



PERGAMON

Social Science & Medicine 51 (2000) 843–857

SOCIAL
SCIENCE
—&—
MEDICINE

www.elsevier.com/locate/socscimed

From social integration to health: Durkheim in the new millennium[☆]

Lisa F. Berkman^{a,*}, Thomas Glass^b, Ian Brissette^c, Teresa E. Seeman^d

^aHarvard School of Public Health, Boston, MA 02115, USA

^bCenter of Aging and Health, Johns Hopkins Medical institutions, Baltimore, MD 21205, USA

^cDepartment of Psychology, Carnegie Mellon, Pittsburgh, PA 15213, USA

^dDivision of Geriatrics, School of Medicine, University of California at Los Angeles, CA 90095, USA

Abstract

It is widely recognized that social relationships and affiliation have powerful effects on physical and mental health. When investigators write about the impact of social relationships on health, many terms are used loosely and interchangeably including social networks, social ties and social integration. The aim of this paper is to clarify these terms using a single framework. We discuss: (1) theoretical orientations from diverse disciplines which we believe are fundamental to advancing research in this area; (2) a set of definitions accompanied by major assessment tools; and (3) an overarching model which integrates multilevel phenomena.

Theoretical orientations that we draw upon were developed by Durkheim whose work on social integration and suicide are seminal and John Bowlby, a psychiatrist who developed attachment theory in relation to child development and contemporary social network theorists.

We present a conceptual model of how social networks impact health. We envision a cascading causal process beginning with the macro-social to psychobiological processes that are dynamically linked together to form the processes by which social integration effects health. We start by embedding social networks in a larger social and cultural context in which upstream forces are seen to condition network structure. Serious consideration of the larger macro-social context in which networks form and are sustained has been lacking in all but a small number of studies and is almost completely absent in studies of social network influences on health.

We then move downstream to understand the influences network structure and function have on social and interpersonal behavior. We argue that networks operate at the behavioral level through four primary pathways: (1) provision of social support; (2) social influence; (3) on social engagement and attachment; and (4) access to resources and material goods. © 2000 Elsevier Science Ltd. All rights reserved.

Keywords: Social integration; Social networks; Social support; Mortality; Health status; Social epidemiology

* Corresponding author. Fax: +1-617-432-3755.

E-mail address: lberkman@hspt.harvard.edu (L.F. Berkman).

[☆] This paper is adapted from Berkman, L.F., & Glass, T. Social integration, social networks, social support and health. In L. F. Berkman & I. Kawachi, *Social Epidemiology*. New York: Oxford University Press; and Brissette, I., Cohen S., Seeman, T. Measuring social integration and social networks. In S. Cohen, L. Underwood & B. Gottlieb, *Social Support Measurements and Intervention*. New York: Oxford University Press.

Introduction

Over the last 20 years there have been dozens of articles and now books on issues related to social networks and social support. It is now widely recognized that social relationships and affiliation have powerful effects on physical and mental health for a number of

0277-9536/00/\$ - see front matter © 2000 Elsevier Science Ltd. All rights reserved.

PII: S0277-9536(00)00065-4

reasons. However, at this juncture, almost 25 years after Cassel (1976) and Cobb (1976) suggested that networks might be critical and 20 years after first empirical studies illustrated effects on mortality (Berkman & Syme, 1979; Blazer, 1982; House, Robbins & Metzner, 1982), it is worth evaluating this field with a critical and theoretical eye to see how we might move forward in the coming decade.

When investigators write about the impact of social relationships on health, many terms are used loosely and interchangeably including social networks, social support, social ties and social integration. The aim of this paper is to clarify these terms using a single framework. We will discuss: (1) theoretical orientations from diverse disciplines which we believe are fundamental to advancing research in this area; (2) a set of definitions accompanied by major assessment tools; and (3) an overarching model which integrates multilevel phenomena.

Theoretical orientations

There are several sets of theories that form the bedrock for the empirical investigation of social relationships and their influence on health. The earliest theories came from sociologists such as Émile Durkheim, as well as from psychoanalysts such as John Bowlby, a British psychoanalyst, who first formulated attachment theory. A major wave of conceptual development also came from anthropologists including Elizabeth Bott, John Barnes, and Clyde Mitchell as well as quantitative sociologists such as Claude Fischer, Edward Laumann, Barry Wellman and Peter Marsden who, along with others, have developed social network analysis. This eclectic mix of theoretical approaches coupled with the contributions of epidemiologists, Cassel and Cobb, form the foundation of research on social ties and health.

Émile Durkheim: social integration, alienation and anomie

Durkheim's contribution to the study of the relationship between society and health is immeasurable. Perhaps most important is the contribution he has made to the understanding of how social integration and cohesion influence mortality. Durkheim's primary aim was to explain how individual pathology was a function of social dynamics. In light of recent attention to "upstream" determinants of health (Link & Phelan, 1995), Durkheim's work reemerges with great relevance today.

In *Suicide*, Durkheim challenges us to understand how the patterning of one of the most psychological,

intimate, and, on the surface, individual acts rests not upon psychological foundations but upon the patterning of "social facts." In *Suicide*, he shows how "social facts" can be used to explain changing patterns of aggregate tendency toward suicide. Durkheim starts his work with the observations that countries and other geographic units and social groups have very stable rates of suicide year after year. Once armed with the irrefutable social patterning of suicide, Durkheim goes on to theorize that the underlying reason for suicide relates, for the most part, to the level of social integration of the group.

Anomic suicide is of particular relevance. This type of suicide defined by Durkheim, is related to large-scale societal crises of an economic or political nature often occurring during times of rapid social change and turbulence. In these situations, social control and norms are weakened (e.g. the regulatory function of integration). Such rapid change serves to deregulate values, beliefs and general norms and fails to rein in or guide individual aspirations (Turner & Noh, 1983). Today crises in Russia and Eastern Europe might be classical situations leading to anomic suicide. Durkheim illustrates suicide is triggered by the erosion of society's capacity for integration. Durkheim's theories related not only to the patterning of suicide but easily extend to other major outcomes ranging from violence and homicides to cardiovascular disease.

John Bowlby: the architect of attachment theory

John Bowlby, one of the most important psychiatrists in the twentieth century (Storr, 1991), proposed theories suggesting that the environment, especially in early childhood, played a critical role in the genesis of neurosis. He believed that the separation of infants from their mothers was unhealthy and saw loss and separation as key issues for psychotherapy. Bowlby proposed that there is a universal human need to form close affectional bonds (Fonagy, 1996). Between 1964 and 1979, he wrote, *Attachment* (Bowlby, 1969), *Separation* (Bowlby, 1973) and *Loss* (Bowlby, 1980) in which he lays out his theory of attachment and how it relates to both childhood and adult development.

Attachment theory contends that the attached figure, most often but not necessarily the mother, creates a secure base from which an infant or toddler can explore and venture forth. Bowlby argued with many psychoanalysts that attachment is a "primary motivational system" (e.g. not secondary to feeding or warmth) (Bowlby, 1969). "Secure attachment," he wrote, "provides an external ring of psychological protection which maintains the child's metabolism in a stable state, similar to internal homeostasis mechanism of blood pressure and temperature control" (Bowlby,

1969). These intimate bonds, created in childhood, form a secure base for solid attachment in adulthood and provide prototypes for later social relations (Fonagy, 1996). Secure attachment as opposed to avoidant, ambivalent, or disorganized attachment, allows the maintenance of affectional bonds and security in a larger system.

In adulthood, Bowlby saw marriage as the adult equivalent of attachment between infant and mother during childhood. If secure, marriage would provide a solid base from which to work and explore the world enmeshed in a “protective shell in times of need” (Holmes, 1993, p. 81).

The strength of Bowlby’s theory lies in its articulation of an individual’s need for secure attachment for its own sake, for the love and reliability it provides, and for its own “safe haven.” Primary attachment promotes a sense of security and self-esteem that ultimately provides the basis on which the individual will form lasting, secure and loving relationships in adult life. The psychosocial environment in infancy and childhood paves the way for successful development that continues through adulthood. For Bowlby, the capacity for intimacy in adult life is not given, but is instead the result of complex dynamic forces involving attachment, loss, and reattachment. Early childhood emotional development is becoming widely recognized as a critical period of development not only for emotional and cognitive development but for health as well.

