

Social Supports, Social Networks, and Schizophrenia

by Muriel Hammer

Abstract

This article considers the meaning of "social support" and its relationship to social networks, and discusses a structural approach to analysis of social connections in the study of schizophrenia. The concept of social supports is seen as methodologically more problematic and less strategic than the more connotatively neutral and more structurally oriented concepts of social networks and social connections. It is argued that in terms of research strategy, if social connections are studied structurally as they change and develop over time, the impact of the specifically *social* processes can be better separated from that of the personal characteristics of the focal individual than seems possible with other approaches. Analysis of the properties of the networks around the focal individual, independently of that individual's own social behavior, can help to disentangle the interwoven complex of causes, characteristics, and consequences of schizophrenia.

On purely theoretical grounds, one would expect the social aspects of people's lives to have an impact on their health; and evidence is now beginning to accumulate that this is indeed the case, for overall longevity (Berkman and Syme 1979), as well as for a wide range of physical and psychiatric conditions (Pilisuk and Froland 1978). Regarding schizophrenia, there is a long history of social theory and research, with some strong findings that have, however, been difficult to interpret (for a review, see Hammer, Makiesky-Barrow, and Gutwirth 1978).

The recent surge of interest in the study of *social supports* in schizophrenia represents a significant shift from the study of social variables in terms of a "social category" approach, with inferences about process (as with the use of "social class" in relation to incidence rates for schizophrenia), to a more direct attempt to study the social processes. The social category approach has certainly been of value, but we are probably ready to focus more attention directly on the social processes. In this context, it may be productive for us to concentrate on the fundamental concept of *social networks*, recognizing *support* as one possible function of a network that is related to, but distinct from functions involving routes of access to others, the mediation of information (both true and false), demands, constraints, and so on.

The study of social supports in schizophrenia has been motivated both by the pressures imposed by implementation of deinstitutionalization policies, and by the continuing interest in gaining a better understanding of the impact of social variables on schizophrenia. These two sources of interest do not always coincide. The vagueness and circularity of meaning in most uses of the concept of social support may or may not be directly harmful for the development of mental health programs for community residents; but it is surely not optimal for the pursuit of an understanding of schizophrenia.

A methodological examination of the concepts of "social supports"

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and "social networks" provides an opportunity to consider an approach to studying schizophrenia from a social perspective which is potentially more precise, more general, and more directly concerned with social processes than has been characteristic in this field.¹ The difference between social networks and social supports is not a mere terminological distinction, since it leads to different formulations of the research problems, different choices of the kinds of measures to be used, different perspectives on the role of basic social research, and a different potential for theoretical analysis.

There are several models of the possible role of social factors in health generally, or in schizophrenia specifically. Social factors may be seen as directly causal (in both the formative and triggering senses), as mediators, moderators, buffers, consequences, or, obviously, some combination of these. Thus, for example, the social transmission of highly dysfunctional communication patterns may be developed as an etiological or a mediating model, while the social provision of help in a crisis is a buffer model. The focus on "support" implies a moderator or buffer role; a broadening to "networks" or "connections" leaves open the possible other roles.

Most importantly, however, in terms of research strategy, if social connections are studied structurally as they change and develop

over time, the impact of the specifically *social* processes can be better separated from that of the personal characteristics of the focal individual than seems possible with other approaches. To the extent that we can analyze the properties of the networks around the focal individual, and their effects, independently of that individual's own social behavior, we can help to disentangle the interwoven complex of causes, characteristics, and consequences of schizophrenia.

The position I will try to elaborate here is that, for the study of schizophrenia, the concept of social supports is methodologically more problematic and less strategic than the more connotatively neutral and more structurally oriented concepts of social networks and social connections. In the sections that follow, I will first consider the meaning of "social support" and its relationship to social networks, and then discuss a structural approach to analysis of social connections. Drawing on studies of schizophrenia by Tolsdorf (1976) and by Sokolovsky and his colleagues (Sokolovsky et al. 1978; Cohen and Sokolovsky 1978), I will suggest a reinterpretation, in structural terms, of their findings on relational, *non*structural social variables, and will try to indicate certain advantages, in terms of clarity, productivity, and theoretical significance, of the structural approach.

Social Supports

I will not review here the various specific definitions that have been given, either conceptually or operationally. Although there is probably some consensus on the basic

notion, usages differ in terms of emphasis on material transactions, services, advice or guidance, encouragement, or, more broadly, connectedness. However defined, social support is conceived, somewhat circularly, as contributing positively to the individual. If some behavior—as when a parent offers advice—appears to be helpful, it constitutes support; if the same behavior appears to be harmful, it may constitute something like interference or restraint, but presumably not support. Thus, if a person has close relationships that help in coping with stress, these are considered supports; but if a person has close relationships that are a *source* of stress, these cannot be considered supports. However, in taking as "supports" only those relationships that are beneficial to a person, we have by definition predetermined a positive association between support and good outcome. This kind of circular approach may be useful for some practical purposes, but it is detrimental to the development of a body of precise and reliable knowledge.

