

social networks and schizophrenia*

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In this article we will consider the role of sociocultural factors in schizophrenia from the perspective of social network theory. Although research on any aspect of schizophrenia confronts basic conceptual and methodological issues, certain problems seem special to social research. Underlying these special problems is the absence of a unifying framework of social analysis—a framework that we believe a social network approach can provide.

Theoretical models of the source of schizophrenic pathology (or pathologies) have implicated genetic-organic variables and a range of sociocultural variables. Available evidence lends support to both genetic and social views of schizophrenia, but gives no clear indication of the more specific variables and mechanisms involved in either kind of model, or of their relationship to each other.

It seems clear that the risk of schizophrenia increases as a function of closeness of genetic relationships to schizophrenic kin, even when certain potentially confounding social variables are controlled (see, for example, Heston 1966); but it is also clear that both conceptually and quantitatively, this association is insufficient, by itself, to account for the occurrence of schizophrenia. Thus, for example, studies of the relatives of schizophrenic patients show no family history of schizophrenia for most patients (Abelin 1972); and identical twins are not found to be 100 percent concordant for schizophrenia, but—especially in the more recent studies—perhaps only 40 percent concordant (Allen, Cohen, and

Pollin 1972; Gottesman and Shields 1973; Pollin 1972).

With respect to social factors, strong associations are found between a number of social variables and aspects of the distribution, forms, and course of schizophrenia. Although alternative explanations are possible for most of these findings, a range of evidence—from studies of the friendship and family interaction patterns of schizophrenic individuals, to differential incidence and prognosis for schizophrenia in populations defined by social and cultural variables—suggests that social conditions play a significant role in the incidence and course of schizophrenia.

The difficulty in investigating which social factors are most fundamentally relevant to schizophrenia, and how they operate, has several major sources. Schizophrenia itself (and psychopathology more generally) remains an elusive phenomenon; research into virtually all its aspects has been hampered by diagnostic uncertainties even within a given cultural group, and rendered still more difficult by the variations in schizophrenic symptomatology that are found across cultural groups. Diagnostic and larger definitional problems, however, are obstacles that social research shares with other approaches in psychopathology, such as genetic research. But unlike genetic approaches, the difficulties of social research are compounded by the lack of a universal, quantitative framework on the basis of which to formulate strategic questions and integrate sets of findings.

The kinds of social variables that would be most powerfully explanatory in relation to schizophrenia would involve factors that can be expected to occur differentially within apparently similar social environments, yet are consistent

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with known large-scale differences in incidence of schizophrenia as a function of membership in such grossly defined social groupings as social classes or cultural groups. A number of relevant hypotheses, based on such concepts as social stress, cultural ambiguity, conflict of values, and social isolation, have plausibility and some empirical support. But although these hypotheses are in no necessary competition, since they may well be different aspects of a common process, the results of different studies cannot readily be related to each other. The findings in this area are conceptually too diverse, and the interpretations of them too often *post hoc*, for any common process to emerge.

We believe that the development of a unifying framework for social research is of critical importance, and that the concept of the social network may provide an appropriate foundation for it. An individual's social network consists of his or her direct social contacts, the relationships among them, and their relationships with others who are not directly connected to the focal individual. Such links may be thought of as the basic building blocks of social structure; and their formation, maintenance, and severance are universal and fundamental social processes. A theory of how these processes work can potentially yield concepts and methods precise and general enough to deal with some of the problems involved in assessing the role of social factors in schizophrenia and the mechanisms by which they operate.

Before going on to examine the conceptual and empirical properties of social networks, we should perhaps reiterate that we are not suggesting an exclusively sociocultural etiology for schizophrenia. Rather, we assume that neither a genetic-organic nor a sociocultural source is typically sufficient and specific with regard to the onset of schizophrenia or the recurrence of episodes. The same organic disposition may be consistent with quite different adaptations just as the same social conditions may allow for different outcomes. The schizophrenic outcome may be seen as the consequence of an interplay between organic factors and factors in the social environment. We will be concerned here with the social environment, conceptualized in terms of social network variables.

