health, including “I felt too tired to do things” (originally “I felt that everything was an effort”) and “it was hard to get started to do things” (originally “I could not get going”). An item, “I felt life was not worth living” was added. Thus, the modified version consisted of 19 items, one item less than the original scale.

I conducted a series of factor analyses the modified version of CES-D for two purposes. First, as Radloff (1977) points out, the original CES-D scale forms internal factors, which can be thought of as subscales for negative affect, positive affect (or happiness), somatic symptoms, and interpersonal symptoms. Although these internal factors were initially observed in an adult sample, Radloff (1991) later reported that these internal factors also appear among adolescents. By conducting factor analysis, I checked to see if the Add Health version of CES-D showed internal structure consistent with the original version. Second, both original and modified versions of CES-D included items that closely related to the concept of social integration. In order to examine consequences of dropping these items to avoid measurement contamination between depressive symptoms and social integration, I computed inter-item reliability of the shorter scale and examined its internal structure.

I used the in-home survey 1 for this analysis and limited the sample to 20,598 respondents who had valid values in all 19 CES-D items. Before conducting factor analysis, I reversed scoring of positive items (e.g., “you were happy”). Unit weighting was used to calculate total scale scores and subscale scores (i.e., simply adding item scores). Factor loadings presented below are based on maximum likelihood estimation with varimax rotation.

(1) Full 19-item scale

Factor analysis with all 19 items showed four factors similar to those reported for the original scale, but a few items did not load on the expected factors (see the first table below). First, “bothered by things” loaded on the negative affect, instead of the somatic symptom factor. This may be because the somatic factor emphasized task-oriented items in the Add Health version that did not include “restless sleep,” and “bothered by things” did not tap this aspect of somatic symptoms. “Poor appetite” did not load on the somatic factor perhaps for the same reason. Second, “talked less than usual” did not load on the interpersonal symptom factor or any other factor. Finally, the new item “not worth living” loaded on the negative affect factor. Alpha coefficient is .87 for this version of CES-D.

(2) Shorter 15-item scale

For this version of CES-D, I dropped two items that loaded on the interpersonal symptom factor including “people were unfriendly” and “people disliked you.” Two additional items, “talked less than usual” and “felt lonely” were dropped because these items also related to the concept of social integration.

As expected, this version formed only three factors, including negative affect, positive affect, and somatic symptoms (see the second table below). These three internal factors in the shorter version of CES-D were only moderately correlated to each other. However, the alpha coefficient remained quite high (.84), despite the smaller number of items included in the scale. In conclusion, interpersonal problem items could be excluded without sacrificing reliability.

Appendix 2.2 cont. Factor Loadings of CES-D Items

	Full 19-item Scale			Short 15-Item Scale			
	Negative Affect	Positive Affect	Somatic Symptoms	Interpersonal Symptoms	Negative Affect	Positive Affect	Somatic Symptoms
1. You were bothered by things that usually don't bother you.	.457	.132	.290	.121	.482	.135	.268
2. You felt that you could not shake off the blues, even with help from your family or your friends.	.660	.176	.230	.088	.672	.177	.205
3. You felt depressed.	.748	.212	.217	.126	.766	.213	.201
4. You thought your life has been a failure.	.435	.253	.174	.242	.471	.260	.205
5. You felt fearful.	.374	.085	.227	.220	.404	.096	.250
6. You felt lonely.	.583	.166	.203	.209	.663	.191	.205
7. You felt sad.	.657	.177	.191	.208	.439	.237	.174
8. You felt your life was not worth living.	.404	.230	.138	.238	.439	.237	.174
9. You felt that you were just as good as other people.	.119	.490	.073	.098	.134	.490	.077
10. You felt hopeful about the future.	.050	.561	.077	.017	.052	.559	.070
11. You were happy.	.273	.634	.122	.064	.278	.635	.115
12. You enjoyed life.	.258	.654	.117	.104	.266	.660	.121
13. You did not feel like eating; your appetite was poor.	.343	.126	.276	.042	.353	.126	.251
14. You had trouble keeping your mind on what you were doing.	.309	.119	.467	.109	.336	.120	.455
15. You felt you were too tired to do things.	.234	.110	.538	.108	.256	.112	.539
16. It was hard to get started doing things.	.170	.082	.554	.143	.189	.088	.580
17. You talked less than usual.	.256	.124	.232	.120			
18. People were unfriendly to you.	.167	.053	.158	.587			
19. You felt that people disliked you.	.248	.143	.139	.716			

Variance explained=39.292%

Variance explained=38.451%

Note: N=20,598. Based on maximum likelihood estimation with varimax rotation.