One might approach the concept of "support" by attempting to define objectively its specific components—an approach that unfortunately entails a level of detailed ethnographic knowledge (with multiple cultural variants) that is probably unattainable. Alternatively, one might attempt to define support by the subject's perceptions, in response to some questions like "Whom do you turn to for help?" But, paradoxically, individuals who receive more help may perceive it less. Those who are in life situations that routinely provide other people to talk with, assistance with household chores,

¹Although the main points made in this article are not specific to the study of schizophrenia, I believe they may be of special consequence because of the unusual degree of confounding of personal, social, and pathological characteristics in this area.

and so on are apt not to recognize these as "help." A survey by Wellman (1979) of a fairly large sample of normal individuals in Toronto finds that although everyone can name some people as intimates, only a very small proportion of these intimates are named as sources of either emergency or everyday assistance. Interestingly, Pearlin and Schooler (1978, p. 10), in a study of coping strategies, find

self-reliance is more effective in reducing stress than the seeking of help and advice from others. . . . This unexpected finding reminds us that help-seekers are not necessarily the same people as help-receivers. . . . At any rate, it is evident that we do not yet know the conditions under which help from others can be effective.

Support may be one function of a set of social connections. As such, it may prove misleading if we are not alert to the complementary impact of restraint, opposition, demandingness, mere presence, range of access, and whatever-else-may-matter, within these sets of social connections. The focus on "support" rather than on demands, restrictions, or social facilitation reflects a pathology-oriented approach that assumes the need for help in coping with problems to be of primary importance. But perhaps differences in a "demand system" or a "facilitation system" would have meant that some of those problems would not have arisen in the first place, thus obviating the need for the "support system." The kind of tightknit network many of us consider to be supportive may well be the least facilitative for making other necessary connections—

leading to a job, to sources of health information, and so on (see, for example, Walker 1978)—so that we may find in some cases that "more support" is associated with "lower satisfaction and more health problems," or, as in the Pearlin and Schooler (1978) study, that help-seeking is associated with negative outcomes. There is recent work, for example, extending earlier findings that suggest that with a more communal kind of network, one has relatively more commitment/loyalty/cohesion, and relatively less individual achievement/career orientation/self-reliance than in looser networks (Radecki 1978). Without necessarily accepting at face value either the findings or the terminology, one may still be led to ask, is this pattern good or bad? It is, of course, neither or both—good at some times and for some things, bad for others.

Related to the concern with support is the almost exclusive concentration on studying people's *close* relationships, when so far as we now actually know, what may matter most over time could be the weak or the distant connections (see, especially, Granovetter 1973)—directly with one's acquaintances, and indirectly with such people as the friends of one's friends, with whom one may not even be acquainted. These second-order connections strongly affect the conditions under which the individuals directly connected to a focal person respond to that focal person. Second-order connections are also a major source of new direct connections for most people (Hammer, unpublished data). It might be noted here that on the basis of our knowledge so far, what appears to distinguish

working class from middle class (particularly professional) networks is the size of the network of weakly linked, seldom-seen individuals rather than the size of the network of close, frequently seen connections (Walker 1978; Pool and Kochen 1978).

Social Network Approaches

Another approach taken in some studies of supports in effect translates the concept of social support into the more researchable concept of "social connections." Support and connections are not equivalent, however, and we might more profitably study social connections explicitly, without the encumbrance of the concept of supports. Social connections are distinctively social and definitionally neutral, unlike support, which generally implies some psychocultural and possibly biological benefits.

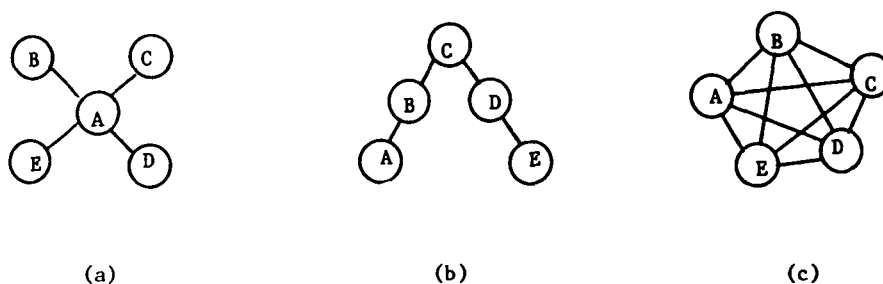
My main point, then, is that instead of measuring what we can only arbitrarily define as "support," we should measure sets of social connections, or networks, analyzing the parameters of social networks to see what relationships they have to each other, and what bearing they have on a variety of possible consequences. Social networks have a complex of parameters, with multiple potential consequences of variation in any of them; and the various aspects of the microsocial system can be studied with less confounding if we are not limited by the notion of support.