General Characteristics of Social Networks

The social network concept has undergone considerable development in the last decade. In early work by anthropologists, the concept was primarily used as a metaphor to characterize the interpersonal relationships which crosscut the well-defined groups and sectors of pre-industrial societies, giving a measure of integration or cohesion to otherwise discrete segments (see, for example, Gluckman 1959; Nadel 1957). By 1961, however, Eisenstadt (1961, p. 209) was suggesting that the network concept "to some extent provides a potentially new analytical tool" in the study of complex societies, and there is by now a significant body of empirical work in anthropology and in social science more generally that systematically analyzes regular properties of social systems in terms of social networks.¹ Network analyses have been applied to such diverse problems as migrant adaptations (Abu-Lughod 1961; P. Mayer 1961, 1962; Phillpott 1968), participation in voluntary associations (Wheeldon 1969), election campaigns (A. Mayer 1966), political movements (Gerlach and Hine 1970), conjugal roles (Bott 1957, 1971; Kapferer 1973), and medical practices (Coleman, Katz, and Menzel 1957). As investigators have shifted from a metaphoric to an analytic use of the network concept, common usages of terminology, techniques of data collection, and modes of data analysis have begun to emerge. (See collected articles in Mitchell 1969, and Boissevain and Mitchell 1973; see also reviews by Bott 1971, Mitchell 1974, and Whitten and Wolfe 1973.) Recent efforts to apply rather sophisticated forms of mathematical analysis to network data (AAA Symposium 1977; Leinhardt 1977) are part of the growing methodological and theoretical development in this area.

As is the practice in this field of inquiry, our use of terms and methods has been adapted to

¹This work also has historical connections with the sociometric studies initiated in the 1930s by Moreno (1934), with small-group studies (e.g., Bavelas 1950), and with the work on interaction patterns by Arensberg, Chapple, and others (e.g., Chapple with Arensberg 1940), although the methodology and the emphases are rather different. (For a discussion of the differences between sociometric and social network analyses, see Killworth and Bernard 1976.)

the particular problems and contexts of our research, but our usage is in general consistent with that of others (e.g., Barnes 1969; Bott 1971; Mitchell 1974; Whitten and Wolfe 1973). We use the general term *social network* to refer to the connections among a set of individuals. From the point of view of any given individual, these connections include not only the links with people he or she knows directly and the links among them, but also the indirect connections which link the initial (focal) individual to larger sets of people, such as friends of friends. To distinguish the different orders of an individual's social network, we use the following concepts:

- The *immediate or personal network* consists of the connections linking a given individual with others and the connections linking those individuals with each other;
- The initial individual's *second order network* consists of the connections linking the members of the immediate network with *their* immediate networks; and
- The *extended network* includes the further connections linking these sets of individuals into larger populations.

Research approaches and findings regarding regular properties of social networks should provide some necessary baselines for studying the networks of schizophrenic individuals.

Any social form, social event, or social institution, whatever its nature, can be analyzed in terms of the sets of connections linking individuals either directly or indirectly. The kinds of variables used in such an approach include network size, degree of interconnectedness, boundedness, symmetry, and so on—variables defined quantitatively in terms of the clustering of connections among individuals.

This approach requires abstracting from the many aspects of human social relationships those nontrivial dimensions which, from this perspective, are presumed to underlie qualitative variations in the social relationships of particular individuals and cultural groups. The quality of interaction in a relationship and its meaningfulness for the participants are undoubtedly of great importance, but these characteristics are not directly comparable across individuals or across populations. For example, it would be difficult to arrive at criteria for assessing

the quality of the relationship between husband and wife that would apply equally well to monogamous spouses in nuclear family households and to polygamous spouses in extended kin households; or even to husbands and wives who are small farmers in contrast to spouses who are residents of large urban centers; or to couples with and without children. However, the complexity of social feedback or the degree of social support that may be provided to husbands and wives by more or less separate networks, or by smaller or larger or more or less interconnected ones, while often less obvious to the participants, involves processes that can be studied in comparable terms despite differences in cultural norms and definitions. The pervasiveness of sets of personal connections, or networks, makes it possible to examine a wide range of social and cultural variables—such as those used in epidemiological studies of schizophrenia—in the same conceptual framework.

Research on other social issues suggests that variations in the structure of the network, or of an individual's position in it, imply variations in diverse other social phenomena. Thus, several studies have found that differences in the structure of social networks may yield more powerful explanations of social processes than do differences in individual attributes or in such categorical variables as social class indices or age groupings. To indicate just a few examples, Bott (1957, 1971) found network structure to be more strongly associated than social class with the allocation of tasks between husbands and wives in a sample of middle class and working class couples in London.² In a study of an African textile factory, Kapferer (1972) found differences in network structure—rather than such factors as traditional age groupings—to be associated with success or failure of the workers' attempts to mobilize a strike action. Coleman, Katz, and Menzel (1957) found that the length of time it took the physicians in a Midwestern community to adopt a new prescription drug was

²Bott's (1957) original hypothesis and findings generated a great deal of subsequent work, on the basis of which she has modified her formulation (Bott 1971). The fundamental conceptualization—that task allocation between spouses is affected by the forms of connectedness in their joint network—seems still to be tenable.

more strongly associated with the pattern of their social ties to local colleagues than with their attitudes to patients and colleagues, their attachments to medical institutions, the medical literature they read, or other individual attributes.

