

Measuring Social Integration and Social Networks

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SOCIAL INTEGRATION

Social integration is the extent to which an individual participates in a broad range of social relationships. Studies conducted across a variety of populations indicate that people who are more socially integrated live longer (reviewed by Berkman, 1995), are more likely to survive myocardial infarction (reviewed by Berkman, 1995; Seeman, 1996), are less likely to report being depressed (reviewed by Cohen, & Wills, 1985), are less likely to suffer a recurrence of cancer (reviewed by Helgeson, Cohen, & Fritz, 1998), and are less susceptible to infectious illness (Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997) than their less integrated counterparts. The health risks of being isolated are comparable in magnitude to the risks associated with cigarette smoking, blood pressure, and obesity and remain even after controlling for these and other traditional risk factors (House, Landis, & Umberson, 1988; Orth-Gomér & Johnson, 1987).

In this chapter, we illustrate the various ways in which social integration has been measured and provide guidelines for choosing an appropriate measure. We begin by discussing the theoretical underpinnings of the social integration concept and reviewing the various measurement techniques that have been used, including an overview of both individual and community-level social integration measures. We suggest that measurement techniques should be chosen in the context of hypotheses about how the social environment might influence health and with consideration of the characteristics of the population under study. In addition, we discuss pathways through which social integration may affect health and methods for assessing these potential mechanisms. Finally, we present a brief overview of formal social network theory and suggest a number of ways this approach might contribute to our understanding of existing literature on social integration and health and improve how we assess integration.

We are enthusiastic about social integration measures for several reasons. First and foremost, the majority of the evidence regarding social relationships and long-term health outcomes (e.g., all-cause mortality, survival after myocardial infarction, survival with breast cancer, psychiatric disorder) has come from studies using integration measures (cf. Berkman, 1995; Cohen, 1988; House, Landis, & Umberson, 1988). Second, these measures provide promising tools for testing theoretical questions. Third, social integration tends to be stable over time, and thus its influence on health may be easier to assess than the perceptions of social support resources. Fourth, social integration may be more amenable to intervention than perceptions of support.

Social Integration Theories

The concept of social integration is rooted in Durkheim's (1897/1951) seminal work on social conditions and suicide. Durkheim proposed that stable social structure and widely held norms are protective and serve to regulate behavior. Consistent with this reasoning, his analysis of suicide rates indicated that suicide was most prevalent among individuals who were not married and lacked ties with the community and church. Faris's (1934) work on cultural isolation and the

development of mental illness also emphasized the importance of social contacts (cf. Jaco, 1954; Ware, 1956). Faris (1934) suggested that socially isolated individuals were at a higher risk for mental disorder. His ideas were grounded in symbolic interactionist tradition and carried the assumption that social interaction was essential to normal personality development and appropriate social conduct.

In contrast to their predecessors, a number of later sociologists suggested that participation in multiple social domains was detrimental to psychological well-being (Coser, 1974; Goode, 1960; Slater, 1963). These theorists viewed people's social environments as a set of interrelated role relationships. The roles prominently discussed included parent, husband or wife, volunteer, church member, and worker. Each role was said to demand different obligations. The more roles, the greater the conflicting obligations and concomitant experience of stress. Goode (1960) used the term *role strain* to illustrate the difficulty of performing multiple roles. Role strain consists of two components, role conflict and role overload. Role conflict occurs when the expectations associated with different roles are discrepant. Role overload occurs when honoring expectations associated with some roles is at the expense of honoring expectations associated with others. As one accumulates more roles, the probability of experiencing role conflict and role overload increases.

Although Goode's ideas have some intuitive appeal, a review by Sieber (1974) noted that empirical data have provided only limited support. In contrast to Goode (1960), Sieber (1974) proposed that possessing multiple roles is beneficial for psychological well-being. He argued that the rewards afforded by multiple roles exceed the burdens associated with role strain. Proposed rewards included accumulating privileges, status security, status enhancement, and self-esteem enhancement. Marks (1977) also suggested that multiple roles were not burdening and added that they could be potential sources of wealth, prestige, sympathy, approval, and favorable self-image. Both Sieber (1974) and Marks (1977) promoted the notion that role accumulation is more gratifying than stressful. This idea is referred to as the *role accumulation* theory. Role accumulation theory resonates with Faris's social isolation hypothesis. Both theoretical views propose that greater levels of social interaction are associated with greater well-being. However, a critical distinction can be made between the two. While Faris (1934) focused on isolation as a stressor, Marks (1977) and Sieber (1974) suggest the greater and more diverse one's social contacts, the better.

A more explicit theory of how social integration benefits health and well-being has been proposed by Thoits (1983). Consistent with symbolic interactionist theorists (Mead, 1934; Stryker, 1980), Thoits argued that people's identities are tied to the social positions or roles they occupy. Social roles are viewed as sets of behavioral expectations that emerge from the social environments in which one interacts. These behavioral expectations instill a sense of predictability in people's lives by providing information about how they ought to act. Also, by meeting role expectations, individuals are given the opportunity to enhance their self-esteem.

Thoits (1983) suggested that role identities provide people information about who they are in an existential sense. Social roles provide a purpose to life. Thus,

as people accumulate role-identities, the sense that they possess a meaningful, guided existence strengthens. It is implied that a sense of meaning in life is an integral component of psychological well-being and that failing to have a sense of meaning often leads to improper conduct and deviant self-destructive behavior. This position is called the *identity accumulation hypothesis* (Thoits, 1983).

Cohen (1988) expressed a position similar to Thoits (1983) in his description of identity and esteem models of the psychological influence of social relationships. He has suggested that the ability to meet role expectations may result in cognitive benefits: increased feelings of self-worth and control over one's environment, which may influence health through a variety of pathways. According to Cohen (1988), the cognitive benefits afforded by holding multiple social roles lessen psychological despair, generate positive affect, and facilitate health-promoting behaviors. Cohen (1988) also suggested that social relationships have an impact on health through social and informational influence. Integrated individuals are subject to social controls that may influence the enactment of health behaviors and prevent risky behaviors (cf. Rook, 1990; Umberson, 1987). Social network members may also act as sources of information regarding appropriate medical care. Moreover, the feedback an individual receives from network members may influence symptom reporting and compliance with medical regimens.

Measuring Social Integration

Social integration is a multidimensional construct that is thought to include both the behavioral component of active engagement in a wide range of activities and/or social relationships and the cognitive component of a sense of communality and an identification with one's social roles. In an attempt to organize our descriptions, we categorized the existing measures according to the components of the social integration construct they assess. Integration measures assessing the number of recognized social positions or social identities are termed *role-based* measures. Measures assessing the extent and frequency of social activities are termed *social participation* measures. Measures assessing individuals' own view of their communality are termed *perceived* integration measures. Finally, measures that blend these various approaches, are termed *complex indicators*. We do not provide a comprehensive review of social integration measures, but rather a sample of the different measurement approaches. Table 3.1 depicts the various approaches to measuring social integration we discuss.