Regardless of personal characteristics, cultural patterns, or genetic variations, human beings are fundamentally social animals, perhaps as much so as the social insects, for whom the isolation of

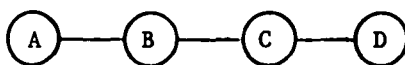
an individual is rapidly lethal. The study of a truly social dimension of social phenomena barely exists—studies in the social domain are apt to be psychological, cultural, or even biological in orientation, rather than strictly social in the sense of concern with patterns of social contact per se. I think a strong argument can be made that the understanding of schizophrenia requires a largely unexplored “purely” social dimension, and I would like to touch on the implications of this orientation for a strategy of research. Although careful research from a variety of perspectives is undoubtedly called for, I believe that analysis of what I will call structural variables, systematically related to normal social processes, can move us furthest.

By “structural” variables, in this context, I mean variables defined in terms of patterns of connections (networks), rather than by the content or quality of relationships. The potential advantages of such variables for research on schizophrenia are that they readily lend themselves to precise, nonarbitrary definition; they are inherently comparable across populations and across studies; they are logically independent of the personal characteristics of the participants; and they can be related to a growing body of information on network processes in normal populations. I will attempt here to indicate illustratively how such an approach might work, and how it might help to cope with one of the major problems in this area—namely, the disentangling of the causes, the manifestations, and the direct and indirect consequences of schizophrenia.²

Figure 1. Examples of network structures



It may be useful to begin by dealing more specifically with approaches to measurement of social connections. Two basic approaches derive from studying *structure* and *content* of the sets of connections in a network—the structure being roughly a multidimensional geometry of the network, and the content being concerned with the nature of the transactions involved in the connections. Thus, for example,



is a linear structure (A is directly connected with B, and B is directly

²Because it is impossible in one article to deal with all the methodological complexities of an approach, or even with all the major ones, many issues will be slighted. Of particular importance, the following should be mentioned: I have not discussed reliability or validity (but see Hammer 1980b). Also, I have oversimplified the sense in which structural variables are precise, comparable, and so on. They are indeed potentially so; but it is not always easy to achieve this.

connected with C, but C is not directly connected with A, etc.) whether it consists of four mountain climbers linked by a rope, or three linked pairs of friends (AB, BC, CD). This doesn't mean that structure and content are totally independent of each other—for example, information exchange (a form of content) is necessarily different in differently structured networks, such as (a) a hub, (b) a chain, and (c) a completely interconnected set. (See figure 1.)

In the hub (a), A controls all message transmission; in the chain (b), an inactive link can block transmission to the rest of the chain. In neither the hub nor the chain do any of the recipients of the message have a potentially redundant source with which to check the accuracy of the message. In the completely interconnected set (c), any message can go to anyone, and can be checked directly with anyone else: message transmission is less efficient (see, for example, Bavelas 1950) but probably more accurate (Caplow 1960). Viewed from the opposite perspective, these different sets of information pathways create or consti-

tute differently structured networks.³

Such structural differences in the form of the network have at least probabilistic consequences. For example, the connections in the completely interconnected set are all *structurally supported* by adjacent common connections whereas none of the connections in the hub or the chain have structural supports. Structural support is not defined by the content of the relationship, but only by the pattern of connections; however, it does affect the likelihood of a relationship being maintained or severed (Hammer 1980a). The differences in these structures do not imply that if B lost a job or broke a leg, A necessarily would or would not come to B's assistance, as a function of being connected in a hub or chain or completely interconnected set. Nonetheless, these structures should be associated with different tendencies. In the hub, B can be dropped without affecting the other connections, unlike the other two forms; in the interconnected set, C, D, and E can help A to help B, who is equally

connected to each of them, unlike the other two forms. It might be noted also, in view of the findings on reciprocity (or symmetry) to be discussed later, that of these three forms of networks, the interconnected set has structurally only symmetrical connections; the connections in the hub are all fully asymmetric, each being a center-periphery connection; and each connection in the chain has some degree of asymmetry in terms of differential access to the rest of the chain by the two members of the connected pair. (But if the chain were made a circle, by the introduction of an AE connection, all connections would be symmetrical.)

Structural support for a given pair of individuals in a network can thus be defined in terms of their number of common connections. I have some evidence that the number of common connections affects the probability of the maintenance or severance of connections over time (Hammer 1980a); whether the number of common connections is also associated with the likelihood of giving and receiving material and emotional help is an empirical question. It is, however, clear that a severed connection is not a source of aid; and for schizophrenic patients (Hammer 1961, 1963-64), as well as for normal subjects (Hammer 1980a), connections which are not structurally supported by common other connections have a relatively high likelihood of being severed.