Social network theory: a new way of looking at social structure and community

During the mid-1950s, a number of British anthropologists found it increasingly difficult to understand the behavior of either individuals or groups on the basis of traditional categories such as kin groups, tribes, or villages. Barnes (1954) and Bott (1957) developed the concept of “social networks” to analyze ties that cut across traditional kinship, residential, and class groups to explain behaviors they observed such as access to jobs, political activity or marital roles. The development of social network models provided a way to view the structural properties of relationships among people with no constraints or expectations that these relationships occurred only among bounded groups defined “a priori.”

Network analysis “focuses on the characteristic patterns of ties between actors in a social system rather than on characteristics of the individual actors themselves and use these descriptions to study how these social structures constrain network member’s behavior” (Hall & Wellman, 1985, p. 26). Network analysis focuses on the structure and composition of the net-

work, and the contents or specific resources which flow through those networks. Social network analysis includes analyses of both egocentric networks with an individual at the center as well as entire networks of networks at the level of communities or workplaces.

The strength of social network theory rests on the testable assumption that the social structure of the network itself is largely responsible for determining individual behavior and attitudes by shaping the flow of resources which determine access to opportunities and constraints on behavior. Network theorists share many of the central assumptions of Durkheim and the structure functionalists. The central similarity is the view that the structural arrangement of social institutions shapes the resources available to the individual and hence that person’s behavioral and emotional responses. Another contribution of network theory is the observation, initially made by Barnes and Bott, that the structure of networks may not always conform to preconceived notions of what constitutes “community” defined on the basis of geographic or kinship criteria. Thus, Wellman argues that the essence of community is its social structure, not its spatial structure (Wellman, 1988, p. 86). By assessing actual ties between network members, one can empirically test whether community exists and whether that community is defined on the basis of neighborhood, kinship, friendship, institutional affiliation, or other characteristics.

A conceptual model linking social networks to health: an overview

Throughout the 1970s and 1980s a series of studies appeared consistently showing that the lack of social ties or social networks predicted mortality from almost every cause of death (Cohen, 1988; House, Landis & Umberson, 1988; Berkman, 1995). These studies most often captured numbers of close friends and relatives, marital status, and affiliation or membership in religious and voluntary associations. These measures were conceptualized in any number of ways as assessments of social networks or ties, social connectedness, integration, activity or embeddedness. Whatever they were named, they uniformly defined embeddedness or integration as involvement with ties spanning the range from intimate to extended. Most studies included measures of both “strong” and “weak” ties (Granovetter, 1973), (weak ties involve contacts with extended non-intimate ties who he found to be central to occupational mobility).

Although the power of these measures to predict health outcomes is indisputable, the interpretation of what the measures actually measure has been open to much debate. Hall and Wellman (1985) have appropriately commented that much of the work in social epi-

demiology has used the term social networks metaphorically since rarely have investigators conformed to more standard assessments used in network analysis. For instance, the existence of “weak ties” is not assessed directly but inferred from membership in voluntary and religious organizations. This criticism has been duly noted and several calls have gone out to develop a second generation of network measures (Berkman, 1986; House et al., 1988; Antonucci & Jackson, 1990).

A second wave of research developed in reaction to this early work and as an outgrowth of work in health psychology that turned the orientation of the field in several ways. Major contributors to this second wave include Antonucci (Antonucci, 1986; Antonucci & Akiyama, 1987b); and Kahn (1979); and Lin (Dean & Lin, 1977; Lin, Dean & Ensel, 1981; Lin & Dean, 1984; Lin, Woelfel & Light, 1985); and House (LaRocca, House & French, 1980; House, 1981; House & Kahn, 1985); and Barbara and Irwin Sarason (Sarason, Sarason & Pierce, 1990) and Rook (Rook, 1990a,b, 1992). These social scientists focused on the qualitative aspects of social relations (i.e. their provision of social support or, conversely, detrimental aspects of relationships) rather than on the elaboration of the structural aspects of social networks. Especially important among these contributions was Kahn and Antonucci’s formulation of the *convoy model* in which the individual is seen in a life course perspective as travelling through life surrounded by members of his/her cohort who share experiences and life histories and who provide support to one another reciprocally over time (Kahn & Antonucci, 1980; Antonucci & Akiyama, 1987a,b).

Lin and colleagues’ social resource theory (Lin, Dean & Ensel, 1986) and rigorous attempts to define the critical domains of support by House (1981) and the Sarason’s call for theory-based work have advanced our understanding of the richness and complexity of social support immeasurably. They have helped us understand the ways that support is linked to mental health. But, all these investigators follow an assumption that what is most important about networks is the support functions they provide. We do not dispute that social support is among the primary pathways by which social networks may influence physical and mental health status. We do, however, argue that it is not the only critical pathway. Moreover, we believe that the exclusive study of more proximal pathways detracts from the need to focus on the social context and structural underpinnings that may importantly influence the types and extent of social support provided. Furthermore, studying social support to the exclusion of other potential pathways, does not help us understand the findings in which large and dense networks or sometimes high levels of support,

are associated with poorer health outcomes or less adaptive behaviors, (e.g. transmission of HIV, illicit drug use, alcohol consumption, and less prenatal care). The work by Rook further points out the critical need to define stressful and detrimental aspects of social relationships which do not fall under the rubric of “support” at all.

In order to have a comprehensive framework in which to explain these phenomena, we must move “upstream” and return to a more Durkheimian orientation to network structure and social context. Indeed, it is critical to maintain a view of social networks as lodged within those larger social and cultural contexts which shape the structure of networks. In fact, some of the most interesting work in the field today relates social affiliation to social status and social and economic inequality (Kawachi, Kennedy, Lochner & Prothrow-Stith, 1997, Wilkinson, 1999). Only then can we fully consider the multiple pathways by which social networks might so profoundly influence health outcomes.

Fig. 1 presents a conceptual model of how social networks impact health. We envision a cascading causal process beginning with the macro-social to psychological processes that are dynamically linked together to form the processes by which social integration effects health. As suggested above, we start by embedding social networks in a larger social and cultural context in which upstream forces are seen to condition network structure. Serious consideration of the larger macro-social context in which networks form and are sustained has been lacking in all but a small number of studies and is almost completely absent in studies of social network influences on health.

We then move downstream to understand the influences network structure and function have on social and interpersonal behavior. We argue that networks operate at the behavioral level through four primary pathways: (1) provision of social support; (2) social influence; (3) on social engagement and attachment; and (4) access to resources and material goods. These micro-psychosocial and behavioral processes, we argue, then influence even more proximate pathways to health status including (1) direct physiological stress responses, (2) psychological states and traits including self-esteem, self-efficacy, security, (3) health-damaging behaviors such as tobacco consumption or high-risk sexual activity, health promoting behavior such as appropriate health service utilization, medical adherence, and exercise, and finally to (4) exposure to infectious disease agents such as HIV, other sexually transmitted diseases (STDs) or tuberculosis.

By embedding social networks in this larger chain of causation, we can integrate “upstream” macro-social forces related to the political economy with social networks as mediating structures between the largest and

smallest scale social forms. Thus, we can examine how labor markets, economic pressures and organizational relations influence the structure of networks (Luxton, 1980; Belle, 1982; Bodemann, 1988; Krause & Borawshi-Clark, 1995). We can examine specifically the role of culture, rapid social change, industrialization and urbanization on the structure of networks. Perhaps the most critical findings to date in this area relevant to social epidemiology are whether “community” is dead or dying in post-industrial American society. In fact, this question has been central to many social network analysts. See Wellman (1988) for an excellent discussion of this question.