Role-Based Integration Measures

Role-based measures assess participation in different types of social relationships. Typically, social integration is defined as the number of social roles (types of social relationships) for which respondents report active participation. Table 3.2 provides a list of the different types of social roles researchers have assessed, as well as the criteria they used to determine role enactment.

Thoits (1983, 1986) used data from the New Haven community study to construct an index assessing participation in eight different social roles. In this scale,

Table 3.1. Approaches to Measuring Social Integration

Role-Based Measures
Assess the <i>number of different types of social relationships</i> in which individuals participate.
Participation-Based Measures
Assess the <i>frequency</i> with which individuals engage in various activities.
Perceived Integration Measures
Assess the extent to which <i>individuals believe they are embedded</i> in a stable social structure and identify with their fellow community members and social positions.
Complex Indicators
<i>Combine information</i> regarding social ties, community involvement, and frequency of contact with friends and relatives into a single summary index.

respondents are given 1 point for each role in which they indicate active participation for up to a total of 8 points. The roles include spouse, parent, worker, student, group member, church member, neighbor, and friend. Thoits (1986) includes criteria for the possession of each role (see Table 3.2). Her cross-sectional analysis of the New Haven community data indicated possessing more roles was associated with less psychological distress (Thoits, 1983). Thoits (1995) has also developed a role-based measure that includes seven additional roles (lover, son or daughter, son-in-law or daughter-in-law, relative, hobbyist, athlete, and step-parent). This measure allows participants to suggest additional role relationships they view as self-descriptive and contains items assessing role importance. Participants select up to three role identities they consider most important, second most important, and third most important. Thoits (1995) does not report whether the additional roles and prompts concerning role salience provide greater sensitivity in predicting mental health outcomes than the original scale.

Moen, Dempster-McClain, and Williams (1992) employed Thoits's (1986) role accumulation criteria in creating a role-involvement measure to assess the influence of social integration on women over the life course. Moen and colleagues (1989; 1992) examined participation in six roles—worker, church member, friend, relative, neighbor, and club or organization member—in 1956 and once again in 1986. Occupying more roles in 1956 was related to improved functional and perceived health status in 1986, even after controlling for age and previous health. Interestingly, the correlation between the number of roles reported in 1956 and in 1986 was relatively modest ($r = .22$).

Cohen's (1991; Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997) Social Network Index (SNI) assesses participation in twelve types of social relationships. These include relationships with a spouse, parents, parents-in-law, children, other close relatives, close neighbors, friends, workmates, school mates, fellow volunteers, members of groups without religious affiliations, and members of religious groups. Respondents are said to participate in a relationship if they report talking to a person on the phone or in person at least once every 2 weeks. One point is assigned for each type of relationship in which a person participates, for a total of 12 possible points. (Alternatively, one can assign participants 1 point for each of the social and religious groups in which they participate, thereby increasing

Table 3.2. Roles and Enactment Criteria

Role	Enactment Criteria
Parent*	Respondent has children under the age of 18 at home ^{a,d} "... respondents who had minor children living in their households (childrears) were distinguished from those whose children were 18 or older and/or living out of the household." (Menaghan, 1989, p. 698)
Spouse	Married or living with someone in a marital-like relationship ^{a,b} Married and living in the same household ^c
Relative*	Has relatives in the area with whom they visit at least occasionally ^a Person had in-person contact with a relative at least once a month ^c
Worker*	Employed either part-time or full-time ^{a,d,e} Currently working full-time, working part-time, or laid off with a definite date to return ^c
Friend*	Respondent had at least one good friend within an hour's drive ^c Respondent has two or more close friends ^a Respondent had in-person contact with a friend at least once a month ^c
Neighbor*	Visited with a neighbor at least once a month ^c Visits neighbors ^{a,d}
Student*	Respondent attends classes regularly ^{a,d} "... respondents were considered students if they stated their main reason for not working was that they were in training or school." (Menaghan, 1989, p. 698)
Church Member*	Respondent attends church services at least occasionally ^a Attends religious services on a regular basis ^d
Volunteer*	"We used membership in groups or clubs rather than attendance...."
Group Member*	(Moen et al., 1992, 1619)
Son/Daughter*	
Daughter-in-law/Son-in-law*	

*In Cohen's (1991; Cohen et al., 1997) SNI, a respondent has to report they have contact (either in person or on the phone) with a person from a specific role category at least once every 2 weeks to possess that role.

^aThoits, 1986.

^bCohen et al., 1997.

^cMenaghan, 1989.

^dMoen, Dempster-McClam, & Williams, 1992.

^eHong & Seltzer, 1995.

the possible number of roles.) The total number of persons with whom a respondent speaks in person or on the phone at least once every 2 weeks provides an estimate of network size. In a study in which role assessment was followed by inoculation with a common cold virus, Cohen and his colleagues (Cohen et al., 1997) found that increased numbers of roles were associated with a decreased probability of developing a cold. Their data also indicate that possessing a greater number of social roles is related cross-sectionally with increased positive affect, self-esteem, and personal control; less smoking and drinking; better diet and sleep; and more exercise (Cohen, 1991; Cohen et al., 1997). Role accumulation,

as measured by the SNI, has also been found to be associated with positive mental health outcomes (reduced anxiety) in response to a stressful exam (Bolger & Eckerd, 1991).

In addition to assessing the number of social roles occupied, this instrument can also be used to obtain information on the various domains of interaction by collapsing the spouse, parents, parents-in-law, children, and other close relatives items into a single category, kin, and treating the other items as described previously. This results in eight possible domains of interaction. Cohen's SNI is available on-line at: <http://www.psy.cmu.edu/~scohen>.

The challenges facing investigators considering using a role-based integration measure are somewhat different from those considering other types of support measures. Rather than spending time choosing between specific measures, the shrewd researcher is advised to consider which social roles it makes sense to assess and what criteria should be set to indicate role enactment. Table 3.2 summarizes roles commonly assessed and criteria that have been used to indicate role possession. Most of the criteria we list imply that role possession involves both a recognition or acceptance of the social position and an activity component (e.g., frequent interaction within the role). An important question is how many roles to sample. General population studies should consider using a minimum of five or six major roles (spouse, parent, worker, church member, social group member, friend). However, assessing more roles provides greater sensitivity. If you are working with a homogeneous sample you may consider employing some of the roles listed in Table 3.2 or other roles that may be more specific to your sample. The issue of what roles to assess becomes particularly salient in dealing with a sample that may be extreme on some dimension (e.g., cultural or age). In these cases, some of the major roles commonly used will not be applicable and thus may have to be replaced with more relevant ones.

An illustration of a role-based measure catered to a specific population is an index developed by Hong and Seltzer (1995). They constructed a scale to assess the role repertoires of mothers of adult children with mental retardation. Their measure assesses participation in five typical roles (spouse, employee (full-time or part-time), neighbor, friend, and relative) and three roles specific to their population of interest (support group member, parent of a nonhandicapped child, and coresident caregiving mother). Each role was weighted equally and summed to create a role count ranging from 0 to 8. A cross-sectional analysis indicated the greater the number of roles a respondent held, the less likely she was to feel depressed (Hong & Seltzer, 1995).