Appendix 2.2 cont. Inter-Item Reliability for and Correlations among CES-D Scale and Subscale Scores

	# Items	Reliability	(1)	(2)	(3)	(4)
(1). Full Scale	19	.87				
(2). Short Scale	15	.84	.98			
(3). Negative Affect Subscale	7	.82	.88	.88		
(4). Positive Affect Subscale	4	.71	.71	.75	.44	
(5). Somatic Symptoms Subscale	4	.63	.74	.75	.59	.31

Note: N=20,598.

Appendix 3.1. Non-Linear Models for Popularity Categories and School Organization Participation Regressed on Socio-Demographic Backgrounds

	Multinomial Logistic Model for Popularity Categories ^(a)		Logistic Regression Model for School Org. Participation ^(b)
	Marginal	Average	
Sex (Female=1)	-.07	-.03	-.07
Race/Ethnicity (ref.=white)			
Black	.59 ***	.20 *	.33 ***
Hispanic	.00	-.17	-.16
Asian	-.06	-.09	.18
Others	.21	-.15	-.35 *
Grade Level (ref.=Grade 9)			
Grade 7	.23	.06	.15
Grade 8	.03	.02	-.04
Grade 10	.16	.05	-.11
Grade 11	.11	-.07	-.12
Grade 12	.12	.09	-.10
Parents' Ed. (ref.=H.S. Graduate)			
Less than High School	.17	-.12	-.18 *
Some College	-.20 *	-.05	.23 **
College Graduate	-.49 ***	-.18 *	.55 ***
Missing	.47 ***	.12	-.04
Single Parent Family	.22 *	.09	-.20 **
<i>Intercept</i>	1.11 ***	1.56 ***	1.71 ***

^(a) Hierarchical multinomial logistic regression model with "popular" as reference category.

^(b) Hierarchical logistic regression model with participant coded as 1 and non-participant coded as 0.

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 11,023$ adolescents in 105 schools

Appendix 4.1. Bivariate Correlations among School-Level Behavioral and Affective/Cognitive Integration Variables

	1	2	3
1. Mean Friendship Activities	-		
2. Mean Problem Discussions	.83 ***	-	
3. Proportion School Organization Participation	-.06	-.08	-
4. Mean Belonging to School	-.16	-.15	.49 ***

* $p < .05$; ** $p < .01$; and *** $p < .001$

$N = 105$ schools

Appendix 5.1. Interaction Effects of Minority/Majority Status and Friendship Integration on Depressive Symptoms

	# Friends at School	Friendship Activities	Problem Discussion	School Org. Participation	Belongingness to School
Race/Ethnicity					
White				-	-
Black			-		+
Hispanic					
Asian				+	
Parents' Ed.					
Less than High School				+	
H. S. Graduate					
Some College					
College Graduate					
Single Parent Family					

"+" positive interaction; "-" negative interaction; others not significant at the .05 level.

Based on examinations of interaction effects between the target socio-demographic attributes and the target integration variables on depressive symptoms in HLM's. These models also included the following variables as independent variables: sex (female=1), race/ethnicity dummy variables (white as a reference), grade level (grade 9 as a reference), parents' educational level (high school as a reference), single parent family, number of non-participant friends, and the target integration variable. Models for a reference category (e.g., white) included a dummy variable for the reference category as a main effect term but did not include dummy variables for the other categories (e.g., black, Hispanic, Asian, and other race).