The assessment of social networks

Next we come to identifying critical domains of social networks. Social networks might be defined as the web of social relationships that surround an individual and the characteristics of those ties (Mitchell, 1969; Laumann, 1973; Fischer, Jackson, Steuve, Ger-

son, Jones & Baldassare, 1977; Fischer, 1982). Burt has defined network models as describing “the structure of one or more networks of relations within a system of actors” (Burt, 1982, p. 20). Thus, while we mainly have considered in this chapter egocentric networks, (networks surrounding an individual) network analysis can easily examine networks of networks. Network characteristics (see Fig. 1) cover:

- range or size (number of network members);
- density (the extent to which the members are connected to each other);
- boundedness (the degree to which they are defined on the basis of traditional group structures such as kin, work, neighborhood);
- homogeneity (the extent to which individuals are similar to each other in a network);

Related to network structure, characteristics of individual ties include:

- frequency of contact, (number of face-to-face contacts and/or contacts by phone or mail);
- multiplexity (the number of types of transactions or

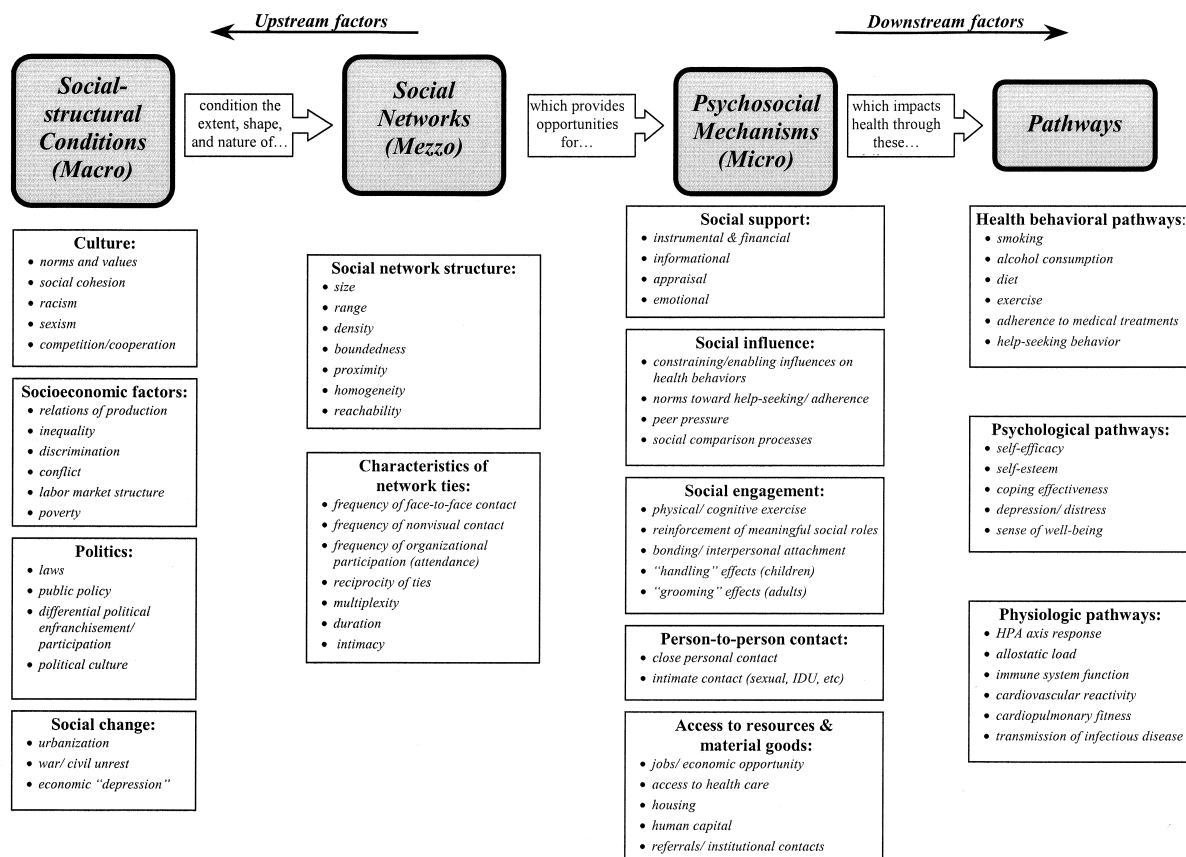


Fig. 1

- support flowing through a set of ties);
- duration (the length of time an individual knows another);
- reciprocity (the extent to which exchanges or transactions are even or reciprocal).

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 enable one to test of whether social integration measures remain associated with positive health outcomes after controlling for network characteristics like the density of the participants' personal networks.

Hirsch's (1979, 1980) Social Network List (SNL) is one of the few measures that has been used in a study documenting 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 Social Network List can also be used to assess density.

Stokes (1985) asks participants to list the initials of people who are "important to their lives" and with whom they have contact with 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' 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.

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. See Harary, Norman and Cartwright (1965) and Hage and Harary (1983) for more on graph theory. A two-way matrix, referred to as a sociomatrix, can also be used to represent data. Here network members, 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

would recommend using one of the many computer packages designed specifically for network analysis (Wasserman & Faust, 1995). 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/>.

Downstream social and behavioral pathways

Social support

Moving downstream, we now come to a discussion of the mediating pathways by which networks might influence health status. Most obviously the structure of network ties influences health via the provision of many kinds of support. This framework immediately acknowledges that not all ties are supportive and that there is variation in the type, frequency, intensity, and extent of support provided. For example, some ties provide several types of support while other ties are specialized and provide only one type. Social support is typically divided into subtypes which include emotional, instrumental, appraisal and informational support (Weiss, 1974). Emotional support is related to the amount of "love and caring, sympathy and understanding and/or esteem or value available from others" (Thoits, 1995). Emotional support is most often provided by a confidant or intimate other, although less intimate ties can provide such support under circumscribed conditions.

Instrumental support refers to help, aid or assistance with tangible needs such as getting groceries, getting to appointments, phoning, cooking, cleaning or paying bills. House (1981) refers to instrumental support as aid in kind, money or labor. Appraisal support, often defined as the third type of support, relates to help in decision-making, giving appropriate feedback, or help deciding which course of action to take. Informational support is related to the provision of advice or information in the service of particular needs. Emotional, appraisal and informational support are often difficult to disaggregate and have various other definitions (e.g. self-esteem support).

Perhaps even deeper than support are the ways in which social relationships provide a basis for intimacy and attachment. Intimacy and attachment have meaning not only for relationships that we traditionally think of as intimate (e.g. between partners, parents and children) but for more extended ties. For instance, when relationships are solid at a community level, individuals feel strong bonds and attachment to places (e.g. neighborhood) and organizations (e.g. voluntary and religious).

Social influence

Networks may influence health via several other pathways. One pathway that is often ignored is based on *social influence*. Marsden asserts that the “proximity of two actors in social networks is associated with the occurrence of interpersonal influence between the actors” (Marsden & Friedkin, 1994, p. 3). As the term is used, influence need be neither associated with face-to-face contact, nor does it require deliberate or conscious attempts to modify behavior (p. 4). Marsden refers to work by Erickson (1988) suggesting that under conditions of ambiguity “people obtain normative guidance by comparing their attitudes with those of a reference group of similar others. Attitudes are confirmed and reinforced when they are shared with the comparison group but altered when they are discrepant” (Marsden & Friedkin, 1994, p. 5). Shared norms around health behaviors (e.g. alcohol, and cigarette consumption, health care utilization, treatment adherence or dietary patterns) might be powerful sources of social influence with direct consequences for the behaviors of network members. These processes of mutual influence might occur quite apart from the provision of social support taking place within the network concurrently. For instance, cigarette smoking by peers is among the best predictors of smoking for adolescents (Landrine, Richardson, Klondoff & Flay, 1994). The social influence which extends from the network’s values and norms constitutes an important and under-appreciated pathway through which networks impact health.

Social engagement

A third and more difficult to define pathway by which networks may influence health status is by promoting social participation and social engagement. Participation and engagement result from the enactment of potential ties in real life activity. Getting together with friends, attending social functions, participating in occupational or social roles, group recreation, church attendance — these are all instances of social engagement. Thus, through opportunities for engagement, social networks define and reinforce meaningful social roles including parental, familial, occupational, and community roles, which in turn, provides a sense of value, belonging, and attachment. Those roles that provide each individual with a coherent and consistent sense of identity are only possible because of the network context which provides the theatre in which role performance takes place.