Social Participation Measures

Social participation measures assess the frequency with which people report engaging in various activities. Single items (e.g., visits with friends) or types of activities (e.g., active leisure) are often used as markers of integration, but they can be combined to create summary participation indices as well (e.g., Robbins, & Metzner, House, 1982). Social participation measures suggest the activities in which integrated people take part confer health benefits. However, the kinds of

activities sampled are often engaged in with others and thus also reflect the range of social ties as well. One means of assessing whether it is activities or social activities per se that are important to health would be to assess different kinds of activities separately (e.g., social, going to the movies with a friend, physical-social, playing golf or tennis, solitary-passive, reading) and contrast whether certain categories of activities are especially strong predictors of health.

The Welin Activity Scale (WAS; Welin, Larsson, Svardsudd, Tibblin, & Tibblin, 1992) was originally used in a 12-year prospective study in Gothenburg, Sweden. The WAS asks participants to estimate how often they engaged in certain activities over the course of the past year. Activities are divided into three categories: *social activities* (8 items), *home activities* (10 items), and *outside home activities* (14 items). Three response options are provided for each item: never (score = 0), occasionally (score = 1), and often or regularly (score = 2). Ratings for the activities in each category are then summed to create three distinct activities scores. Scores for these three subscales are moderately correlated (.44 to .53) but appear to reflect distinct constructs. Results from the Gothenburg study indicate increased social activity was a prospective predictor of less cardiovascular mortality (Welin et al., 1992). In contrast, high levels of home activity were associated with less mortality from causes other than cardiovascular disease and cancer.

The Social Participation Scale (SPS) was created from questions taken from the Tecumseh Community Health Study (House et al., 1982). The SPS assesses participation in four categories of social activity: (1) *intimate social relationships* (e.g., marital status, visits with friends and relatives), (2) *formal organizational involvements outside work* (e.g., going to church meetings), (3) *active and relatively social leisure* (e.g., going to movies, fairs and museums), and (4) *passive and relatively solitary leisure* (e.g., watching television and reading). Parallel items tap respondents' satisfaction with their activities. The items that comprise the "intimate social relationships" section of the SPS resemble those from the role-based measures discussed previously. However, the three remaining sections of the SPS distinguish it from role based measures. Items from these subscales require respondents to estimate the frequency with which they engaged in various types of activities during the past year. Items from the first three participation subscales (excluding items concerning passive activities) can be summed to create a cumulative participation index (see House et al., 1982, for details).

Although House and colleagues (1982) propose scales representing each of four categories of social activity, they fail to report whether these four categories were associated with mortality. However, they did report that among men three specific activities were associated with reduced mortality over a 9- to 12-year follow-up: attending meetings of voluntary associations (formal organizational), going to lectures or classes (active, social leisure), and attending spectator events (active, social leisure). They also found that men reporting higher levels of activities on the cumulative index had lower mortality across the follow-up (House et al., 1982). Among women, only two activities were associated with mortality. The frequency of church attendance (formal organizational) predicted less mortality, and the amount of time spent watching television (passive, solitary leisure) was associated with greater mortality. Although women reporting higher levels of so-

cial activities on the cumulative index had lower mortality over the follow-up, this effect was not found when controls for other risk factors were included in the analysis. There were no reliable associations between mortality and satisfaction with activities among both men and women. This suggests that weighting items based on participants' ratings of satisfaction is not always useful.

Perceived Integration Measures

Perceived integration measures assess individuals' feelings of communality and belongingness. Prototypic measures inquire about familiarity with the community and identification with social roles. The perceptions assessed in these measures are thought to reflect characteristics of the social environment, as well as individuals' representations of their environments. Employing both a perceived integration measure and a more structural indicator of social integration (e.g., number of social roles) can allow one to address whether people's perceptions reflect characteristics of their social environment and, more important, whether these perceptions are predictive of health outcomes after controlling for differences in social participation or role engagement.

Heidrich and Ryff (1993) constructed a set of scales to reflect three psychological dimensions of integration in an elderly population: the presence of normative guidelines, the possession of meaningful roles, and the presence of appropriate reference groups. Two of the subscales, the *roles* subscale and the *reference* subscale, are particularly relevant. The *roles* subscale contains 10 items indicating the extent to which individuals perceive themselves as holding important, satisfying, and meaningful roles (e.g., "There are a lot of important things left for people to do after they retire"). The *reference* subscale contains 8 items assessing belongingness—whether individuals view themselves as a member of a social group, sharing values and attitudes with other elderly people (e.g., "I feel a sense of shared values with senior citizens in this country"). Participants are asked to rate the extent to which they agree with each statement on a scale ranging from 1 to 6, with higher scores indicating a higher degree of integration. Each subscale is scored separately. Both subscales were associated with decreased psychological distress and increased life satisfaction in cross-sectional analyses (Heidrich & Ryff, 1993).

Hanson and colleagues (Hanson, Isacson, Janzon, & Lindell, 1989; Hanson, Isacson, Janzon, Lindell, & Rastam, 1988) developed the Malmö Influence, Contact, and Anchorage Measure (MICAM) for use in a prospective population study of males in Malmö, Sweden. The measure assesses three markers of social integration: (1) social anchorage, (2) contact frequency, and (3) social participation. The contact frequency and social participation subscales overlap with integration measures previously discussed. However, the social anchorage scale is a novel approach to measuring integration. It contains eight items assessing the degree to which respondents feel integrated into their communities (e.g., "Would you say that you are rooted and have a feeling of familiarity with your neighborhood?"). Unfortunately, there is little evidence to suggest that the MICAM predicts health outcomes. After controlling for a number of variables correlated with mortality,

Hanson and colleagues failed to find an association between any of the three integration markers and all-cause mortality (Hanson et al., 1989).

Complex Indicators

Complex indicators typically combine information about marital status, number of social ties, frequency of contact with friends and relatives, and community involvement into a single summary index. The most recognized complex indicator is Berkman and Syme's (1979) Social Network Index (SNI). This summary measure was created from four distinct components: marital status, a sociability index (based on contact with friends and relatives), church membership, and group membership. The SNI considers both the number and the relative importance of social ties across these four network categories and combines this information into a single summary measure (ranging from 1 to 4). In Berkman's (empirically based) weighting system (1979), an index of intimate contacts (marital status, friends and relatives) is given nearly four times the weight as group membership and twice the weight of church membership.