Research on normal individuals thus far shows surprising consistency in the size and structure of immediate personal networks, despite cultural variations and necessary differences in techniques of eliciting data. Our own data on urban, suburban, and rural networks in metropolitan New York, in Vermont, and in London, as well as other data from Britain on both working class and middle class individuals (Cubitt 1973), and from Malta (Boissevain 1974) and Africa (Kapferer 1973), yield the following regularities: an individual's network typically consists of perhaps 6 to 10 intimately known individuals, most of whom are known to each other, and an additional 30 or so individuals who are also seen regularly by the focal individual—i.e., a total of about 40. With few exceptions, the range in both our own data and the other data we are able to find is about 25 to 50, with a mean just under 40. In this set of about 40, 20 percent of the possible connections tend actually to occur (i.e., for a set of 40, about 150 of the 780 possible direct connections); and the form consists of five or six clusters of six or seven highly interconnected individuals in each, with a lower degree of connection across clusters. There is little information to date on people's more extended networks—including sets of acquaintances, friends of friends—but our own data (Hammer 1978) and data from Boissevain (1974), Pool (1973), and Pool and Kochen (1978) suggest an estimate of perhaps 1,000 people within a readily accessible extended network.

Further research is needed to determine the range of applicability of this pattern of regularities of personal networks across different cultural contexts, different parts of the life cycle, and a variety of specially defined populations—especially those with very high (or very low) incidence rates for schizophrenia.

With respect to other general network properties, we have found that the interconnected-

ness of close ties in a network is a direct function of their mean duration (Hammer and Schaffer 1975). Forming connections takes time, and forming an interconnected set takes considerably more time. To achieve an interconnected set of five individuals, each of those five would have to connect with each other, involving 10 connections that would have to occur; if there were 10 individuals in the set, there would be 45 connections that would have to occur among them, and so on. In the study just cited, the degrees of interconnectedness in a sample of networks were perfectly correlated with the mean durations of the networks. Thus, for any individuals—including, of course, schizophrenic individuals—a relative lack of long-term ties would tend to preclude anything more than peripheral participation in any interconnected network of close relationships.

Also of interest here, in light of the significance of disordered communication in most views of schizophrenia, are studies relating network structure to patterns of communication. While communicational patterns in part reflect internally generated thought processes, it seems clear that they are also shaped and influenced by the social history of the participants and by the more immediate social contexts in which communication takes place. A growing body of experimental and observational studies indicates that network variables may be used to analyze these social influences. Network variables affect accuracy of transmission of information (Caplow 1960), efficiency of performance in tasks involving communication (Bavelas 1950; Hammer, Polgar, and K. Salzinger 1969), and a variety of other linguistic and cognitive measures (e.g., Bernstein 1971, 1973; Deutsch, Hammer, and S. Salzinger 1975; Gutwirth 1973, 1974; Labov 1972; S. Salzinger, Patenaude, and Lichtenstein 1975). In addition, we have found, in small relatively bounded networks of normal individuals, an association between the extent to which the individuals are socially central rather than peripheral participants in the group, and the relative predictability or communicability of their speech to the other participants (Hammer, Polgar, and K. Salzinger 1969; K. Salzinger et al. 1970). This association is of interest because of

the comparatively low predictability generally found for the speech of schizophrenic individuals (K. Salzinger, Portnoy, and Feldman 1964, 1966). Since we find a relationship between group participation and speech predictability in a normal population, low predictability of speech seems not to be simply a function of psychopathology, but of social interaction as well. Further work should indicate whether the association holds for different types of networks, and for schizophrenic as well as normal individuals.

Although little direct research has yet been done on social networks in schizophrenia, the few direct findings, as well as inferences from other kinds of studies, support the expectation that such research would be of value. In an early study, Hammer (1963-64) found that for schizophrenic patients—regardless of ethnicity or sex—network variables were associated with both speed of admission to the hospital after the onset of symptoms, and differences in maintenance of contact between patients and members of their immediate personal networks during hospitalization. More recent studies suggest the following: Schizophrenic subjects tend to have personal networks that are smaller than those of nonpsychotic controls (Pattison et al. 1975; Sokolovsky et al. 1978) and that are characterized by less symmetry of relationships (Sokolovsky et al. 1978; Tolsdorf 1976); changes in the networks of schizophrenic subjects are associated with changes in symptomatology (Sokolovsky et al. 1978; Wing 1978); schizophrenic ex-patients who live with their parents have better outcomes if the *parents* have more social contacts (Brown, Birley, and Wing 1972); the affected twin in discordant monozygotic twin pairs tends to have relationships mediated through the co-twin (Pollin and Stabenau 1968); indicators of prior social contact patterns are prognostic of outcome for schizophrenic patients (Hawk, Carpenter, and Strauss 1975; Strauss and Carpenter 1972, 1974; Gittelman-Klein and Klein 1969).

In addition to studies which focus directly on social contact patterns, research on a number of epidemiological and other social variables associated with schizophrenia can be interpreted in terms of known or plausible differences in

network characteristics. In the following section we offer a reinterpretation of findings from a selection of studies of schizophrenia in terms of hypothesized variations in network structure.