In addition, network participation provides opportunities for companionship and sociability. We, as well as others (Rook, 1990b), argue that these behaviors and attitudes are not the result of the provision of sup-

port per se, but are the consequence of participation in a meaningful social context in and of itself. We hypothesize that part of the reason measures of social integration or “connectedness” have been such powerful predictors of mortality for long periods of follow-up is that these ties give meaning to an individual’s life by virtue of enabling him or her to participate in it fully, to be obligated (in fact, often to be the provider of support) and to feel attached to one’s community.

Person-to-person contact

Another behavioral pathway by which networks influence disease is by restricting or promoting exposure to infectious disease agents. In this regard the methodological links between epidemiology and networks are striking. What is perhaps most remarkable is that the same network characteristics that can be health-promoting can at the same time be health-damaging if they serve as vectors for the spread of infectious disease. Efforts to link mathematical modeling applying network approaches to epidemiology are in their infancy and have started to appear over the last 10 years (Klondahl, 1985; Laumann, Gagnon, Michaels, Michael & Coleman, 1989; Morris, Robinson, Raphael & Bishop, 1991; Morris, 1994; Friedman, 1995).

The contribution of social network analysis to the modeling of disease transmission is the understanding that in many, if not most cases, disease transmission is not spread randomly throughout a population. Social network analysis is well suited to the development of models in which exposure between individuals is not random but rather is based on geographic location, sociodemographic characteristics (age, race, gender) or other important characteristics of the individual such as socioeconomic position, occupation, sexual-orientation (Laumann et al., 1989). Furthermore, because social network analysis focuses on characteristics of the network rather than on characteristics of the individual, it is ideally suited to the study of diffusion of transmissible diseases through populations via bridging ties between networks, or uncovering characteristics of ego-centered networks that promote the spread of disease.

Access to material resources

Surprisingly little research has sought to examine differential access to material goods, resources and services as a mechanism through which social networks might operate. This, in our view, is unfortunate given the work of sociologists showing that social networks operate by regulating an individual’s access to life-opportunities by virtue of the extent to which networks overlap with other networks. In this way networks op-

erate to provide access or to restrict opportunities in much the same way the social status works. Perhaps the most important among studies exploring this tie is Granovetter's classic study of the power of "weak ties" that, on the one hand lack intimacy, but on the other hand facilitate the diffusion of influence and information, and provide opportunities for mobility (Granovetter, 1973).

We have identified five mechanisms by which the structure of social networks might influence disease patterns. While social support is the mechanism most commonly invoked, social networks also influence health through additional behavioral mechanisms including: (1) forces of social influence; (2) levels of social engagement and participation; (3) the regulation of contact with infectious disease; and (4) access to material goods and resources. These mechanisms are not mutually exclusive. In fact, it is most likely that in many cases they operate simultaneously.

Biological and psychological pathways proximate to health status

Social networks operate through the above described series of five principle mechanisms in shaping the health of individuals. In turn, these mechanisms impact other downstream factors via biologic and psychological pathways most proximate to the health outcome. Moving across our diagram (Fig. 1), we now turn our attention to these pathways. Three distinct pathways will be outlined although again, the reader is alerted to the distinct possibility, in fact, likelihood, that multiple pathways are involved simultaneously.

First, social networks via social influence or supportive functions influence health-promoting or health-damaging behaviors such as tobacco and alcohol consumption, physical activity, dietary patterns, sexual practices, illicit drug use. Second, social networks via any number of pathways influence cognitive and emotional states such as self-esteem, social competence, self-efficacy, depression and affect. Third, networks may have direct effects on health outcomes by influencing a series of physiologic pathways largely related to stress responses. We view pathways one and two as logical and valid pathways, however, there is not a large literature to date on the links between networks and health behaviors or psychological attributes so we will review them only briefly before turning to the third pathway. The reader is referred to two excellent recent reviews on the physiologic and behavioral processes linked to social networks and support (Uchino, Cacioppo & Kiecolt-Glaser, 1996; Knox & Uvnas-Moberg, 1998).

Health behaviors

Evidence suggests that, in general, social network size or "connectedness" is inversely related to risk-related behaviors. Data from Alameda County show a steady gradient between increasing social disconnection and the cumulative prevalence of health-damaging behaviors such as tobacco and alcohol consumption, physical inactivity, and consequent obesity. Trieber and colleagues (Trieber, Batanowski, Broden, Strong, Levy & Knox, 1991) report that social support is related to physical exercise. Several studies have reported that social support is related to smoking cessation, especially among men (Hanson, Isaccsson, Janzon & Lindell, 1990; Murray, Johnston, Dolce, Lee & O'Hara, 1995) but other studies have reported no associations (Mermelstein, Cohen, Lichtenstein, Beer & Kamarck, 1986).

In general, behavioral pathways such as these do not appear to account for a large part of the relationship between social networks and morbidity or mortality. In most instances, relative risks are reduced about 20% when such behaviors are introduced into multivariate models (Berkman & Syme 1979; House et al., 1982; Kaplan, Salonen, Cohen, Brand, Syme & Puska, 1988; Seeman, Berkman, Kohout, LaCroix, Glynn & Blazer, 1993a). However, this may be due to the fact that we are most often measuring components of networks (size and support) that are less predictive of health behaviors. The addition of assessments of other mechanisms including social influence and social engagement may strengthen the explanatory power of our models.

Psychologic mechanisms

Self-efficacy, defined as the degree of confidence persons have in their ability to perform specific behaviors, has been shown to be associated with a variety of health and functional outcomes (Grembowski et al., 1993; McAuley, 1993; Tinetti & Powell, 1993; Seeman, Rodin & Albert, 1993b; Mendes de Leon, Te, Baker, Richardson & Tinetti, 1996). There is a considerable body of evidence that self-efficacy is one of the psychosocial pathways through which social support operates. For example, in a study of post-partum depression, the protective effect of social support was observed to occur primarily through its mediation of maternal feelings of self-efficacy (Cutrona & Troutman, 1986). Other studies have observed the indirect influence of social support through enhanced self-efficacy in coping with abortion (Major, Cozzarelli, Sciacchitano, Cooper, Testa & Mueller, 1990), smoking cessation (Gulliver, Hughes, Solomon & Dey, 1995), and depression (McFarlane, Bellissimo & Norman, 1995).

The association between social networks and health-promoting behavior such as exercise has also been shown to be mediated through self-efficacy (Duncan & McAuley, 1993).

Evidence suggests that on-going network participation is essential for the maintenance of self-efficacy beliefs in late life. A study by (McAvay, Seeman & Rodin, 1996) found that lower levels of social network contact were predictive of decline in the health and safety domains of self-efficacy, and the absence of instrumental support was also associated with decline in the productivity, health, and transportation domains. There is some evidence that the impact of self-efficacy and social support are reciprocal — meaning that while social support may bolster self-efficacy, it may also be the case the self-efficacy is independently associated with higher levels of social support (Holahan & Holahan, 1987). The complexity of these reciprocal dynamics have yet to be fully examined.

Several theoretical perspectives suggest that possessing multiple social roles promote self-esteem and self-worth (Sieber, 1974; Thoits, 1983; Cohen, 1988). Feelings of esteem and self-worth are thought to enhance adaptation to stressful life events, promote positive affect and prevent depression (Cohen, 1988).

Social integration appears to operate through additional psychosocial pathways. For example, some evidence suggests that social support promotes functional and adaptive coping styles (Holahan & Moos, 1987; Wolf et al., 1991). An influential study by Dunkel-Schetter, Folkman and Lazarus (1987) has shown however that these relationships are likely to be reciprocal. Their evidence suggests that in stressful situations, different coping styles elicit different responses from the social environment. Indeed, the tendency to ask for and make use of social support itself is one of many possible coping styles, itself with numerous psychological antecedents and correlates (Dunkel-Schetter, Feinstein, Taylor & Falke, 1992). In a review of patterns of attachment, Fonagy (1996) presents evidence that attachment relationships contribute to self-esteem and the perception that the individual is in control of his or her own destiny.