Higher scores on the SNI were associated with less total mortality in 9-year (Berkman & Syme, 1979) and 17-year follow-ups (Seeman, Kaplan, Knudsen, Cohen, & Guralnik, 1987) of men and women of Alameda County, California. Reynolds and Kaplan's (1990) 17-year follow-up also found that integrated women were less likely to die of cancer. Schoenbach and his colleagues (Schoenbach, Kaplan, Freedman, & Kleinbaum, 1986) used Berkman and Syme's weighting system to create a network index from questions in the Evans County Cardiovascular Epidemiologic Study. The Evans County index predicted mortality but just among white males (Schoenbach et al., 1986). The evidence regarding the SNI's relation to mental health outcomes has been inconsistent (Goodenow, Resine, & Grady, 1990; Schaefer, Coyne, & Lazarus, 1981). Although all of these studies listed employed Berkman & Syme's weighted scoring system, Seeman and her colleagues have also employed a scoring system in which marital status, visits with friends and relatives, and church and group membership contribute equally to the summary index. The index resulting from this unweighted scoring system also predicted mortality during a 5-year follow-up of elderly adults (Seeman, Berkman et al., 1993).

Psychometrics on the SNI and additional evidence for the scale's predictive validity are available in Berkman and Breslow (1983). Instructions for scoring the scale are not published, but can be obtained from Lisa Berkman (berkman@hsph.harvard.edu).

The Social Connections Index (SCI) was developed by Kaplan and colleagues (Kaplan et al., 1988) to investigate mortality rates among males and females in Kuopio and North Karelia, Finland. The SCI contains five questions concerning the extent and frequency of social connections. Items assess social participation: planned visits with friends and relatives, meetings with clubs and societies, number of daily interactions, and marital status. One of the advantages of the SCI is that it is easy to score. Marital status is the only dichotomous variable and is weighted 1 (unmarried) and 4 (married) to equalize its contribution to the sum-

mary measure. The remaining questions, all of which yield responses between 1 and 6, are combined with marital status to create a single continuous index. Individuals identified by the SCI as having more social connections had lower mortality from all causes, cardiovascular disease, and ischemic heart disease during the 5-year follow-up (Kaplan et al., 1988). These effects were found among men but not women.

Other complex indicators of social integration have been used in studies of mental health outcomes. Nine items were used to measure social well-being in the Rand Health Insurance Experiment (Donald & Ware, 1982; Donald, Ware, Brook & Davies-Avery, 1978). Social well-being consists of two components: social contacts and activities and social resources. The items in the Rand measure resemble items from other complex indicators, such as frequency of contact with friends and relatives and frequency of church participation. Like complex indicators previously described, these items can be aggregated to create a summary index (scoring is available in Donald & Ware, 1982). Items can also be summed to create distinct measures of social resources and social contacts. Visits with friends and relatives and home visits by friends form the social contacts index. Attendance at religious services, number of neighborhood acquaintances, and number of close friends and relatives form the social resources index. Donald and Ware (1982) report that the social resources and social contacts subscales and their combination, the social well-being scale, all have adequate internal consistencies, alphas ranging from .66 to .88. They also report that these indices are stable over 1-year intervals. In a cross-sectional analysis, the summary index was associated with better mental health regardless of stressful life events. Moreover, in longitudinal analyses, high levels of social well-being were found to predict subsequent improvements in mental health (Williams, Ware, & Donald, 1981). Analyses conducted on the subscales indicated social resources were better predictors of mental health than social contacts (Donald & Ware, 1982).

Issues in the Measurement of Social Integration

Weighting

The issue of whether to employ a weighted scale is particularly germane in considering the use of a role-based measure, a participation measure, or a complex indicator. A number of the complex indicators assign more weight to certain types of relationships (marital status) or contacts (family or friends) to reflect the presumed importance of these ties. We would recommend weighting items only when there is a sound conceptual reason to do so. For example, if a researcher believes that social integration is a marker for emotional support, then it makes sense to weight marital status more than employment status or membership in a social group. However, if the researcher believes that social integration is beneficial because it promotes the development of a diversified self-concept, then there is no reason to weight marital status more than group membership. Although it has yet to be done, one could compare the efficacy of different weighting schemes

as a means of testing the various explanations offered for the social integration findings.

Conflict

Social networks can also be inimical to health. Relationships are often accompanied by conflict and stress (Goode, 1960; Rook, 1984; Rook & Pietromonaco, 1987). Interpersonal conflict is associated with increased negative affect (Bolger, DeLongis, Kessler, & Schilling, 1989) and decreased emotional well-being (Abbey, Abramis, & Caplan, 1985) and has been linked to depression and social withdrawal (Evans, Palasano, Lepore & Martin, 1989) and susceptibility to infectious disease (Cohen et al., 1998). Because social integration measures do not explicitly assess the qualitative aspects of social ties, they are relatively insensitive to conflict. Including indicators of conflictual network ties might provide insight regarding the relation between social conflict and social integration and improve existing measures. For example, Rook (1984) found that the number of problematic relationships elderly widowed women reported was cross-sectionally associated with decreased psychological well-being.

Scale Components Another means of better understanding the factors that underlie social integration is to consider separately the different subscales that make up these aggregate measures. Many of these measures have been designed with this intent. For example, the HIE's social well-being scale (Donald & Ware, 1982) contains measures of both social resources and social contacts and activities. The SPS allows investigators to consider the importance of different categories of activity (House et al., 1982). Other scales can be easily adapted to fulfill this purpose as well (e.g., Berkman & Breslow, 1983; Seeman et al., 1987). Role-based measures seem particularly advantageous in this regard. They can be used to discern whether certain types of roles may be particularly important to social integration. However, the low base rate of certain roles would make this option less feasible for studies with small samples.

Social Isolation Social isolation has been implicated as a risk factor in the development of both mental and physical illness (Paris, 1934; Lynch, 1979), which raises the question of whether social integration should be viewed as merely the absence of isolation. The test of social isolation versus social integration is essentially a test of a threshold model versus a more linear model—that is, whether the difference in risk is between isolated and not isolated or whether there is a gradient of protection. Although the conceptualization of social integration we provide suggests integration should be viewed as a gradient of protection, the available empirical evidence has not resolved this issue (Berkman & Breslow, 1983; House, Umberson, & Landis, 1988). This lack of resolution may be because many existing measures include a limited range of social roles and activities in assessing integration and may not be suited for detecting whether there is a gradient of protection.

The question as to whether the social integration effects reflect a threshold effect has implications for those considering intervention. For example, knowing substantial health benefits are gained from active participation in one social role versus none or from having one source of companionship versus none could identify individuals who might benefit most from techniques like grafting a new tie (cf. chapter 8). A word of caution is warranted, though; isolated individuals might possess characteristics (e.g., personality disorders) that may lend them less receptive to intervention (cf. Heller, Thompson, Trueba, Hogg, & Vlachos-Weber, 1991). Moreover, recruiting and retaining isolated participants may prove to be a challenge.