Let us consider one other network function, distinct from structural support but potentially as important for the study of schizophrenia. This might be called social facilitation, or range of access

to others. Here the relevant values are almost the opposite of those involved in support. Support, structurally, rests on redundancy; but judged by an access criterion, every redundant connection wastes social energy. Given 10 connections of a focal individual, all connected, but only with each other, one has access through those 10 connections only to the same 10 connections; whereas given 10 connections, each with 10 other connections, one has access through those 10 connections to 100 connections. We have only some preliminary information on what mix of structural support and access may be found in normal populations (Pool and Kochen 1978; Radecki 1978; Walker 1978)—but no good information as yet on even normal variation in different communities, or for men and women, or at different parts of the life cycle (see Fischer et al. 1977; Cubitt 1978). We also have no information at this time, except by rough inference, on what may be desirable under different conditions of life transition. For migration, perhaps a low-density, far-flung network gives better access; for a crisis (e.g., if a young mother gets sick) perhaps a high-density, close network with greater structural support provides more help in caring for her children. Nor do we have any information on what network patterning might give the best overall "social insurance."

Hirsch (1979, p. 271), in a study of college students, finds that "students in high density [social networks] received significantly more social and emotional support than did students in low density [social networks]"; whereas ". . . students in low . . . density [social networks] reported a significantly

³Outside the laboratory, such forms are all abstractions from more complex networks. In the real social world, approximate examples of these forms might be: (a) for the hub, the radio dispatcher transmitting to and receiving from each of a set of cab drivers who are not directly in touch with each other; (b) for the chain, a tenant paying the rent to a doorman who gives it to the building manager who gives it to the landlord; or, less formally, A might be a friend of B, who is sister to C, who lives with D, who works with E, etc.; and (c) for the completely interconnected set, a small work team, or the members of a household, or a high school clique.

higher mean satisfaction with their emotional support."

So far this is all on the positive side. But connections also make demands, create constraints, and engender stress. In the life event measurement scales, one of the highest stress events is the death of a spouse—to which only married people are subject. You also cannot have a sick child if you don't have children; and you don't have to worry about your friends' approval if you don't have friends. There is considerable pressure imposed by one's connections on one's opinions, attitudes, and general lifestyle. To take one example, a network of heavy drinkers may not be the healthiest social environment for an incipient alcoholic. (On the other hand, Alcoholics Anonymous relies on the pressure provided by a network of individuals for avoiding alcohol. The social mechanism appears to be the same, both for increasing and for decreasing the intake of alcohol.) Or, for those who remember "Doc," in Whyte's *Street Corner Society* (1955), it seems clear that his options were severely restricted by the demands imposed by his large active set of connections. In a slightly different vein, the study by Brown et al. (1977) of a rural island in Scotland found that while the more connected or more integrated women did, as expected, show lower rates of depression, they also showed higher rates of anxiety than the less connected women. Apart from a few examples, however, we do not yet know much about the impact of the constraints imposed by one's connections. One would expect that relatively sparse connections among the subsets or clusters of one's network would diminish con-

straint, while, of course, also reducing feedback and redundancy.

A Structural Examination of Some Nonstructural Network Findings in Schizophrenia

In turning to some of the most relevant work in schizophrenia, I should first note that there are almost no purely structural network studies in the area. What mainly characterizes such approaches is not what aspect of a relationship is selected for study, but that whatever content one uses to define a connection, it is the *pattern* in a *set of connections* that is analyzed. Such structural analysis incidentally also sheds light on the "meaning" or "value" of each dyadic relationship, which cannot be well understood in isolation from the patterns in the relevant set of relationships.

I will try to illustrate the advantages of a structural approach to analysis of social connections by reexamining two of the nonstructural variables in the recent studies of the social networks of schizophrenic individuals by Tolsdorf (1976) and by Sokolovsky and his colleagues (Sokolovsky et al. 1978; Cohen and Sokolovsky 1978). "Reciprocity" and "multiplexity" (which will be defined below) are found to distinguish the social connections of schizophrenic and nonschizophrenic subjects in both studies, despite the fact that these variables are not identically defined in the two studies. These variables are also associated, in the study of Sokolovsky et al., with symptom level and with the likelihood of return to the hospital. These variables are explicitly viewed, in both studies, as rela-

tional or content variables rather than as structural or morphological social variables. That is, they are measures that characterize a relationship rather than measures that characterize a network, which is a set of relationships.

For *reciprocity*, or directionality of a relationship, each relationship is judged in terms of the relative degree to which the focal person provides service or help of some sort to the other person, or receives it from the other person (referred to as "dependence" by Sokolovsky et al.). No criteria are given for these judgments, but both studies find that their schizophrenic subjects are markedly unbalanced in their giving and receiving relationships, while the nonschizophrenic subjects are not. Interestingly, the schizophrenic subjects seem to *receive* as much support as the nonschizophrenic subjects; what they lack is people to whom they *give* support.