Social support may additionally operate through its influence on emotion, mood, and perceived well-being. Numerous studies have shown that social support is associated with symptoms of depression (Lin et al., 1981; Lomauro, 1990; Bowling, 1991; Morris et al., 1991; Matt & Dean, 1993; Holahan, Moos, Holahan & Brennan, 1995; Holahan, Moos & Brennan, 1997). This evidence is particularly important in light of the fact that social support, especially perceived emotional support, has been shown to buffer the deleterious influences of stressful life events on the risk of depression and depressive symptoms (Lin & Dean, 1984; Lin et al., 1986; Vilhjalmsson, 1993; Paykel, 1994). The evi-

dence appears to be strong that those who are socially isolated are at increased risk of depression especially in late life (Murphy, 1982). The relationship in some cases is reciprocal with support influencing depressive symptoms and vice versa (Oxman, Berkman, Kasl, Freeman & Barrett, 1992). In studies of psychological health, one consistent finding is that the perceived adequacy of social support, more so than the availability of support, appears to be most important (Henderson, 1981).

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/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 (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.

Physiologic pathways

An examination of the pathways linking social networks to health outcomes yields a rich and complex lattice work of interlinking mechanisms — biological, psychological and biophysiological — that cascades from the macro to the micro, from upstream to downstream (and potentially back upstream again) to generate potentially powerful influences on health and well-being across the life-course. One of the robust findings in the literature on networks and health is the broad impact network integration has on all-cause mortality. While this may be related to the numerous pathways which more proximately impact disease onset or progression, it is also possible that some more general phenomenon is at work. Our inability to address this question in a serious way has been the result in part on the lack of a larger theoretical model such as the one proposed here. By specifying a chain of inter-related pathways that range from the macro to the micro, we can expand the scope of our investigation and identify domains of influence that have previously remained unexplored. Below, we describe several promising areas where such expansion might profitably take place.

We speculate that social isolation, disintegration and

disconnectedness influence mortality and therefore longevity or life expectancy by influencing the rate of aging of the organism. In a review on aging from a social and biomedical perspective, Berkman (1988, p. 51), hypothesized that social isolation “was a chronically stressful condition to which the organism responded by aging faster. Isolation would then also be associated with age-related morbidity and functional decline. Thus, the cumulative conditions which tend to occur in very old age (would be) accelerated.” Such “accelerated aging” hypotheses have also been applied to other social experiences, especially related to explaining racial differences in health in the US (Jones, 1995).

Missing from our earlier conceptualization was a life-course perspective which has become much clearer with evidence accumulated since the 1988 review. Research on humans and animals (both primates and non-primates) indicates that early experiences, especially social experiences between primary caregivers and infants, are powerful determinants of social, behavioral, and physiological development across the lifespan. In fact, many changes in function that are considered “normal aging” show variability related to early life experiences. It now appears that long-term neurobiological experiences which unfold in old age may have been shaped, in part, by experiences during early “critical” or “sensitive” experiences (Suomi, 1997).

In a series of studies, Meaney and colleagues have shown that in rodents frequency of early handling and maternal separation contribute to stable differences throughout the lifespan in the hypothalamic–pituitary–adrenal (HPA) axis responses. These differences are especially marked in response to stressful stimuli (Meaney, Aitken, Bodnoff, Iny & Sapolsky, 1985; Meaney, Aitken, Berkel, Bhatnagar & Sapolsky, 1988; Meaney, Aitken & Sapolsky, 1991; Francis, Diorio, LaPlante, Weaver, Seckl & Meaney, 1996). The HPA axis response to stress is a classic adaptive mechanism in virtually all mammals. Briefly, these experiments show that rats handled during the post-natal period show faster adrenocortical recovery from stress than do non-handled rats or those experiencing maternal separation. Furthermore, the aged rats that were not handled showed age-related rises in basal glucocorticoid levels that were not apparent among the aged handled rats (showing an “aging” effect).

Most remarkable was that in old age, there was marked hippocampal cell loss and cognitive impairment in the aged non-handled rats. These results indicated that experiences involving maternal separation and withdrawal from handling, in general, a nurturant experience, influence the way rodents react to stress and appear to accelerate the aging of the organism. In addition, they point to the importance of a life-course

perspective in which the influences of affiliation are developmental. We take these results to indicate the possibility that chronic social isolation throughout the life course may produce persistent HPA axis response difference that induces faster aging.

The social environment in adulthood

Early theories of aging assumed that plasticity was a characteristic of early phases of development and was virtually non-existent by old age. In contrast, developmental neurobiologists, neuropsychologists, social scientists and geriatricians now recognize that in most domains, change occurs through the life-course and is not restricted to early development. For instance, neuronal plasticity especially following injury has been the subject of a great deal of research most of which suggests the aging brain is more plastic than we ever suspected (Cotman, 1985; Moss & Albert, 1988).

The impact of social attachments made in early years on health outcomes remains an intriguing and understudied area; however, the vast body of epidemiologic evidence produced to date indicates that it is adult social circumstances that are linked to poor health outcomes. Debates in which we pitch continuity (the effect of early development/environment) against discontinuity (the effect of recent events) are not likely to be fruitful since both have consequences for health outcomes. Furthermore, we know that large scale social upheavals and transitions profoundly disrupt patterns of social organizations established in earlier life. Geographical relocation related to urbanization, housing policy, or employment opportunities, large scale social change or depression as seen in Russia or Eastern Europe, job stress and corporate policies that are not “family” friendly represent environmental challenges that tear at the fabric of social networks which in turn have deleterious consequences on health.

For instance, animals who are isolated have been shown to have more extensive atherosclerosis than less isolated animals. This has been shown in both primates and non-primates (Nerem, Levesque & Cornhill, 1980). Shively and colleagues (Shively, Clarkson & Kaplan, 1989) have reported that adult female cynomolgus monkeys housed alone compared to those housed in small groups had developed more atherosclerosis than other animals while there were no differences in lipid concentration.

With regard to cardiovascular reactivity, several recent studies have identified remarkably strong relationships with support and reactivity assessed in terms of blood pressure response to stress or challenge. Among the clearest of these is an experiment conducted by Kamarck and colleagues (Kamarck, Manuck & Jennings, 1991). In this experiment, they

exposed all subjects to a challenge involving public speaking. They then randomly told half the group that social support was available by telling them before the “challenge” that someone was available for help if they needed it. They would be just outside the room. In fact, no support was actually provided; it was merely available if needed. People without support had higher systolic and diastolic pressure both before the actual challenge as well as during the challenge. Thus, support availability protects increased blood pressure response associated with stressful situations.

This type of experiment has now been repeated varying several critical aspects of the design (the nature of the challenge, the type of support, the match between subject and supporter). Some evidence suggests that support may moderate stress differentially for men and women (Kirschbaum, Klauer, Filipp & Hellhammer, 1995). Although they are not completely consistent, the majority of these studies confirm the important role of support in moderating levels of reactivity although the type of challenge and match between supporter and subject are important to outcomes (Uchino et al., 1996).

A few studies have reported variations in cortisol, epinephrine or norepinephrine related to social isolation. Sapolsky, Alberts and Altmann (1997) report that in their studies of baboons in the wild, the degree of affiliation was related to adrenocortical status. As found in most studies of humans, they note that it was not a single form of affiliation that is important but an aggregate measure of eight aspects of social connectedness. In humans, work by our group from the MacArthur Foundation on Successful Aging (Seeman, Berkman & Rowe, 1994) report that among older men and women with relatively high functional status, social networks and support are related to basal levels of several neuroendocrine factors assayed from overnight urine samples. Studies by Knox and colleagues (Knox, Theorell, Svensson & Waller, 1985) show measures of lack of attachment with intimate contacts as well as low number of contacts with acquaintances are associated with high resting plasma adrenaline levels in young men. In this same study, the later measure of contact with acquaintances was related to heart rate variability. In a study of stress related to a nuclear power plant accident, Fleming, Baum, Gisriel and Gatchel (1982) showed that people with low social support had higher levels of urinary norepinephrine regardless of their level of stress.