Appendix 5.2. Main and Interaction Effects of Egocentric and School Composition on Depressive Symptoms (Unstandardized HLM Coefficients, Analysis for Race and Ethnicity)

	Target=White				Target=Black			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
	1.75 ***	1.75 ***	1.63 ***	1.75 ***	1.77 ***	1.77 ***	1.66 ***	1.77 ***
Sex (Female=1)								
Race/Ethnicity (ref=white)								
Black								
Hispanic								
Asian								
Others								
Grade Level (ref=Grade 9)								
Grade 7								
Grade 8								
Grade 10								
Grade 11								
Grade 12								
Parents' Ed. (ref=H.S. Graduate)								
Less than High School								
Some College								
College Graduate								
Missing								
Single Parent Family								
Belonging to School								
Prop. Target Race Egocentric								
Prop. Target Race Egocentric								
*Target Individual Race								
Target School Composition								
Target School Composition								
*Target Individual Race								
Target School Composition								
*Prop. Target Race Egocentric								
*Target Individual Race								
Intercept								
Intercept Variance								
Degrees of Freedom								
Chi Square								
Level 1 Error Variance								
Deviance								
# Parameters								

*p < .05, **p < .01, and ***p < .001
 N = 11,623 adolescents in 165 schools
 (Continuing to the next page.)

Appendix 5.2 cont. Main and Interaction Effects of Egocentric and School Composition on Depressive Symptoms (Unstandardized HLM Coefficients, Analysis for Race and Ethnicity)

	Target=Hispanic				Target=Asian			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Sex (female=1)	1.77 ***	1.77 ***	1.67 ***	1.78 ***	1.76 ***	1.76 ***	1.65 ***	1.76 ***
Race/Ethnicity (ref.=white)								
Black	.73 *	.72 *	.39	.71 *	.73 *	.72 *	.39	.72 *
Hispanic	.53	.56	.53	.16	1.56 ***	1.50 ***	1.52 ***	1.50 ***
Asian	1.56 **	1.48 **	1.69 ***	1.49 **	.36	.09	.31	.00
Others	-.47	-.54	-.50	-.53	-.39	-.42	-.39	-.42
Grade Level (ref.=Grade 9)								
Grade 7	-1.16 ***	-1.16 ***	-.94 ***	-1.16 ***	-1.17 ***	-1.15 ***	-.94 ***	-1.15 ***
Grade 8	-.61 *	-.62 *	-.62 *	-.61 *	-.63 *	-.61 *	-.61 *	-.61 *
Grade 10	.05	.05	-.17	.05	.06	.05	-.17	.05
Grade 11	.37	.37	.05	.38	.37	.36	.04	.36
Grade 12	-.05	-.05	-.37	-.04	-.05	-.06	-.38	-.06
Parental Ed. (ref.=H.S. Graduate)								
Less than High School	1.35 ***	1.34 ***	1.21 ***	1.34 ***	1.47 ***	1.47 ***	1.35 ***	1.47 ***
Some College	-.45	-.45	-.29	-.45	-.47	-.48	-.31	-.48
College Graduate	-1.18 ***	-1.19 ***	-.99 ***	-1.19 ***	-1.23 ***	-1.24 ***	-1.04 ***	-1.24 ***
Missing	1.10 ***	1.09 ***	.89 **	1.09 ***	1.13 ***	1.13 ***	.93 ***	1.13 ***
Single Parent Family	.67 **	.67 **	.50 *	.66 **	.65 **	.65 **	.48 *	.64 **
Belongingness to School			-.53 ***				-.53 ***	
Prop. Target Race Egocentric	1.17	1.04	.87	1.04	-.87	-1.16	-.97	-1.16
Prop. Target Race Egocentric *Target Individual Race	1.38	1.48	1.66	2.58	3.43 **	3.22 *	3.46 **	3.60
Target School Composition		.97	.88	1.08		2.22	2.15	2.23
Target School Composition *Target Individual Race		-.53	-.55	1.14		1.39	.30	1.94
Target School Composition				-3.31				-1.56
Target School Composition *Prop. Target Race Egocentric *Target Individual Race								
Intercept	7.72 ***	7.64 ***	12.54 ***	7.63 ***	7.86	7.78 ***	13.67 ***	7.78 ***
Intercept Variance	.70	.70	.44	.68	.72	.71	.43	.71
Degrees of Freedom	104	103	103	103	104	103	103	103
Chi Square	311.12 ***	309.20 ***	240.57 ***	303.80 ***	314.65 ***	309.81 ***	237.91 ***	309.53 ***
Level 1 Error Variance	35.98	35.98	33.73	35.99	36.02	36.02	33.76	36.02
Deviance	70891.95	70886.88	70157.51	70883.26	70903.74	70893.91	70163.22	70890.33
# Parameters	2	2	2	2	2	2	2	2

*p < .05, **p < .01, and ***p < .001
N = 11,095 adolescents in 105 schools

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