Selecting Appropriate Integration Measures

In deciding what category of measure to use, our advice is to begin by considering your own theories about why social integration is salubrious. Your own hypotheses will dictate which categories of measures may be more appropriate. For example, when testing the hypothesis that health consequences stem from integrated individuals having more social interaction and participating in more gratifying activities, a measure that assesses social participation would be most appropriate. When testing the hypothesis that the belief that one is embedded in a stable social network is sufficient for the observed health benefits, a perceived integration scale would be appropriate. When testing the hypothesis that the benefits of social integration result from having a range of different types of ties that provide information, support, or a diversified self-concept, then a role-based measure would be appropriate. Of the categories of measures we have reviewed, the complex indicators inform us the least about what characteristics of social ties are responsible for the relation between participating in a network and health. This is because they combine different components of social integration into a single index.

Although some measurement techniques may provide better matches to theories, there remains considerable overlap between the various approaches outlined. However, there are techniques that can be used to better understand how social integration affects health. First, using more than one type of integration measure or weighting scales to reflect different theoretical positions can help determine the important underlying processes. Second, measuring potential mediators allows researchers to establish the pathways through which integration operates. We can also gain a better understanding of how integration influences health by taking advantage of the burgeoning intervention tradition (see chapters 6, 7, 8, 9, and 10 in this volume). Because of its robust relation with mental and physical health, integration should be considered a potential component of psychosocial interventions (cf. Arnetz, Theorell, Levi, Kallner, & Eneroth, 1983; Clarke, Clarke, & Jagger, 1992). Moreover, understanding how interventions influence people's existing relationships, patterns of activity, and perceptions of social resource availability may help us to understand why certain interventions are successful and others fail. Successful interventions may have an impact on health by altering patterns of social integration.

Assessing Pathways Linking Social Integration and Health

In planning studies, it is important to include measures that assess the pathways through which social integration may influence health. There is compelling evidence that social integration is important to health but little data regarding the factors that mediate the relation between social integration and health. It is likely that no single process can explain the link between social integration and health. Thus, the goal of the integration researcher should be to identify and understand a range of contributing processes in order to identify which pathways may be most important and most amenable to intervention. It is also important to keep in mind that the effects of social integration on health may be the result of differences in cognitive, behavioral, and biological functioning (see chapter 1). These mediational pathways represent different interdependent levels of analysis. Studies that include measures representing multiple levels will be best able to elucidate the complexities of the pathways that link integration and health.

In the paragraphs that follow, we highlight some of the major psychological and behavioral constructs that have been implicated as potential mediators of the relation between social integration and health (see preceding section on Social Integration Theories). Chapter 1 of this book provides a discussion of the some of the biological—that is, immunological and neuroendocrine—pathways that may link social relationships and health. Measurement of these factors is discussed in Cohen, Kessler, and Underwood-Gordon (1995).

Personal Control Drawing from the symbolic interactionist (most notably Mead, 1934) notion that social roles guide behavioral interactions, Thoits (1983) has suggested that possessing multiple social roles promotes a sense of predictability and controllability in one's life. These positive psychological states are presumed to impact self-care (Cohen, 1988) and mediate the association between role possession and psychological distress (Thoits, 1983). The most often used measure of personal control is Rotter's (1966) locus of control measure. This scale assesses the degree to which people expect that they control their outcomes and the degree to which they expect their outcomes are controlled by others, chance, God, or luck. Rotter's (1966) measure has been criticized on the grounds that it measures only generalized expectations and does not distinguish control over personal outcomes from control over other entities. More recent measures assess perceptions of control over various domains separately. For example, Paulhus's (1983) Spheres of Control (SOC) scale assesses control over personal events (e.g., "When I make plans I am almost certain to make them work"), interpersonal events (e.g., "I have no trouble making friends"), and social and political events (e.g., "The average citizen can have an influence on government decisions"). Other measures distinguish between chance factors and powerful others as external causes of outcomes (Levenson, 1981). (See Leftcourt, 1991, for a review of personal control measures.)

Self-Esteem Several theoretical perspectives suggest that possessing multiple social roles promotes self-esteem and self-worth (Cohen, 1988; Sieber, 1974; Thoits, 1983). Feelings of esteem and self-worth are thought to enhance adaptation to stressful life events, promote positive affect, and prevent depression (Cohen, 1988). There are a substantial number of self-esteem measures available, with the two most widely recognized measures being Rosenberg's Self-Esteem Scale (1965) and Coopersmith's Self-Esteem Inventory (1967, 1981). Both of these measures assess global self-worth and have demonstrated adequate reliability and validity (see Blascovich & Tomaka, 1991). Measures assessing feelings of competence in specific domains are also available. For example, Seeman and her colleagues (Seeman, Rodin, & Albert, 1993) have developed a measure to assess competence in interpersonal domains (e.g., interacting with friends and family) and instrumental domains (e.g., ability to handle personal finances). It is worth considering whether feelings of competence in certain domains (e.g., interpersonal, work related) are more important to understanding social integration than global self-esteem.

Meaning and Purpose According to the symbolic interactionist perspective, role identities provide behavioral expectations, meaning, and guidance to life (Mead, 1934; Thoits, 1983). These states are assumed to be prerequisites to psychological health. Meaning or purpose in life has been conceptualized in a variety of ways, with some theorists using the terms to refer to the extent to which individuals identify with their roles (e.g., Simon, 1997; Thoits, 1983) and others using the term to refer to the belief that life provides suitable challenges and rewards and continues to be worth living (Antonovsky, 1979; Burton, 1998). Despite the abundance of theoretical work concerning meaning and purpose, this area remains underdeveloped in regard to measurement. The Meaning and Purpose in Life scales on Ryff's (1989) measure of psychological well-being and Antonovsky's (1987) Sense of Coherence scale are among the more established measures. Ryff's (1989) Purpose in Life is particularly noteworthy because it has 20-, 14-, 9-, and 3-item versions and good psychometric qualities. Burton (1998) has developed a 5-item measure of "global integrative meaning." This scale has also demonstrated acceptable psychometric properties and in a cross-sectional analysis has been found to mediate the relation between social integration and psychological distress (Burton, 1998).

Self-Concept A number of theoretical perspectives propose that individuals' self-concepts reflect the social positions they hold (Burke & Tully, 1977; Cooley, 1902; Mead, 1934; Stryker, 1980). This view suggests socially integrated individuals possess more diverse self-concepts. Possessing a diverse self-concept is assumed to influence both how people appraise negative life events and how they respond to negative information about the self (Linville, 1985). Self-concept assessment has a lengthy history. Simple measures such as the Twenty Statements Test (TST) require participants to generate statements in response to the question "Who are you?" Other techniques, such as the Q-sort (e.g., Block, 1961), require participants to sort cards containing self-evaluative statements into different piles according

Thuras, & Lewis, 1990). The social control literature is another area in which measurement has not kept pace with theoretical development.

Social Support Social integration is often interpreted as evidence of access to social support resources. However, it is not clear that support has anything to do with the health benefits associated with being socially integrated. In fact, evidence from the mental health literature suggests that integration and social support promote mental health through different pathways and that social integration and perceived support are minimally correlated (Cohen & Wills, 1985). To test the hypothesis that the health benefits associated with social integration stem from the fact that integrated individuals have more support available to them, we recommend measuring support separately. The measurement of received support and perceived support is discussed in chapter 4 of this book.