The Tolsdorf and Sokolovsky studies also both find that the schizophrenic subjects have markedly fewer *multiplex* relationships, as against uniplex relationships, than do the normal subjects. Multiplex relationships are defined by

the extent to which network members have multiple role relationships with each other; e.g., they are simultaneously kinfolk, neighbors, and members of a common church. This condition of *multiplex* . . . social bonds contrasts with social links based upon only one role relationship . . . e.g., a network of neighbors or of co-workers in an office. [Chrisman 1977, p. 365]

As used by Tolsdorf (1976),

The number of content areas is almost infinite, so I will confine myself to twelve broad content areas: primary kin, secondary

kin, primary friend, secondary friend, economic, recreational, political, religious, sexual, fraternal, mutual aid, and service. These categories are not all mutually exclusive, and they may occur in any combination in any given relationship. . . . linkages containing only one content area [should] be called uniplex and relationships containing more than one content area be called multiplex. [p. 409]

Cohen and Sokolovsky (1978) use a related concept for

differentiating *uniplex*, or single-stranded relations in which links represent only one type of content (e.g., visiting and conversation, personal assistance, loans) from *multiplex*, or multistranded, relationships that contain more than one content. [p. 548]

Thus, although there is some agreement on the kind of distinction involved in this variable, the specific definitions are different from each other, and are clearly rather arbitrary. (Breaking "infinite" content areas into a manageable number of categories is unavoidably arbitrary unless it rests on prior analysis as elaborate and culture-specific as is done, for example, in deriving the phonemic system of a particular language.) Whatever the definition, however, there is generally an expectation that multiplex relationships are stronger, more important, and more "supportive" than uniplex ones; and the schizophrenic subjects in both studies have fewer such relationships.

Turning first to reciprocity, the reciprocal or nonreciprocal giving and receiving of aid between two individuals is not easily translated into a structural variable, but there are structural approaches to "symmetry" of network connections that might be used. I should

note here that fundamentally the directionality of a relationship between two people can only be judged in terms of the role of actual or implicitly assumed third parties. If A gives B money, for example, both are participating in the transaction: the significance of it, in terms of the directionality of the relationship, is different if B then uses the money to pay A's landlord or to pay B's landlord.

Let me briefly describe three kinds of measures we have used that do not rely on judging the quality of a relationship, and which lend themselves to structural analysis of subgroups or whole networks: (1) whether each individual speaks to others (among a delimited set) as much as, or more or less than, they speak to that individual; (2) the extent to which the individuals in some delimited set name each other, reciprocally or nonreciprocally, as being part of their personal networks; and (3) the extent to which connected individuals balance in their acquaintanceship overlap—i.e., the proportion of the individuals in A's regular network of connections known to B, as compared with the proportion of B's regular network of connections known to A. The last approach should also reveal the extent to which one individual's relationships all tend to be mediated through another—a pattern reported for a number of schizophrenic patients (Hammer 1961; Kostant et al. 1979), and which is likely to distort findings on network size and other variables if not taken into account.

These measures seem to me to be advantageous partly because they can be precisely defined; but primarily because—whatever the content that defines the

connection—they are oriented toward analysis of the pattern in the set of connections. Each of these measures is, of course, derived from some aspect of the relationships among interacting individuals; but each is based on a distribution among a set of connections rather than on dyadic relationships considered separately. The potential advantages of such structural analysis over measures of an individual's degree of "dependence," or of the direction of assistance in the relationship, are that, in addition to precision of definition and measurement, they are more readily comparable across studies and across populations. Their meaning can be investigated in terms of normal processes, independent of the personal characteristics of the focal individual. This does not mean that personal characteristics have no bearing on whether someone has many dependent relationships, or more generally asymmetric interactions;⁴ it means only that the sets of relationships can be studied independently of those

⁴We have, for example, some evidence that people with more unbalanced interaction patterns, as defined by the fact that they speak to others in the network more or less than those others speak to them, tend to have initially lower measures of the predictability or comprehensibility of their speech (Hammer, Polgar, and Salzinger 1969). Let me emphasize that this finding is from normal subjects. But given the mass of work on aberrations of communication in schizophrenia (see, e.g., Hammer and Salzinger 1964 and review by Salzinger 1973), it may be worth looking at the communicational process in terms of variations in normal social processes, for sets of connections not limited to the nuclear family.

personal characteristics. For example, the degree of reciprocity, or symmetry—or “dependence”—can be examined for the network as a whole rather than merely for the focal individual’s own direct relationships, as is done by Tolsdorf and by Sokolovsky et al. Thus, if “dependence” can be adequately assessed, it too can be analyzed in terms of the set of relationships into which it fits. Given a focal individual with mainly dependent relationships, what is the nature of the surrounding relationships? Is there a set of mainly reciprocal ties that accommodate the one node of non-reciprocity; or a whole network of nonreciprocal connections that balance out as a totality; or a network with nonreciprocal connections that produce great strains and shifts over time?

Certain types of networks seem quite normally to have more non-reciprocal relationships than others. Specifically, for the measures we have used, we have found that small locality-based networks (e.g., groups whose participants interact repeatedly in a neighborhood bar or clubhouse) have greater asymmetry than more open, branching networks (Hammer, in preparation). It may be worth exploring whether there is any tendency, for reasons that need not be integral to schizophrenia, for schizophrenic individuals to have an unusually high proportion of their relationships through such groups. If this were the case, it would not necessarily imply that the finding is trivial, in the sense that it does not *underlie* schizophrenia. It would mean, however, that it should be pursued differently (both in terms of research and therapeutic interven-

tion) from the ways one would pursue it if the *network* were as symmetric as most, but the focal individual’s relationships were not.