Another pathway by which social relationships might influence health involves alteration in immune response. While immune function is a complex and multidimensional phenomenon and not detached from neuroendocrine response, much progress has been made in the last decade or two in understanding how social ties influence immune function (Cohen, Doyle, Skoner,

Rabin & Gwaltney, 1997). Early studies show the pervasive effects of bereavement or living with a severely ill spouse or child in terms of suppressed immune function, particularly cellular immunity. Work over the last few years by Kiecolt-Glaser and colleagues and others has found that less devastating aspects of relationships such as the quality of marital relationship or feelings of loneliness among medical students also compromises immunocompetence (Kiecolt-Glaser, Garner, Speicher, Penn, Holliday & Glaser, 1984; Glaser, Kiecolt-Glaser, Speicher & Holliday, 1985; Thomas, Goodwin & Goodwin, 1985; Kiecolt-Glaser, Fisher, Ogrocki, Stout, Speicher & Glaser, 1987). The latter studies of medical students showed that those who were lonely had not only lower levels of natural killer-cell activity but significantly high Epstein–Barr virus (EBV) antibody titers. Thus again, we see provocative evidence that social isolation may regulate immune mechanisms involved in the regulation of latent infections.

Conclusion

Our aim in this review was to integrate some classical theoretical work in sociology, anthropology and psychiatry with the empirical research currently underway on social networks, social integration and social support. Rather than review the vast amount of work on health outcomes which is the subject of several excellent recent papers, we hoped to develop a conceptual framework that would guide work in the future.

With the development of this framework, we are struck by two issues of profound importance. The first is the “upstream” question of identifying those conditions which influence the development and structure of social networks. Such questions have been the substantive focus of much of social network research especially in relationship to urbanization, social stratification and culture change. Yet little of this work becomes integrated with health issues in a way that might guide us in the development of policies or intervention to improve the health of the public. Recent work relating social cohesion to economic inequality begins to help us decipher the complex interrelationships between these social experiences (Kawachi et al., 1997; Wilkinson, 1999) but much more multilevel work is needed in this area. Of particular interest, would be more cross-cultural work comparing countries with different values regarding social relationships, community, sense of obligation. The same might be true to specific areas within countries or specific cultural or ethnic groups with clearly defined values.

The second major issue relates to the “downstream” question. Many investigators have assumed that networks influence health via social support functions. Our framework makes clear that this is but one path-

way linking networks to health outcomes. Furthermore, the work on conflicts and stress points out that not only are not all relationships positive in valence (Rook, 1990a) but that some of the most powerful impacts on health that social relationships may have are through acts of abuse, violence, and trauma. Fully elucidating these downstream experiences and how they are linked to health via which biological mechanisms remains a major challenge in the field.

References

- Antonovsky, A. (1979). *Health, stress and coping: New perspective on mental and physical well-being*. San Francisco, CA: Jossey-Bass.
- Antonovsky, A. (1987). *Unraveling the mystery of health*. San Francisco, CA: Jossey-Bass.
- Antonucci, T. C. (1986). Measure social support networks: hierarchical mapping technique. *Generations*, *X*, 10–12.
- Antonucci, T., & Akiyama, H. (1987a). An examination of sex differences in social support among older men and women. *Sex Roles*, *17*, 737–749.
- Antonucci, T., & Akiyama, H. (1987b). Social networks in adult life and a preliminary examination of the convoy model. *J. Gerontology*, *42*, 519–527.
- Antonucci, T. C., & Jackson, J. S. (1990). The role of reciprocity in social support. In B. R. Sarason, I. G. Sarason, & G. R. Pierce, *Social support: an interactional view* (pp. 173–198). New York: John Wiley.
- Barnes, J. A. (1954). Class and committees in a Norwegian island parish. *Human Relations*, *7*, 39–58.
- Belle, D. E. (1982). The impact of poverty on social networks and supports. *Marriage and the Family Rev.*, *5*, 89–103.
- Berkman, L. (1986). Social networks, support and health: Taking the next step forward. *AJE*, *123*(4), 559–562.
- Berkman, L. (1988). The changing and heterogeneous nature of aging and longevity: A social and biomedical perspective. *Ann. Rev. Ger. Geriatrics*, *8*, 37–68.
- Berkman, L., & Syme, S. (1979). Social networks, host resistance, and mortality: A nine-year follow-up of Alameda County residents. *AJE*, *109*, 186–204.
- Berkman, L. F. (1995). The role of social relations in health promotion. *Psychosom. Med.*, *57*, 245–254.
- Blazer, D. (1982). Social support and mortality in an elderly community population. *AJE*, *115*, 684–694.
- Bodemann, Y. M. (1988). Relations of product and class rule: the basis of patron/clientage. In B. Wellman, & S. D. Berkowitz, *Social structures: a network approach*. Cambridge, UK: Cambridge University Press.
- Bott, E. (1957). *Family and social network*. London: Tavistock Press.
- Bowlby, J. (1969). *Attachment and loss*. London: Hogarth Press.
- Bowlby, J. (1973). *Attachment and loss*. London: Hogarth Press.
- Bowlby, J. (1980). *Attachment and loss*. London: Hogarth Press.
- Bowling, A. (1991). Social support and social networks: their relationship to the successful and unsuccessful survival of elderly people in the community. An analysis of concepts and a review of the evidence. *Fam. Pract.*, *8*, 68–83.
- Burt, R. S. (1982). *Toward a structural theory of action*. New York: Academic Press.
- Burton, R. (1998). Global integrative meaning as a mediating factor in the relationship between social roles and psychological distress. *Journal of Health and Social Behavior*, *39*, 201–215.
- Cassel, J. (1976). The contribution of the social environment to host resistance. *AJE*, *104*, 107–123.
- Cobb, S. (1976). Social support as a moderator of life stress. *Psych. Med.*, *38*, 300–314.
- Cohen, S. (1988). Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychology*, *7*, 269–297.
- Cohen, S., Doyle, W. J., Skoner, D. P., Rabin, B. S., & Gwaltney Jr, J. M. (1997). Social ties and susceptibility to the common cold. *JAMA*, *277*, 1940–1944.
- Cotman, C. (1985). *Synaptic plasticity*. New York: Guilford Press.
- Cutrona, C., & Troutman, B. (1986). Social support, infant temperament, and parenting self-efficacy: a mediational model of postpartum depression. *Child Development*, *57*, 1507–1518.
- Dean, A., & Lin, N. (1977). The stress-buffering role of social support. *J. Nervous & Mental Dis.*, *165*, 403–416.
- Duncan, T., & McAuley, E. (1993). Social support and efficacy cognitions in exercise adherence: a latent growth curve analysis. *J. Behav. Med.*, *16*, 199–218.
- Dunkel-Schetter, C., Feinstein, L., Taylor, S., & Falke, R. (1992). Patterns of coping with cancer. *Health Psychol.*, *11*, 79–87.
- Dunkel-Schetter, C., Folkman, S., & Lazarus, R. (1987). Correlates of social support receipt. *J. Pers. Soc. Psychol.*, *53*, 71–80.
- Erickson, B. H. (1988). The relational basis of attitudes. In B. Wellman, & S. D. Berkowitz, *Social structures: a network approach* (pp. 99–121). New York: Cambridge University Press.
- Fischer, C. S. (1982). *To dwell among friends: personal networks in town and city*. Chicago: University of Chicago Press.
- Fischer, C. S., Jackson, R. M., Steuve, C. A., Gerson, K., Jones, L. M., & Baldassare, M. (1977). *Networks and places*. New York: Free Press.
- Fleming, R., Baum, A., Gisriel, M., & Gatchel, R. (1982). Mediating influences of social support on stress at Three Mile Island. *J. Hum. Stress*, *8*, 14–22.
- Fonagy, P. (1996). Patterns of attachment, interpersonal relationships and health. In D. Blane, E. Brunner, & R. Wilkinson, *Health and social organization: towards health policy for the twenty-first century*, (pp. 125–151). New York/London: Routledge.
- Francis, D., Diorio, J., LaPlante, P., Weaver, S., Seckl, J., & Meaney, M. (1996). The role of early environmental events in regulating neuroendocrine development. Moms, pups, stress and glucocorticoid receptors. *Ann. NY Acad. Sci.*, *794*, 136–152.
- Friedman, S. R. (1995). Promising social network results and suggestions for a research agenda. *NIDA Research Monograph*, *151*, 196–215.