Socially Integrated Communities

The notion of social capital offers a slightly different perspective on the concept of social integration. Social capital refers to the extent to which communities offer their members opportunities to increase their personal and family resources (Coleman, 1988). Communities that afford increased opportunity for active involvement in formal group activities and better public schooling are said to have increased social capital (Putnam, 1995). This perspective raises the possibility that individual differences in social integration reflect differences in the communities in which people live. Moreover, it also suggests that it is possible for community characteristics to have an independent impact on health and/or interact with an individual's level of social integration.

The primary approach to measuring social capital has been to assess perceptions of individuals and then aggregate responses over neighborhoods or census blocks. Typical measures contain questions regarding group memberships, civic participation, and feelings of communality with one's neighborhood (social cohesion). For example, Sampson Raudenbush, and Earls (1997) developed a five-item trust and cohesion measure. Participants were asked to report whether they agreed with a series of statements about their neighborhoods (e.g., "This is a close-knit neighborhood" and "People in this neighborhood can be trusted"). Cross-sectional data demonstrated neighborhoods higher in social cohesion experienced less violence (e.g., robberies, muggings, gang fights) than those lower in social cohesion (Sampson et al., 1997). Buckner (1988) has also developed a measure of neighborhood cohesion (the Neighborhood Cohesion Instrument [NCI]). This 18-item instrument assesses three proposed dimensions of cohesion: attraction to the neighborhood, neighboring (social interaction), and sense of community. Work by Buckner (1988) has demonstrated that the NCI is positively associated with the length of time people lived in their neighborhood.

Social capital could also be assessed by identifying the extent to which communities afford opportunities for social activities, volunteerism, group membership, leisure, and political activism (Fitzgerald, 1949). For example, one could

to the extent to which they are deemed self-descriptive. Recent measures of self-concept take into consideration that people can hold multiple self-representations simultaneously (Higgins, Bond, Klein, & Strauman, 1986; Rogers, 1965). For example, Higgins's (1987) measure of self-concept discrepancy requires participants to generate attributes of their actual self, ideal self (their own or others' hopes and goals for them), and ought self (their own or others' beliefs about duties required of them). Other self-concept measures are specific to people in certain age groups (e.g., adult, child, elderly). (See Byrne, 1996, for a review.)

Linville's (1985, 1987) measure of self-complexity comes close to capturing the notion of self-diversity. Based on the Q-sort, in this measure participants are asked to sort cards containing self-descriptive statements into piles that capture different aspects of who the participants think they are. Participants are instructed that they are free to create as many or as few piles as they wish and that they are allowed to use the same descriptive statements in multiple piles. Self-complexity is based on two factors: (1) the number of piles participants generate (more piles mean greater complexity) and (2) the extent to which different self-descriptive statements are used in the piles created (more adjectives mean greater complexity).

Affect Social integration is hypothesized to promote positive affect and prevent negative affect (Cohen, 1988). Depressed affect is hypothesized to alter willingness to enact health behaviors and has been found to be associated with decreased immune competence (Herbert & Cohen, 1993). Taken together, these findings raise the possibility that affect may be one of the pathways through which social integration affects health. Positive and negative affect have been viewed as both stable traitlike characteristics (e.g., Watson, Clark, & Tellegen, 1988) and relatively transitory states (e.g., Nowlis & Green, 1957). The Profile of Mood States (McNair, Lorr, & Droppleman, 1971) and the Nowlis Mood Adjective Checklist (Nowlis & Green, 1965) represent two of the more widely used measures of positive and negative affect. The Trait PANAS (Watson, et al., 1988) represents a widely used trait measure. Stone (1995) provides a comprehensive review of the available measures and a discussion of issues relevant to measuring affect in the context of health research.

Social Controls Several theorists have suggested that the health benefits associated with integration may result from the fact that integrated individuals are subjected to additional social controls (House, Landis, & Umberson, 1988; Rook, 1990; Umberson, 1987). In this context, social control is used to refer to two processes: (1) direct efforts others make to influence the health practices of the target and (2) the regulating, stabilizing responsibilities associated with holding social positions (Rook, 1990). These two dimensions are often measured separately. For example, the presence of children in the home has been commonly used as an indicator of role responsibilities (Umberson, 1992), and questions regarding whether respondents perceive that other people deter and promote behaviors relevant to health have been used to assess direct social control efforts (e.g., Rook,

count the number of parks, golf courses, tennis courts, bars and bowling alleys, churches, social clubs, and community-based volunteer groups per capita. It is also possible to measure the frequency of town meetings and other indicators of civic participation (e.g., PTA meetings, local political party organizations; e.g., Chavis, Hogge, & McMillan, 1986). Such measures identify communities that afford increased opportunity for political activism. Another factor one should consider measuring when conducting community level analyses is the quality of the social services within different communities. For example, communities with more tennis courts, bowling alleys, and parks are also likely to have better hospitals and other social services. In such circumstances, increased accessibility to high-quality health care service may explain why people who live in communities that afford opportunities for integration have better mental and physical health.

Despite their prevalence in community research, social capital has rarely been examined in relation to traditional mental and physical health outcomes. However, in a recent cross-sectional study, Kawachi, Kennedy, Lochner, and Prothrow-Stith (1997) assessed two markers of social capital: the proportion of people in each state who believe others could be trusted and the per capita density of membership in voluntary groups. Both measures were associated with lower all-cause mortality, lower mortality from coronary heart disease and malignant neoplasms, and lower infant mortality. Kawachi and colleagues' (1997) study is the first to show an association between social capital and a traditional health outcome. By including both individual and community-level markers of social integration, future studies will be able to determine whether constructs such as social cohesion and competence account for the social integration effects.

USING SOCIAL NETWORK ANALYSIS TO MEASURE SOCIAL INTEGRATION

In this section, we illustrate how measurement techniques from formal social network theory can be applied to better understand the existing literature on social integration and health and improve social integration measures (see Hall & Wellman, 1985; House & Kahn, 1985). Our discussion of network theory is relatively narrow in focus, and we direct the interested reader to additional resources on network analysis (see also Burt & Minor, 1983; Hall & Wellman, 1985; Mitchell, 1969; Mitchell & Trickett, 1980; Wasserman & Faust, 1994).

An Overview of the Network Perspective

Within formal network theory, the term *network* refers to the ties that connect a specific set of actors or nodes (Mitchell, 1969). Although nodes typically represent individuals, they can just as easily represent other social entities: corporations, groups, or families. Networks can be differentiated by their scope. Personal or ego-centric networks encompass the ties surrounding a single focal individual.

Aggregate or whole networks encompass the total set of ties among members of a population. Because they are most applicable to the measures of social integration we have discussed, we pay exclusive attention to personal networks in which nodes represent individuals and ties represent relationships between individuals.