A Selective Review of Research on Social Variables in Schizophrenia

Two types of studies have dominated research on the role of social variables in the development and course of schizophrenia: large-scale epidemiological surveys of incidence or prevalence in relation to such variables as social class; and small-scale intensive studies of selected variables for a limited sample of cases. What follows is not intended to survey the literature on social aspects of psychopathology but rather to indicate how the approach proposed here complements more traditional approaches to the role of social variables in schizophrenia.

Epidemiological Research

Epidemiological research on social variables in schizophrenia has provided the strongest associations yet found for any characteristics of schizophrenia, with the possible exception of the more recent genetic studies.

Among the many social variables that have been found to be associated with high rates of schizophrenia (or of psychopathology more generally) are social disintegration (e.g., Leighton et al. 1963), lower class status (e.g., Hollingshead and Redlich 1958), ethnic marginality (e.g., Murphy 1959), migration (e.g., Malzberg and Lee 1956), in-city mobility, and urban residence. (For early references on a number of social variables, see Hammer and Leacock 1961; other references are included below). Because of fundamental methodological and conceptual difficulties, however, the significance of these social variables for schizophrenia is not clear. An extensive survey of the epidemiological literature by Dohrenwend and Dohrenwend (1969) revealed, for example, that very few of these associations were found consistently. In the studies

they surveyed, only low social class position and low status ethnic group membership were fairly consistently related to high rates of schizophrenia. The inconsistency of findings with respect to some variables, such as urban residence and ethnic marginality, for example—which in some populations were strongly associated with schizophrenia and in others not at all—appears at least partially to reflect methodological differences in the various studies. These include the criteria for defining cases of schizophrenia (e.g., whether hospital rates or community estimates were used) and a range of other differences in procedures of data collection.

Perhaps even more significant are the conceptual problems resulting from the grossness of the social variables investigated. "Migration," "social class," and "ethnic marginality," for example, are too complex as social phenomena to implicate any particular mechanism that would account for their association with psychopathology. From the perspective of network analysis, these complex social variables involve—to varying degrees—distortions or disruptions in the regular network of social contacts. What we suggest is that alterations in people's sets of social ties constitute a plausible underlying mechanism. The few studies of the social networks of psychotic individuals have yielded some evidence of the relevance of network characteristics to psychopathology (Hammer 1961, 1963–64; Pattison et al. 1975; Sokolovsky et al. 1978; Tolsdorf 1976). Application of the results of such small-scale studies to the design of research on carefully selected larger populations may reveal the extent to which variations in network characteristics could account for the epidemiological findings. In the absence of such data, certain inferences are tentatively suggested below, based on the expectation that social networks of normal size, stability, and interconnectedness are important in providing the social and communicational matrix for normal enculturation, and in providing the social supports for coping with a variety of stresses. Networks that are atypically small, unstable, or socially dispersed will not adequately meet these needs.

Migration, Social Marginality, and Acculturation

The possible relevance of network alterations to the epidemiological findings is perhaps most obvious in the high incidence of schizophrenia often associated with migration, where it seems very likely that networks of social relationships would be interrupted. Unfortunately, we do not have the kind of detailed data necessary to determine this. What are the rates, for example, among those who migrate as part of a personally connected group that is sufficiently large for major sets of connections to remain intact, as against those who migrate singly or in pairs? While there are no adequate data of this sort (but see Murphy 1977 for a brief review of the effects of variation in migration patterns), a few studies are suggestive.

Rates of incidence of schizophrenia for blacks in New York have been substantially higher than for whites. When Malzberg (1956) analyzed this phenomenon in relation to migration he found first, that for both whites and blacks, migrants had much higher rates; second, that the black-white differential was largely accounted for by the excess of migration among blacks. Furthermore, this excess was very largely accounted for by those who had migrated within the past 5 years. Given the cumulative nature of social connections and the time depth required for an interconnected set to develop, the more recent migrants to a place in which they had no already-established sets of families and friends could be expected to have smaller and less interconnected social networks; while those who had migrated earlier—and therefore had time to develop larger and more interconnected sets of contacts—were no longer inordinately at risk.

If, however, minority group status restricts individuals to within-group relationships, and the minority group is quite small, normally large and connected networks may not develop over time. Murphy's (1959) study of a number of different minority groups in Singapore is of interest here. For women—whose contacts, according to Murphy, were more limited to their own group than were those of the men—he found a

clear inverse relationship between rates of incidence of schizophrenia and the size of the minority group: that is, the smallest minority group had the highest rates of incidence.