- Glaser, R., Kiecolt-Glaser, J., Speicher, C., & Holliday, J. (1985). Stress, loneliness and changes in herpes virus latency. *J. Behav. Med.*, 8, 249–260.
- Granovetter, M. (1973). The strength of weak ties. *Am. J. Sociol.*, 78, 1360–1380.
- Grembowski, D., Patrick, D., Diehr, P., Durham, M., Beresford, S., Kay, E. et al. (1993). Self-efficacy and health behavior among older adults. *J. Health Soc. Behav.*, 34, 89–104.
- Gulliver, S., Hughes, J., Solomon, L., & Dey, A. (1995). An investigation of self-efficacy, partner support and daily stresses as predictors of relapse to smoking in self-quitters. *Addiction*, 90, 767–772.
- Hage, P., & Harary, F. (1983). *Structural methods in anthropology*. Cambridge: Cambridge University Press.
- Hall, A., & Wellman, B. (1985). Social networks and social support. In S. Cohen, & S. L. Syme, *Social support and health* (pp. 23–41). Orlando: Academic Press.
- Hanson, B., Isaccsson, S., Janzon, L., & Lindell, S. (1990). Social support and quitting smoking for good: is there an association? Results from the population study “Men Born in 1914,” Malino, Sweden. *Addict. Behav.*, 15, 221–233.
- Harary, F., Norman, R. Z., & Cartwright, D. (1965). *Structural models: An introduction to the theory of directed graphs*. New York: Wiley.
- Henderson, S. (1981). Social relationships, adversity and neurosis: an analysis of prospective observations. *Br. J. Psychiatry*, 138, 391–398.
- Hirsch, B. (1979). Psychological dimensions of social networks: A multimethod analysis. *Am. J. Community Psychol.*, 7, 263–276.
- Hirsch, B. (1980). Natural support systems and coping with major life events. *Am. J. Community Psychol.*, 8, 159–172.
- Holahan, C., & Holahan, C. (1987). Self-efficacy, social support, and depression in aging: a longitudinal analysis. *J. Gerontol.*, 42, 65–68.
- Holahan, C., & Moos, R. (1987). Personal and contextual determinants of coping strategies. *J. Pers. Soc. Psychol.*, 52, 946–955.
- Holahan, C., Moos, R., Holahan, C., & Brennan, P. (1995). Social support, coping, and depressive symptoms in a late-middle-aged sample of patients reporting cardiac illness. *Health Psychol.*, 14, 152–163.
- Holahan, C., Moos, R., H, C. K., & Brennan, P. (1997). Social context, coping strategies, and depressive symptoms: an expanded model with cardiac patients. *J. Pers. Soc. Psychol.*, 72, 918–928.
- Holmes, J. (1993). *John Bowlby and the attachment theory*. London: Routledge.
- House, J., Robbins, C., & Metzner, H. (1982). The association of social relationships and activities with mortality: Prospective evidence from the Tecumseh Community Health Study. *AJE*, 116, 123–140.
- House, J. S. (1981). *Work, stress and social support*. Reading, MA: Addison Wesley.
- House, J. S., & Kahn, R. (1985). Measures and concepts of social support. In S. Cohen, & S. L. Syme, *Social support and health* (pp. 79–108). Orlando: Academic Press.
- House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science*, 241, 540–545.
- Jones, C. (1995). *Systolic blood pressure and “race”: are black folks aging faster?* San Diego, CA: American Public Health Association Annual Meeting.
- Kahn, R. (1979). Aging and social support. In M. W. Riley, *Aging from birth to death: an interdisciplinary perspective* (pp. 72–92). Boulder, CO: Westview.
- Kahn, R., & Antonucci, T. (1980). Convoys over the life-course: attachment, roles and social support. In P. B. Baltes, & O. Brim, *Life span development and behavior* (pp. 253–286). New York: Academic Press.
- Kamarck, T., Mannuck, S., & Jennings, J. (1991). Social support reduces cardiovascular reactivity to psychological challenge: a laboratory model. *Psychosom. Med.*, 52, 42–58.
- Kaplan, G., Salonen, J., Cohen, R., Brand, R., Syme, S., & Puska, P. (1988). Social connections and mortality from all causes and cardiovascular disease: Prospective evidence from eastern finland. *AJE*, 128, 370–380.
- Kawachi, I., Kennedy, B., Lochner, K., & Prothrow-Stith, D. (1997). Social capital, income inequality, and mortality. *Am. J. Public Health*, 87, 1491–1498.
- Kiecolt-Glaser, J., Fisher, L., Ogrocki, P., Stout, J., Speicher, C., & Glaser, R. (1987). Marital quality, marital disruption and immune function. *Psychosomatic Med.*, 49.
- Kiecolt-Glaser, J., Garner, W., Speicher, C., Penn, G., Holliday, J., & Glaser, R. (1984). Psychosocial modifiers of immunocompetence in medical students. *Psychosom. Med.*, 46, 7–14.
- Kirschbaum, C., Klauer, T., Filipp, S., & Hellhammer, D. (1995). Sex-specific effects of social support on cortisol and subjective responses to acute psychological stress. *Psychosom. Med.*, 57, 23–31.
- Kloudahl, A. S. (1985). Social networks and the spread of infectious diseases: the AIDS example. *Soc. Sci. Med.*, 21, 1203–1216.
- Knox, S., Theorell, T., Svensson, J., & Waller, D. (1985). The relation of social support and working environment to medical variables associated with elevated blood pressure in young males: A structural model. *Soc. Sci. Med.*, 21, 525–531.
- Knox, S., & Uvnas-Moberg, K. (1998). Social isolation and cardiovascular disease: an atherosclerotic pathway? *Psychoneuroendocrinology*, 23(8 November), 877–890.
- Krause, N., & Borawshi-Clark, E. (1995). Social class differences in social support among older adults. *Gerontologist*, 35, 498–508.
- Landrine, H., Richardson, J. K., Klondoff, E. A., & Flay, B. (1994). Cultural diversity in the predictors of adolescent cigarette smoking: the relative influence of peers. *J. Behav. Med.*, 17, 331–336.
- LaRocca, J., House, J., & French, J. (1980). Social support, occupational stress, and health. *J. Health & Soc. Behav.*, 21, 202–208.
- Laumann, E. O. (1973). *Bonds of pluralism*. New York: Wiley.
- Laumann, E. O., Gagnon, J. H., Michaels, S., Michael, R. T., & Coleman, J. S. (1989). Monitoring the AIDS epidemic in the U.S.: a network approach. *Science*, 244, 1186–1189.
- Lin, N., & Dean, A. (1984). Social support and depression: a panel study. *Social Psychiatry*, 19, 83–91.
- Lin, N., Dean, A., & Ensel, W. (1981). Social support scales: A methodological note. *Schizophrenia Bull.*, 7, 73–88.