Network analysis is a quantitative means of describing the relationships that exist between members of an individual's social network. For example, network analysts use the number of nodes contained in a network to provide an estimate of the network's size. For our purposes, network analysis provides a means of measuring properties of networks that may provide a closer match to theories about social integration. We begin our discussion of the network perspective by reviewing measures of network structure that may be relevant to social integration.

Assessing Structural Properties of Networks

Structure is the term used to describe stable patterns that exist among ties. The simplest and most widely used measure of network structure is network size (i.e., the number of people in the network). Network size has been utilized in a number of studies involving health outcomes (e.g., Gallo, 1982; Haines & Hurlburt, 1992; Seeman, Berkman, Blazer, & Rowe, 1994). However, it is a relatively weak predictor of health (see reviews by Cohen & Wills, 1985, and Uchino, Cacioppo, & Kiecolt-Glaser, 1996) and, although correlated with integration, is probably not responsible for the effects of social integration (e.g., Cohen et al., 1997).

Network density is a concept we believe to be more relevant to understanding how social integration operates. Network density refers to the extent to which network members know one another. High-density networks, where network members are acquainted, have been hypothesized as helpful in maintaining one's social identity and promoting the flow of support resources from network members (McKinlay, 1973; Walker, MacBride, & Vachon, 1977; Wellman, 1981). For example, in a cross-sectional study of Korean, Chinese, Japanese, and Filipino immigrants, Kuo and Tsai (1986) found that immigrants who possessed higher-density networks tended to report less depression than those with less dense networks. In contrast, low-density networks are thought to be particularly valuable during life transitions or following changes in one's network, due to, for example, divorce, unemployment, or geographic relocation (Granovetter, 1973; Hirsch, 1980; Hirsch, 1981a; Wilcox, 1981). For example, Hirsch (1980) examined women who were recently widowed and found low-density networks were associated with improved mental health, presumably because these women had portions of their networks which did not overlap with their husbands'. Because integrated individuals are thought to possess a wide range of social relationships, they may possess lower-density networks than their less integrated counterparts, but as of yet there are no data regarding the relation between social integration and network density.

Measures of Network Size and Density

A number of researchers have developed measures to estimate network size and density. These measures may be particularly useful if they are employed in conjunction with standard social integration measures. This would test whether social integration measures remain associated with positive health outcomes after controlling for network characteristics like the density of the participants' personal networks. Systematic analyses of this sort can be used to rule out potential explanations for the social integration effects and also may provide insight about what processes may be operating.

Hirsch's (1979; 1980) Social Network List (SNL) is one of the few measures that has been used to document a relation between a formal network measure (density) and a health outcome (mental health). Hirsch's measure asks respondents to list up to 20 significant others with whom they have contact at least once every 2 weeks and indicate which people are relatives and friends. This provides an estimate of network size. The SNL can also be used to assess density. Participants are asked to list the individuals previously named in a matrix and then indicate individuals they consider to have relationships with each other. One of the easily remedied limitations of this scale is that Hirsch (1980) does not specify the criterion used to judge whether two people have a relationship. Hirsch (1981b; Hirsch & Reischl, 1985) has also used the SNL to obtain density measures for specific portions of respondents' personal networks, boundary density. Boundary density is the proportion of actual to potential ties that exist between network members of any two domains of interaction (e.g., family and work).

Stokes (1985) asks participants to list the initials of people who are "important to their lives" and with whom they have contact at least once a month and indicate which people are their relatives. From these queries, a structural measure (network size) and a measure of network composition (percentage of kin) are obtained. Stokes's SNL (1985) also yields an estimate of network density. Respondents are asked to indicate which network members they believe have contact with each other at least once a month. Density is computed by dividing the number of actual ties among network members by the number of potential ties.

Additional Measures of Network Structure

In addition to network size and density, a number of other measures of network structure may also be of relevance to health (Hall & Wellman, 1985). For example, rather than getting a summary measure of network density, network analysts often distinguish portions of individuals' personal networks that are higher in density than others. These higher-density portions are referred to as *clusters*. This fine-grained network analysis could be useful in determining how the social networks of integrated individuals differ from those of their less integrated counterparts. Moreover, it could be used to examine whether structural network features influence access to social support (Wellman & Wortley, 1990). Table 3.3 lists some network measures that may be relevant to investigators interested in social rela-

tionships and health (see Hall & Wellman, 1985; Mitchell & Trickett, 1980). Unfortunately, there are few studies that test the relations between these measures and health outcomes.

Representing Network Data

Network data can be represented graphically in the form of sociograms or in matrices. Simple graphs use nodes to represent actors in a network and lines to represent ties. (For more on graph theory, see Harary, Norman, & Cartwright, 1965, and Hage & Harary, 1983.) A two-way matrix, referred to as a *sociomatrix*, can also be used to represent data. Here, network members are listed in rows and columns, and numeric values reflect the attributes of ties (e.g., strength, intimacy) between two actors. The task of analyzing and managing network data can be formidable, but simple measures of network structure like size and density are relatively simple to estimate. For those interested in engaging in more sophisticated network analyses, we recommend one of the many computer packages designed specifically for network analysis (cf. Wasserman & Faust, 1994). Information about programs that might meet individual specifications can be obtained at the Web page of the International Network for Social Network Analysis (INSNA): <http://www.heinz.cmu.edu/project/INSNA/>.

Table 3.3. Network Features Potentially Relevant to Health

Characteristic	Measure
Range (Size)	The number of network members
Density	The extent to which a network is interconnected; measured by comparing the actual number of direct ties with the number of ties that would exist if all members were directly connected
Degree	The average number of direct ties a network member has with other network members
Reachability	For use with aggregate networks; the maximum number of ties it takes to connect any two nodes
Boundedness	The number of ties that fall within the network's bounds
Cliques	Portions of a network in which all network members are directly tied; has a density of 1.0
Clusters	Portions of the network with high density; defined by less stringent criteria than cliques
Components	For use with aggregate networks; portions of the network where everyone is tied directly or indirectly
Dispersion	The ease with which an individual can make contact with the person; often measured in terms of geographic distance

Improving Integration Measures Using Network Concepts

In addition to suggesting structural features of social networks with potential implications for health, formal network theorists have addressed a number of issues that might be adopted to improve social integration measurement.