In another study, using data from a number of Massachusetts communities, Wechsler and Pugh (1967) found the incidence of schizophrenia in particular social groups—defined by occupation, nativity, age range, and several other variables—to be related to whether or not the group was underrepresented in the community. For example, skilled workers from communities in which there were relatively many skilled workers had lower rates than those in communities with relatively few skilled workers; and this kind of relationship held true for most of the other categories examined. The findings can be reasonably interpreted in the same framework as Murphy's (1959) findings on Singapore minority groups, some of the migration studies, and studies of "ethnic marginality" (i.e., individuals living in areas dominated by another ethnic group). In all these studies, the groups with the highest rates of incidence of schizophrenia are those in which numerical underrepresentation in a community would very likely restrict the range of social contacts available to group members.

Two other interpretations of these findings might be made—one based on genetic predisposition (or "selection"), another based on acculturation stresses—but neither appears to be as consistent with the available data as the network interpretation we are suggesting. A "selection" hypothesis would suggest that individuals predisposed to schizophrenia are more likely to migrate or to become concentrated in socially marginal enclaves or groups, thus increasing the apparent rate of incidence in such groups. However, this interpretation is difficult to reconcile with certain results, such as Murphy's (1959) differential findings for men and women among Singapore minorities: there is no genetic evidence for such a sex difference; nor is there any obvious genetic mechanism for the inverse correlation, for women but not men, between incidence and group size. A finding reported by Malzberg (1940) on incidence rates among immi-

grants to the United States also does not support a simple selection hypothesis. Since incidence rates for immigrants were considerably higher than for native-born Americans, rates for the offspring of two foreign-born parents should theoretically have been *higher* than for the offspring of mixed native- and foreign-born parents, whereas Malzberg found their rates to be slightly *lower*.

The high rates of incidence of schizophrenia among migrant and marginal groups might also be interpreted as a consequence of the stresses and strains of acculturation. Murphy (1967) has focused on communicational ambiguities and contradictions that emerge within particular cultures during periods of change, as well as in intercultural contexts. He has related rates of psychopathology to ambiguity of cultural expectations when changes in the social context produce conflicts between differing role values. However, acculturation difficulties cannot directly account for his own earlier findings on Singapore minorities (Murphy 1959) or for the findings on underrepresented groups in the study of Massachusetts communities (Wechsler and Pugh 1967). The high rates of schizophrenia found in these studies are related not simply to conflicting cultural expectations, but to the size of the groups involved. Larger groups may permit members to maintain effective intragroup networks, thus mitigating the stressful effects of conflicting role expectations.

Personal networks are, moreover, the major medium of acculturation (see, for example, P. Mayer 1961, 1962), so that to the extent that acculturation is a relevant factor, network properties are probably implicated in whatever mechanism may underlie the association between schizophrenia and migration, marginality, or rapid cultural change.³

³Personal networks may also indirectly affect apparent cultural differences in the severity of symptomatology. In a study of the timing of requests for treatment among Mexican-Americans, Fabrega and Wallace (1970-71) showed how strong family ties led unacculturated families to postpone seeking formal care, as this carried the risk of separation from the "sick" member through hospitalization. As a result, when compared either to Anglos or to acculturated

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Social Class

One of the strongest epidemiological findings entails an inverse relationship between class status and incidence of schizophrenia. (Among many references, see B.P. Dohrenwend and B.S. Dohrenwend 1974; Kohn 1968, 1972). Although this relationship has been found repeatedly and on a large scale with highly significant class differentials, it is not uniformly found. It has been found very strongly in large metropolitan centers, but either weakly or not at all in some smaller cities (e.g., Kohn and Clausen 1955). Further, it appears that if one excludes the lowest social class from consideration, the class differential in incidence of schizophrenia is not very marked. This lowest social class contains poor migrants, people who are unemployed or sporadically employed, and large numbers of people from low status ethnic minorities: it should therefore include a disproportionate number of individuals with limited and weak connectedness with others (see Hammer 1973).⁴

Two competing hypotheses have been advanced as explanations for the high incidence of schizophrenia in the lowest class. The "drift" hypothesis—a particular form of the "selection" hypothesis mentioned earlier—suggests that individuals prone to schizophrenia are more likely to "drift" downward in social class status. Alternatively, the environmental conditions of lowest class life, including poverty, have been viewed as etiological factors in the high incidence of schizophrenia. Several studies have tested these alternative hypotheses, with inconclusive results. Most of the relevant studies have compared class status of schizophrenic patients with that of their fathers, or class status of the fathers with that of the general population. Some of these studies have found evidence of downward intergenerational mobility on the

part of the schizophrenic patients;⁵ but some studies have also found that the fathers of the schizophrenic patients tended disproportionately to have had lower class occupations. (For discussions of these various issues, see Goldberg and Morrison 1963; Hollingshead and Redlich 1958; Srole et al. 1962; Turner and Wagenfeld 1967. For summaries of work in these areas, see B.P. Dohrenwend and B.S. Dohrenwend 1969, 1974; Kohn 1968).