With regard to multiplexity, one approach to a more structurally oriented definition than those used in the studies of Tolsdorf and Sokolovsky et al. would rest on the assumption that when pairs of individuals have several common sets or clusters of connections, this reflects multiple contexts of activities in their relationships. A typical social network has several internally interconnected clusters of individuals, some of whom also interact with network members outside their own highly interconnected cluster. These individuals may be said to have multiplex relationships with the focal individual. What this approach should enable us to do is to go beyond the question of how the networks of schizophrenic subjects differ from those of normal subjects, and to analyze these differences in terms of some of the normal processes governing them. This would include an examination of the conditions affecting the likelihood of such cross-cluster connections—such as the duration of the connections.

Measures of Clustering

One other measure from studies of Tolsdorf and Sokolovsky et al., network density, is worthy of discussion here; it is the main structural measure commonly used in network studies and indicates the extent to which the individuals connected to a focal individual are also connected to each other. Neither study finds any significant differences in network density for

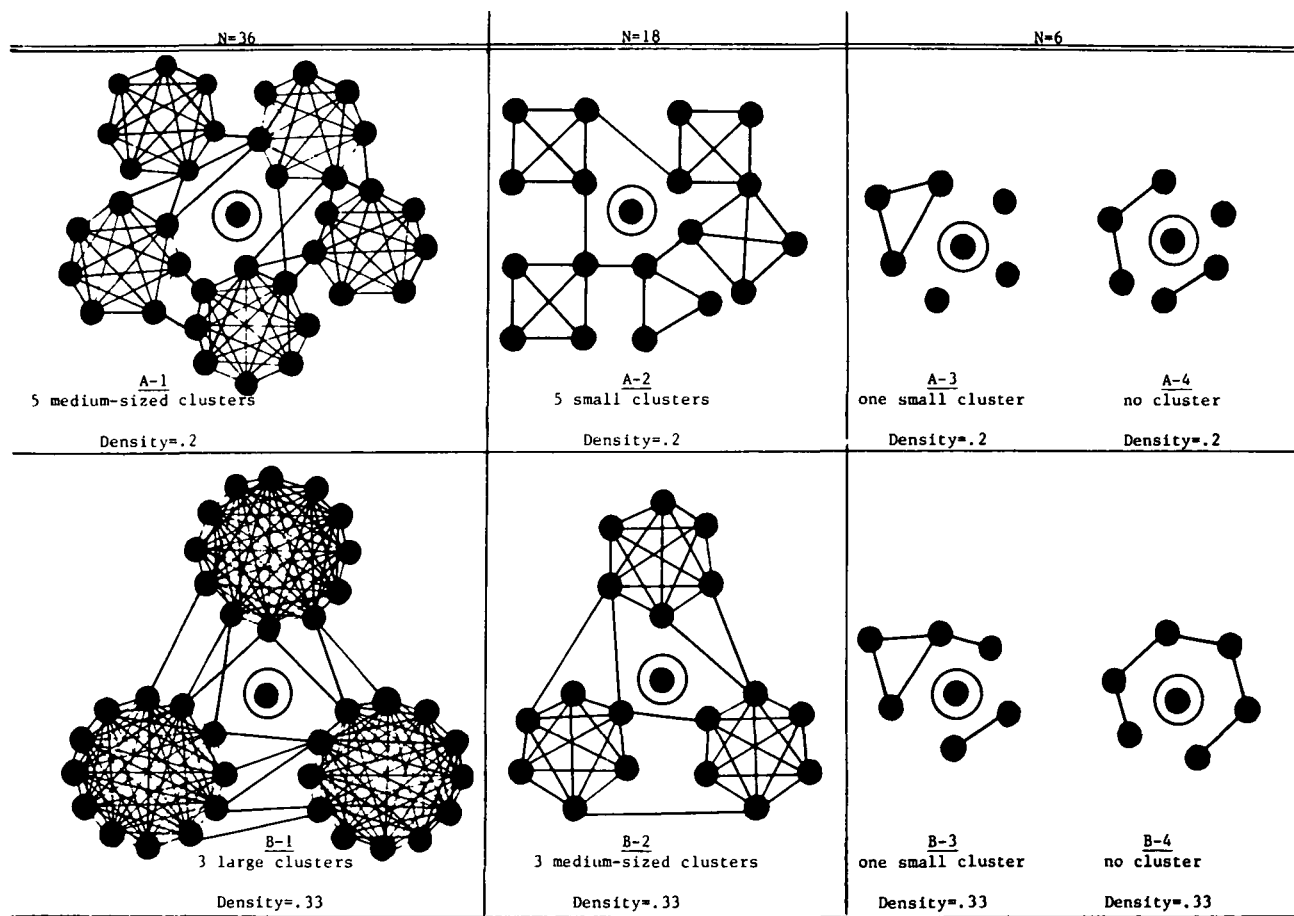
their schizophrenic and nonschizophrenic individuals. One may interpret this to mean that the networks of schizophrenic and normal individuals are structurally similar, or one can turn to the structural components of the density measure to look further for meaningful differences. Interestingly, density measures for personal networks generally show a rather limited range of variation across studies, a phenomenon that Cubitt (1973), for example, complains about in discussing her attempt to compare the immediate personal networks of British middle class and working class families. Since density is measured as the ratio of actual to possible connections among a set of N individuals, the denominator for the ratio is based on N^2 , and one might therefore expect density to decrease rapidly as N increases. That this is *not* so, for network sizes varying from 18 to 53 in Cubitt’s data, and up to 100 in the networks I have studied (N^2 from less than 400 to 10,000), reflects a property of networks that may well be universal for human beings (and possibly for other primates, but probably not for social insects)—namely, that networks of any size above a very small N are composed of a number of tightly connected sets (or clusters) of individuals, with a scattering of connections across the clusters. Typically, for the material so far available, there are about six people, fully or almost fully interconnected (about 70–100 percent connected in Cubitt’s data), in each of five or six clusters, with some cross-cluster connections (about 5 percent of possible connections in Cubitt’s data), and possibly a few relatively unconnected individu-