Defining a Tie

Social and health scientists often discuss the relation between participating in a social network and health as if the issue of what is encompassed in the term *social network* was self-evident. However, this is not the case. The definition of what constitutes a tie identifies which individuals are considered nodes in a network. Ties are commonly chosen based on either normative, affective, or interdependence-exchange criteria (Fischer, 1982; McCallister & Fischer, 1978). Normative or formal criteria result in networks that include people who occupy socially recognized roles: mother, daughter, employee, neighbor, friend. Affective criteria encompass individuals respondents feel close to or care about. Finally, interdependence or exchange criteria include people with whom respondents interact regularly, exchange resources, or both (Fischer, 1982). Although there is typically considerable overlap between networks generated by these three techniques, they do tend to elicit different network members (cf. Bernard, et al., 1990). For example, networks based on affective criteria tend to be smaller than networks generated by exchange criteria and contain a higher percentage of kin (Milardo, 1992). Work by Van Groenou, Van Sonderen, and Ormel (1992) has demonstrated the role-based (88% concordance), affective-based (78% concordance), and exchange-based (74% concordance) criteria have all shown adequate test-retest reliability over a 4-week period. Table 3.4 depicts some of the ways these criteria have been operationalized (cf. Laumann, Marsden, & Prenskey, 1983; Marsden, 1990).

Social integration measures typically include ties based on normative criteria. For example, in Cohen's SNI (1991; Cohen et al., 1997), a person is judged to be a network member if he or she occupies one of 12 role categories. Although overlaid in the past, affective and exchange-interdependence criteria can also be employed in social integration measures and may be useful for testing ideas about what kinds of processes may underlie the social integration effects. In some instances, a specific definition of a tie may provide a better match to theory. For example, to test the hypothesis that social integration measures reflect the availability of support resources, you should consider employing a definition of a tie that closely reflects this position (e.g., those individuals you feel comfortable turning to for support). Alternatively, the hypothesis that the effects can be attributed solely to intimate ties might be best tested by using an affect-based definition of a tie (e.g., those individuals with whom you feel comfortable sharing personal information and feelings). We also advocate using different types of criteria and comparing the predictive validity of measures based on these different definitions (cf. Bernard et al., 1990; Milardo, 1992).

Table 3.4. Operational Definitions for Network Membership

Source	Criteria
Brugha et al. (1987)	"... those aged at least 14 years living in the household . . . ; those they considered close relatives or friends." (p. 124)
Henderson, Duncan-Jones, McAuley, & Ritchey (1978)	Links active within the preceding year with a frequency of at least once per month (excluding links developed solely within the context of a formal or institutional relationship).
Stokes (1985)	Up to 20 people who are significant in your life and with whom you have contact at least once a month.
Wellman (1988)	<i>Intimate network members</i> : people respondents feel closer to outside their homes. <i>Significant network members</i> : people who are in touch with respondents in their daily lives and who are significant in their lives.
Campbell, Marsden, & Hurlburt (1986)	Persons with whom the respondent shares nine kinds of relational contact, adult household members, and other people the respondents deem important.
Burt (1984, 1985)	The people with whom you discussed important matters (over the past 6 months).
Tolsdorf (1976)	Those people to whom respondents feel close and consider they know well.
Hirsch (1980)	Up to 20 significant others with whom the respondents have contact at least once during any 4- to 6-week period.
Sonderer et al. (1992)	"... persons who mean a lot to you and without whom life would be difficult."

The Social Networks in Adult Life questionnaire (SNAL; Antonucci & Akiyama, 1987; Antonucci, Fuhrer, & Dartigues, 1997), also referred to as the *convoy measure*, is an example of a measure that is based on an affective network membership criterion. Respondents begin by naming people to whom they feel so close that it would be difficult for them to imagine life without them and then are prompted to name people with whom they have relationships that are less close (Kahn & Antonucci, 1980). Three concentric circles are used to represent levels of affective attachment. In a cross-sectional study Antonucci et al. (1997) found that increased network size (across all three concentric circles) as measured by the SNAL questionnaire, was inversely associated with depression in an elderly population. The convoy measure provides a straightforward technique to determine network size based on affective closeness, and for this reason it is often used with children (Levitt, Guacci-Franco, & Levitt, 1993). One advantage of the SNAL is that it allows one to compare the relative effectiveness of definitions of ties based on different levels of emotional closeness.

Limiting Network Size

Although researchers often place limits on the number of people an individual can nominate as network members, network size is primarily determined by how

you choose to define a tie. As indicated in Table 3.4, definitions of ties vary considerably in inclusiveness. Those investigating social integration have traditionally assessed a very narrow range of network ties (e.g., marital ties, ties with close friends, relatives, and formal churches and social groups) and have experienced a great deal of success in predicting health outcomes from differences in networks typically containing between 5 and 20 members. These measures imply that close ties and ties to established formal organizations (churches and social groups) are critical to health and well-being. However, because few investigators have assessed extended network ties in the study of health, this issue has not been resolved. We currently know little about how properties of people's broader social networks affect health (Haines & Hurlburt, 1992).

FUTURE DIRECTIONS AND CONCLUSIONS

Our primary goal in writing this chapter was to provide a resource to aid in the selection and evaluation of social integration measures. Social integration measures have been used across a wide range of scientific disciplines. However, despite their prominence, surprisingly little is known about why they are such powerful predictors of physical and mental health. The association between social integration and health is clear. However, determining whether this relation reflects differences in patterns of social participation, differences in the availability of resources, or differences in cognitive self-concept remains a chief research priority.

We have illustrated that existing categories of integration measures emphasize different components of the social integration construct. For evaluating measurement options, we urge researchers to consider their own hypotheses about how social environment influences health and allow these beliefs to guide measurement selection. We encourage contrasting scales to answer questions about social integration. This includes determining the potential implications that community-level factors may have on health. We also advocate assessing potential mediators of the relation between integration and health. Finally, we have pointed to concepts from formal social network theory as a potential means of exploring how characteristics of the social environment have an impact on health and well-being.

In regard to future directions, one area of interest concerns the development of daily integration measures. One of the principal criticisms of many of the social integration measures and network data more generally is that they are subject to retrospective bias (cf. Bernard, Killworth, Kroenfeld, & Sailer, 1984; Freeman, Romney, & Freeman, 1987). For example, participation-based social integration measures often ask respondents to report about activities and interactions occurring over periods of up to 12 months. Retrospective estimates of this sort are sensitive to recent events and may not adequately reflect what actually occurred months earlier. One way to circumvent these biases is to complement standard integration measures with daily and within-day measures (cf. Eckenrode & Bolger,

1995; Reis & Wheeler, 1991). For example, one might consider assessing individuals' daily social interactions and activities. This information could be used to evaluate the extent to which the daily lives of persons with different levels of social integration differ. For example, one might imagine that socially integrated individuals spend more time interacting with others, engage in more activities, and experience fewer conflicts. Moreover, daily assessments of the number and duration of daily interactions can be used to create behavioral indices of concepts like tie strength and relationship importance. Such techniques would seem to aid in understanding which behavioral and cognitive differences would seem to aid for the relation between social integration and health.

Finally, we also believe research in the field of social integration would benefit from a closer alignment with the intervention tradition. Examining intervention programs designed to either alter network structure by grafting a tie (chapter 8) or increase participation by promoting activities (Arnetz et al., 1983; Clarke et al., 1992) in our view is one of the most promising means of elucidating causal mechanisms and influencing health. Natural experiments such as these provide critical opportunities for examining how social integration operates.

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