Using a different approach, two studies (Gerard and Houston 1953; Hare 1956) carried out in different urban settings found differential overall incidence rates between slum and non-slum areas, but not for those admitted to treatment from family settings: the excess of nonfamily residences in slum areas accounted for the differential. This has generally been taken to support a "selection" model to the effect that predisposed individuals, being withdrawn and asocial, tend to move out of family settings. However, it is not clear to what extent lowest class social conditions themselves *produce* more non-family residence; nor is it clear to what extent the social conditions in the lowest class directly elicit or aggravate schizophrenic symptomatology in vulnerable individuals who might not have become schizophrenic under other conditions.

The most likely interpretation of the available data is that social "drift" contributes to the high incidence rates for schizophrenia in the lowest class, but without sufficient magnitude to account for the differential (B.P. Dohrenwend and B.S. Dohrenwend 1969). The environmental conditions of low class status can be viewed from the network perspective we propose, although there are as yet no actual network data on the lowest social class. The life conditions in this class status involve—from early childhood—an exceptionally high risk of severed connections as a consequence of death, forced change of residence within a locality, or migration. The resulting disruptions in networks and associated so-

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Mexican-Americans, unacculturated Mexican-American subjects requesting outpatient care showed more severe symptoms.

⁴Although strong extended kin networks are commonly reported for low-status ethnic minorities, external social pressures seem sufficiently pervasive that large numbers of individuals become cut off from such networks.

⁵It would be interesting to investigate the extent to which downward drift itself reflects weakened connections since, despite universalistic occupational norms, personal connections affect occupational options.

cial reinforcement and feedback, if considered as a cumulative process, would constitute a plausible mechanism linking class status with the incidence of schizophrenia.

Intensive Studies

Intensive studies of smaller populations, such as those on social isolation or family interaction, can clarify and extend the results of the larger epidemiological studies. While epidemiological studies have documented the uneven social distribution of schizophrenia, attempts to account for the distribution have come from more direct studies of schizophrenic individuals.⁶ These studies draw conceptually on both epidemiological findings and clinical descriptions, and seek to identify the mechanisms through which environmental variables act on vulnerable people. We will briefly review three theoretical formulations that posit such mechanisms and consider how each relates to the one proposed here. The mechanisms are: (a) ambiguous or contradictory communication patterns, (b) stress, and (c) social isolation. These formulations are not mutually exclusive; nor do they exclude or contradict a social network approach; however, we believe that social network theory can provide an integrative framework within which to investigate the operation of these mechanisms.

Communication Patterns

Disordered communication is widely considered to be a critical feature of schizophrenia (see, for example, review by K. Salzinger 1973). The considerable interest in studying communication patterns of schizophrenic patients to some extent reflects a recognition of the central role of communication in social functioning. Despite a large number of clinical descriptions and experimental studies in this area, however, we still cannot adequately interpret the relationship of communication style to pathology.

⁶There are not as yet any relevant prospective studies—e.g., of individuals socially defined as being at high risk for schizophrenia—which would be methodologically more difficult but more powerful.

One major research approach has focused on interaction and communication in family settings and there is a substantial body of theoretical, descriptive, and experimental work in this area (e.g., Bateson et al. 1963; Lidz 1973; Lidz, Fleck and Cornelison 1965; Reiss 1968; Wynne 1972). Investigators of family interaction patterns have theorized that schizophrenia is essentially produced by distorted patterns of communication within families, and they have described a number of atypical patterns involving “amorphous” interchanges, messages with contradictory meanings, and so on. On methodological grounds, one may question the etiological significance of these studies; but even if the patterns described are not demonstrably etiological, their systematic characterization may nevertheless contribute to an understanding of social processes relevant to schizophrenia. One particularly interesting finding from a recent study by Wynne and Singer (in press: cited by Keith et al. 1976, p. 539) should be explored further: They found the level of schizophrenic symptomatology in a sample of schizophrenic patients to be much more strongly correlated with a measure of deviance of parental communication ($r = .74$) than with a measure of parental psychopathology ($r = .37$).⁷

We believe, however, that the processes these investigators are studying would be clarified if such work were expanded to include interactions beyond those in the nuclear family. Deviant intrafamilial communication may in part reflect distortions in the social connections of family members with outsiders; and it may also be expected to affect each of the family members more or less strongly, depending in part on the connections each has with outsiders. Wynne (1972) himself has drawn attention to what he calls “the most serious shortcoming” of family studies: neglect of extrafamilial interactions of members with extended kin, friends, work associates, and the personnel of treatment facilities.

⁷It is not within the scope of this paper to discuss genetic research in schizophrenia, but it may be worth commenting that the assumption (e.g., Wender et al. 1977) that social etiological processes, like genetic ones, should be reflected in a higher incidence of schizophrenia in the “agents” (e.g., adoptive or biological parents) is not logically warranted.

ties. He argues that extrafamilial interactions need to be seen as variables that have an impact both on individual behavior and on family patterns of interaction and communication; and they should be investigated in relation to improvement and deterioration in the postmorbid social functioning of schizophrenic individuals.