als. In the illustrative schematic diagram (Figure 2, see panel A-1) of a network with an N of 36, with five clusters of 7-8 members each and a few connections from each cluster to the other clusters, network density is .2, which is a commonly found density value. If we have the same N (36), but only three clusters (as in panel B-1), density increases to .33. If, instead, we halve N , but keep the

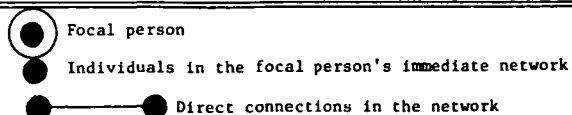
same number of clusters, we continue to get the same density values—for five clusters, .2 (panel A-2); for three clusters, .33 (panel B-2). (Similarly, any increase in N , without change in the number of clusters, yields the same density values.) Very small networks, however, do not follow the same pattern (see panels A-3, A-4, B-3, B-4), since they are quite restricted in the number of clusters possible.

With respect to the density findings in the studies of Tolsdorf and Sokolovsky et al., and those reported also by Pattison et al. (1975), two points should be noted; these have to do with the size of the network, and with the number of clusters composing it. First, if N is very small, as is the case in the data of Sokolovsky et al. and Pattison et al., there may be no inter-connected cluster, only one, or at

Figure 2. Relations among network size, density, and clustering



Note: Each cluster is diagrammed as a completely interconnected set; and where there is more than one cluster, some cross-cluster connections are also shown. For visual simplicity, connections between the focal person and the individuals in the focal person's network are not indicated.



most two. A density measure for a very small network that is in the same range as is found for larger networks (as reported in the study of Sokolovsky et al.) therefore reflects a very different pattern, as indicated in the preceding diagrams for $N = 6$ —namely, that there is virtually no clustering and mainly a scattering of individuals with only as many connections as are usually found across clusters. By contrast, a very high density measure (as in the findings of Patison et al.) means there may be only a single cluster. As has already been suggested by Cubitt (1973) and Niemeijer (1973), cluster and cross-cluster measures may be more sensitive structural measures than overall network density, and should be more revealing for our purposes as well. In Tolsdorf's data, where the average size of the network for schizophrenic patients is not significantly smaller than for normal networks, the values reported for the kinship segment of the networks suggest that the density of connections among nonkin may be relatively low, although the data are unfortunately not presented in a way that makes such an analysis possible.

More generally, for any measures that may be found universally to have a limited range under normal conditions—as is the case, in a preliminary way, for density, based on clusters of connections—we can begin to explore the mechanisms governing that limitation of range, and the consequences of moving outside of it.

Perhaps I should add here that both the size of the network and the temporal characteristics of one's connections may be quite important. While neither of these is quite what I mean by a structural

variable, both of them have strong implications for structural (as well as nonstructural) variables, as has been indicated above for the relationship of size to density. With regard to the temporal characteristics, Silberfeld (1978) has found that a major difference in the socializing of psychiatric and nonpsychiatric patients was that the average amount of time spent with others was lower for the psychiatric patients. FitzGerald (1979) has found that initially uniplex relationships tend to become multiplex over time; we have found that density or interconnectedness increases as a function of the duration of the connections (Hammer and Schaffer 1975); and that asymmetric relationships are more likely in a group setting—that is, where people spend time with a set of others, rather than in one-to-one interactions (Hammer, in preparation). Hallinan (1978) has found (for schoolchildren) that asymmetric friendship choices are an early phase of friendship formation, and tend more often to become null than mutual. One possible implication for the low symmetry and multiplexity of the schizophrenic subjects in the studies of Tolsdorf and Sokolovsky et al. is that they have an unusual proportion of recent relationships.