- Lin, N., Dean, A., & Ensel, W. M. (1986). *Social support, life events and depression*. New York: Academic Press.
- Lin, N., Woelfel, M. W., & Light, S. C. (1985). The buffering effect of social support subsequent to an important life event. *J. Health Soc. Behav.*, 26, 247–263.
- Link, B., & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior, extra issue*, 80–94.
- Lomauro, T. (1990). Social support, health locus-of-control, and coping style and their relationship to depression among stroke victims. Dissertation Abstract. *Dissertation Abstracts International*, 51(5-B), 2628.
- Luxton, M. (1980). *More than a labor of love*. Toronto: Women's Press.
- Major, B., Cozzarelli, C., Sciacchitano, A., Cooper, M., Testa, M., & Mueller, P. (1990). Perceived social support, self-efficacy, and adjustment to abortion. *J. Pers. Soc. Psychol.*, 59, 452–463.
- Marsden, P. V., & Friedkin, N. E. (1994). Network studies of social influence. In S. Wasserman, & J. Galaskiewicz, *Advances in social network analysis: research in the social and behavioral sciences* (pp. 3–25). Thousand Oaks, CA: Sage.
- Matt, G., & Dean, A. (1993). Social support from friends and psychological distress among elderly persons: moderator effects of age. *J. Health Soc. Behav.*, 34, 197–200.
- McAuley, E. (1993). Self-efficacy, physical activity, and aging. In J. Kelly, *Activity and aging: staying involved in later life* (pp. 187–206). Newbury Park, CA: Sage.
- McAvay, G., Seeman, T., & Rodin, J. (1996). A longitudinal study of change in domain-specific self-efficacy among older adults. *J. Gerontol. B, Psychol. Soc. Sci.*, 51, P243–P253.
- McFarlane, A., Bellissimo, A., & Norman, G. (1995). The role of family and peers in social self-efficacy: links to depression in adolescence. *Am. J. Orthopsychiatry*, 65, 402–410.
- Mead, G. (1934). *Mind, self, and society*. Chicago: University of Chicago Press.
- Meaney, M., Aitken, D., Berkel, C., Bhatnagar, S., & Sapolsky, R. (1988). Effect of neonatal handling on age-related impairments associated with the hippocampus. *Science*, 239, 766–768.
- Meaney, M., Aitken, D., Bodnoff, S., Iny, L., & Sapolsky, R. (1985). The effects of postnatal handling on the development of the glucocorticoid receptor systems and stress recovery in the rat. *Prog. Neuro-Psychopharmacol. & Biol. Psychiat.*, 9, 731–734.
- Meaney, M., Aitken, D., & Sapolsky, R. (1991). Postnatal handling attenuates neuroendrine, anatomical, and cognitive disfunctions associated with aging in female rats. *Neurobiol. Aging*, 12, 31–42.
- Mendes de Leon, C., Seeman, T. E., Baker, D., Richardson, E., & Tinetti, M. (1996). Self-efficacy, physical decline, and change in functioning in community-living elders: a prospective study. *J. Gerontol. B, Psychol. Soc. Sci.*, 51, S183–S190.
- Mermelstein, R., Cohen, S., Lichtenstein, F., Beer, S., & Kamarck, T. (1986). Social support and smoking cessation maintenance. *J. Consult. Clin. Psychol.*, 54, 447–453.
- Mitchell, J. C. (1969). *The concept and use of social networks*. Manchester, UK: Manchester University Press.
- Morris, M. (1994). Epidemiology and social networks: modeling structured diffusion. In S. Wasserman, & J. Galaskiewicz, *Advances in social network analysis: research in the social and behavioral sciences* (pp. 26–52). Thousand Oaks, CA: Sage.
- Morris, P. L., Robinson, R. G., Raphael, B., & Bishop, D. (1991). The relationship between the perception of social support and post-stroke depression in hospitalized patients. *Psychiatry*, 54, 306–316.
- Moss, M. B., & Albert, M. S. (1988). Future directions in the study of aging. In M. Albert, & M. Moss, *Geriatric neuropsychology* (pp. 293–304). New York: Guilford Press.
- Murphy, E. (1982). Social origins of depression in old age. *Br. J. Psychiatry*, 141, 135–142.
- Murray, R., Johnston, J., Dolce, J., Lee, W., & O'Hara, P. (1995). Social support for smoking cessation and abstinence: the Lung Health Study. The Lung Health Study Research Group. *Addict. Behav.*, 20, 159–170.
- Nerem, R., Levesque, M., & Cornhill, J. (1980). Social environments as a factor in diet-induced atherosclerosis. *Science*, 208, 1475–1476.
- Oxman, T., Berkman, L., Kasl Jr, S., Freeman, D., & Barrett, J. (1992). Social support and depressive symptoms in the elderly. *Am. J. Epidemiol.*, 135, 356–368.
- Paykel, E. (1994). Life events, social support and depression. *Acta Psychiatr. Scand.*, 377(Suppl), 50–58.
- Rook, K. (1990a). Stressful aspects of older adults' social relationships: current theory and research. In A. P. Stephens, J. H. Crowther, S. E. Hobfoll, & D. L. Tennenbaum, *Stress and coping in later-life families* (pp. 173–192). New York: Hemisphere.
- Rook, K. S. (1990b). Social relationships as a source of companionship: implications for older adults psychological well being. In B. R. Sarason, T. G. Sarason, & G. R. Pierce, *Social support: an interactional view* (pp. 221–250). New York: Wiley.
- Rook, K. (1992). Detrimental aspects of social relationships: taking stock of an emerging literature. In H. O. Viel, & U. Baumann, *The meaning and measurement of social support* (pp. 157–169). New York: Hemisphere.
- Ryff, C. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57, 1069–1081.
- Sapolsky, R., Alberts, S., & Altmann, J. (1997). Hypercortisolism associated with social subordination or social isolation among wild baboons. *Arch. Gen. Psychiatry*, 54, 1137–1143.
- Sarason, B. R., Sarason, I. G., & Pierce, G. (1990). *Social support: an interactional view*. New York: Wiley.
- Seeman, T., Berkman, L., & Rowe, B. D. J. (1994). Social ties and support and neuroendocrine function. *Ann. Behav. Med.*, 16(2), 95–106.
- Seeman, T., Berkman, L., Kohout, F., LaCroix, A., Glynn, R., & Blazer, D. (1993a). Intercommunity variation in the association between social ties and mortality in the elderly: a comparative analysis of three communities. *Ann. Epidemiol.*, 3, 325–335.
- Seeman, T., Rodin, J., & Albert, M. (1993b). Self-efficacy and

- functional ability: how beliefs relate to cognitive and physical performance. *J. Aging Health*, 5, 455–474.
- Shively, C., Clarkson, T., & Kaplan, J. (1989). Social deprivation and coronary artery atherosclerosis in female cynomolgus monkeys. *Atherosclerosis*, 77, 69–76.
- Siebert, S. (1974). Toward a theory of role accumulation. *American Sociological Review*, 39, 567–578.
- Stokes, J. P. (1985). The relation of social network and individual differences in loneliness. *J. of Personality and Social Psychology*, 48, 981–990.
- Storr, A. (1991). "John Bowlby", *Monks Roll*. London: Royal College of Physicians.
- Suomi, S. (1997). Early determinants of behaviour: evidence from primate studies. *British Medical Bulletin*, 53, 170–184.
- Thoits, P. (1983). Multiple identities and psychological well-being: a reformulation of the social isolation hypothesis. *American Sociological Review*, 48, 174–187.
- Thoits, P. (1995). Stress, coping, and social support processes: where are we? What next? *Journal of Health and Social Behavior, extra issue*, 53–79.
- Thomas, P., Goodwin, J., & Goodwin, J. (1985). Effect of social support on stress-related changes in cholesterol levels, uric acid level and immune function in an elderly sample. *Am. J. Psychiatry*, 142, 735–737.
- Tinetti, M. C., & Powell, L. (1993). Fear of falling and low self-efficacy: a case of dependence in elderly persons. *J. Gerontol.*, 48(Special), 35–38.
- Trieber, F., Batanowski, T., Broden, D., Strong, W., Levy, M., & Knox, W. (1991). Social support for exercise: relationship to physical activity in young adults. *Prev. Med.*, 20, 737–750.
- Turner, R., & Noh, S. (1983). Class and psychological vulnerability among women: The significance of social support and personal control. *J. Health Soc. Behav.*, 24, 2–15.
- Uchino, B. N., Cacioppo, J. T., & Kiecolt-Glaser, J. K. (1996). The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for health. *Psychological Bulletin*, 119(3), 488–531.
- Vilhjalmsson, R. (1993). Life stress, social support and clinical depression: a reanalysis of the literature. *Soc. Sci. Med.*, 37, 331–342.
- Wasserman, S., & Faust, K. (1995). *Social network analysis*. Cambridge: Cambridge University Press.
- Weiss, R. S. (1974). The provisions of social relationships. In Z. Rubin, *Doing unto others*. Englewood Cliffs, NJ: Prentice Hall.
- Wellman, B. (1988). The community questions re-evaluated. In M. P. Smith, *Power, community and the city* (pp. 81–107). New Brunswick, NJ: Transaction.
- Wilkinson, R. G. (1999). Income inequality, social cohesion and health: clarifying the theory. A reply to Muntaner and Lynch. *International Journal of Health Services*, 29(3), 525–543.
- Wolf, T., Balson, P., Morse, E., Simon, P., Gaumer, R., Dralle, P. et al. (1991). Relationship of coping style to affective state and perceived social support in asymptomatic and symptomatic HIV-infected persons: implications for clinical management. *J. Clin. Psychiatry*, 52, 171–173.