In the extensive literature on schizophrenic communication, the research most relevant to our interests here has concentrated on quantitative aspects of meaningfulness and communicability of speech, particularly as these may be indicative of social processes. Despite greater internal redundancy in schizophrenic than in normal language use (Fairbanks 1944; Feldstein and Jaffe 1962; Hammer and K. Salzinger 1964; Whitehorn and Zipf 1943), schizophrenic speech shows reduced social predictability (K. Salzinger, Portnoy, and Feldman 1964, 1966). Salzinger and his colleagues used several measures of the reconstructability, by other subjects, of systematically altered speech passages as indicators of the communicability or social predictability of the speech, and found lower predictability for schizophrenic patients than for normal subjects of similar backgrounds. Our own unpublished data (collected in collaboration with Drs. Barry Gurland and Lawrence Sharpe) indicate that the speech of schizophrenic patients is also less predictable than that of psychiatric patients with other diagnoses. The speech of schizophrenic patients seems furthermore to be more idiosyncratic than that of normal speakers, as reflected in measures of vocabulary usage. Normal subjects showed more commonality of vocabulary usage with each other than with schizophrenic subjects of similar backgrounds; and the schizophrenic subjects showed even less commonality with each other than with the normal subjects (Hammer and K. Salzinger 1964).

Although some of this research has been motivated by the attempt to use communication measures as a reflection of thought processes, these measures also reflect social processes. For example, as we indicated above in our discussion of general characteristics of social networks, we have found for normal individuals that the relative predictability of their speech was directly related to the extent of their social partic-

ipation (Hammer, Polgar, and K. Salzinger 1969; K. Salzinger et al. 1970). By implication, social peripherality must be considered in interpreting findings on the low communicability of schizophrenic speech as well.

A set of studies by Salzinger and Pisoni (1958, 1960, 1961) shows that systematic reinforcement of selected categories of the speech of schizophrenic patients elicits normal conditioning curves, but that patients tend to exhibit more rapid extinction curves than normal subjects. This implies that a higher or more sustained rate of interactional exchange may be necessary in order for schizophrenic patients to perform within the normal range. Although approached from quite different perspectives, the studies of disturbed family communication patterns cited above and the work of Wing and his colleagues on under- and overstimulation (see below) also deal with the impact on schizophrenic individuals of different interaction modes. In some of our own work on normal networks, we have suggestive findings relating interaction modes, communicability of speech, and network type (Hammer, in preparation; Hammer, Polgar, and K. Salzinger 1969). Further work might be able to identify what forms of social connectedness tend to produce modes and rates of interaction that may elicit more normally responsive communication styles in schizophrenic individuals.

Stress

A number of investigators (see Brown and Birley 1968, and references in B.S. Dohrenwend and B.P. Dohrenwend 1974) have employed the concept of "stress" to describe the mechanism through which the social environment acts on the vulnerable individual to produce psychopathology. In this view, social stress produces psychological stress, which elicits schizophrenia in vulnerable individuals. (For an elaboration of the concept of vulnerability, see Zubin 1976; Zubin and Spring 1977.) Much of the work on social stress, which has focused on "life event" stressors, has documented an increase in the number of certain types of life events during the

few weeks preceding acute onset or relapse in schizophrenia (e.g., Brown and Birley 1968).

Ongoing work on life event stressors may be expected to resolve some of the methodological problems which researchers have thus far encountered—for example, a need for better methods of eliciting and cross-checking subjects' reports; a possible tendency toward differential reporting of life events by schizophrenic and nonschizophrenic subjects; cultural variability in the "stressfulness" of certain kinds of life events. More fundamentally, the problems in this research stem from the need for measures of stress that are neither circular nor arbitrary. For example, one methodological problem in assessing the role of life events in psychopathology is that a given event—a potential stressor—does not have the same impact on all individuals. Social network analysis can contribute to a noncircular approach to this problem: to the extent that a given life event affects the networks of different individuals in predictably different ways, it becomes possible to compare the impact on different individuals by measuring the degree of disturbance (social, not psychological) which that event introduces into their respective networks. As a hypothetical illustration, the death of a spouse has an objectively different impact—and thus constitutes a different degree of stress—on a social network whose focal individual is connected to sets of kin, co-workers, same-sex friends, and neighbors than on a network whose focal individual is mainly connected to other couples and to the spouse's kin and colleagues. Job loss or promotion, migration, marriage or divorce, birth or death of a child, and the like all have impact on a focal individual's network of social connections, with systematic differences for different kinds of networks.