Methodological Conclusions

How might a structural approach help to deal with issues of causes, signs, and consequences of schizophrenia? Let me say clearly, to begin with, that no methodology is magical, and this approach will not solve the multileveled, complex problems of inadequate definition, ambiguity of time of onset, or confounding of the social

effects of schizophrenia with the social effects of modes of treatment. However, some of the properties of a social network are essentially independent of any particular focal individual, and to the extent that we can analyze the networks around the focal individual rather than analyze the focal individual's social behavior, we may derive some advantages. If there is recruitment or loss in the focal individual's second order network, followed by change in the focal individual's symptoms, the social change is more likely a trigger than a reflection—e.g., the marriage of a close friend is not likely to be symptomatic of the focal person's illness, but is likely to affect the organization of the focal person's connections. (The approach also permits the use of retrospective material, particularly if it is on second-order connections, and obtained from people around the focal individual, since this material is probably subject to less bias than is usually the case with retrospective data on schizophrenia.)

If we are to collect data on second-order networks, on large sets of weak connections, on processes over time, with careful verification of information, is the amount of work so massive as to be totally unrealistic? I think two answers are called for here. First, it should be recognized that the job may indeed require many years of basic work. There is no reason to suppose that social processes are less complex than biological ones, and we do not expect to understand genetic mechanisms in schizophrenia without considerable effort expended in understanding genetic mechanisms more generally—in sweet peas and fruit

flies as well as in human beings. If we limit our conceptualization to social support as a possible buffer against stress, and measure this with the most conveniently available sources of data, we may be able to demonstrate that people who see themselves as having supportive relationships are better off than others, but we will have learned little about social mechanisms in schizophrenia.

Second, there are obvious strategies of research that can yield relevant information even before the millennium arrives. If we can acquire some firm knowledge through intensive work with small samples, we are then in a better position to develop measures applicable on a larger scale. If we use measures that make a clear distinction between the informant's social supports—or more generally, social connections—and the informant's perception of them, we are in a better position to make inferences that can guide further work. If we use longitudinal designs—even short-term ones—we can study the critical processes, and can better analyze what precedes and what follows. If we select strategic populations, we can increase the value of findings on small samples. And if we develop testable theoretical models, they can direct our choice of measures, as well as help to integrate the findings from diverse studies.

My own theoretical inclination in relation to schizophrenia, for reasons I have tried to develop elsewhere (Hammer and Zubin 1968; Hammer 1972; Hammer, Makiesky-Barrow, and Gutwirth 1978), is to use a social feedback model of cultural predictability, in which one's social orientations and social performance—including

one's ways of maintaining and forming connections—are viewed as being shaped over time by the feedback mediated through one's changing networks of connections. For this model, the most appropriate measures seem to me to involve the number of clusters in a personal network, their connections with each other, and their connections out to the larger social system; and the role of these in mediating social communication and the acquisition and maintenance of social skills. Such a model lends itself to hypotheses that, I think, can be tested concerning the implications over time for schizophrenia of structural distortions in the transmission pathways of both direct and indirect networks of connections.

Whatever the theoretical model, however, it seems plausible—both intuitively and by inference from a wide range of studies—to expect that the ways in which people are connected with each other have relevance to schizophrenia: to its occurrence, its impact, and its course over time. There is a long history of interest in the study of social variables in schizophrenia, but despite considerable ingenuity and effort, clear relationships still elude us. This is partly due to the difficulties involved in defining appropriate populations for study, in assessing time of onset, in disentangling causes from manifestations or consequences of schizophrenia; and partly due to the wide range of social concepts and methods used, which has not been conducive to forming a coherent interpretation of findings. The recent sense of renewed optimism in this field, around the role of "social support," probably derives as much from its apparent conceptual

unity as from the encouraging findings on the relevance of social connections to both psychiatric and physical health conditions. A number of studies of the impact of social connections on health have obtained positive results, despite the fact that they have used fairly crude measures. In the case of schizophrenia, however, whose manifestations are so prominently social in quite complex ways, such crude measures can yield only confounded results. To permit any adequate interpretation of findings, we must develop more rigorous approaches. I have suggested here that an approach emphasizing the structural properties of sets of social connections can potentially yield greatest precision, comparability, and theoretical significance.

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Acknowledgment

The author acknowledges the critical help of some very supportive colleagues: Drs. Susan Barrow, Chris Beels, Vivian Garrison, Linda Gutwirth, Sylvia Polgar, Samuel Sutton, and Joseph Zubin.

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Families Today

Families Today: A Research Sampler on Families and Children has been published by HEW's National Institute of Mental Health. The two-volume publication features 37 NIMH-supported research projects that are representative of the full scope of NIMH interest in both the problems confronting and the strengths of families.

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