In recent research on schizophrenic patients in England, Wing and his associates (e.g., Wing 1978) have used the concepts of "understimulation" and "overstimulation" to characterize polar aspects of the relationship between social stress and psychopathology. They view social withdrawal as a self-protective reaction against the stresses of intense and demanding social interaction on the part of vulnerable individuals with inadequate communicational capacities;

and they suggest that florid symptoms become manifest when such withdrawal is not possible. In studies of hospitalized schizophrenic patients and of ex-patients, they found that two sets of social conditions were conducive to increased symptomatology and relapse. An "understimulating" social environment, characterized in part by limited social contact, led to apathy and increased social withdrawal, while an "overstimulating" social environment, characterized by frequent, highly charged interaction and/or overly taxing social demands, led to a reappearance of florid symptoms.

Brown, Birley, and Wing (1972) have developed an "Index of Expressed Emotion" (IEE) for measuring overstimulation. They found the IEE of a patient's key relative to be strongly associated with symptomatic relapse in the patient in the 9 months following discharge from the hospital. Of special interest from a social network perspective is a related finding, that the IEE of the patient's key relative was associated with the *relative's* degree of social isolation, particularly for parents. Parents who spent more time with people other than the patient had lower degrees of "expressed emotion" than parents who had fewer outside contacts. Although formulated from a different perspective, this finding indicates the need for better, more precise information on the social networks of both schizophrenic individuals and those closely connected to them.

Social Isolation

A number of early studies (e.g., Faris 1934) focused on the role of social isolation in the development of schizophrenia. These studies postulate that symbolic communication and socially controlled interaction between individuals are essential for the development of normal behavior; where communication and interaction are broken or disturbed, the development of normal social behavior is affected. Such breaks occur most frequently in the "disorganized" parts of the social structure where large numbers of people experience excessive mobility, ethnic conflict, overcrowding, and the social isolation

that may promote development of the "seclusive" traits which foreshadow schizophrenia (Dunham 1967).

The approach we propose also assumes that the capacity for normal social behavior develops in the context of social interaction and communication: an individual's set of social contacts—the social network—constitutes the matrix in which this occurs. A network approach should be able to yield information on the range or kinds of variation in social contact patterns that are likely to provide adequate social reinforcement and feedback for the development and maintenance of appropriate social behavior.

A number of studies have assessed the premorbid social characteristics of schizophrenic subjects, but their significance is not yet clear. Dunham (1967) points out that it has never been demonstrated that those who become schizophrenic were previously more isolated than those who do not, while Jaco (1954) and Kohn and Clausen (1955) suggest that isolation may be a consequence rather than a cause of schizophrenic breakdown.

In a set of studies which support the notion that social contact patterns are implicated in the course of schizophrenia, Gittelman-Klein and Klein (1969) have examined premorbid social patterns in relation to outcome and found a strong association between poor outcome and more restricted premorbid social contact. In related work, Strauss and Carpenter (1972) and Hawk, Carpenter, and Strauss (1975) have investigated the effect of more proximate social factors on outcome. In these studies, the amount of social contact just prior to hospitalization was a strong predictor of outcome 5 years later.

Kreisman's (1970) study of adolescent friendship patterns in males who subsequently became schizophrenic showed relatively little difference between schizophrenic individuals and controls on whether they had people they referred to as best friends, whether they had other peer connections, or the amount of time they spent in socializing (although the few extreme isolates were all schizophrenic). It does, however, show one or two distinctions relevant to the analysis here. First, for more of the schizophrenic individuals, there was comparatively little con-

nection between familial and peer subgroups or clusters, and thus, inferentially, lower cross-cluster connectedness more generally. A second suggestive finding from Kreisman's study is that schizophrenic subjects tended more than controls to report a particular kind of nonreciprocity with their best friend: the best friend, rather than the preschizophrenic adolescent, was more often the one to decide where they went, what they did, whom else they saw. Thus, at least in the perception of the schizophrenic patient, this placed him at a remove from other relationships, which were to some extent mediated by the best friend.

This one-step-removed mediation appears to be a widespread pattern among schizophrenic individuals. It was prevalent among a sample of schizophrenic patients studied at Bellevue Hospital (Hammer 1961); and studies of discordant monozygotic twins have suggested the same pattern—that is, the schizophrenic twin seemed to have had most of his or her relationships mediated through the co-twin who did not become schizophrenic (Pollin and Stabenau 1968).

Social Networks and Psychopathology

Only a few studies have so far been directly concerned with the social networks of schizophrenic patients and ex-patients. These have been exploratory studies limited to the immediate personal network at a single time period, and they have emphasized the relationships of the focal individual rather than the general network properties that exist independently of any particular individual.

Three recent studies have compared the immediate networks of schizophrenic individuals (in one case, more generally "psychotic") with those of nonpsychotic individuals. In a study by Sokolovsky et al. (1978) comparing the networks of nonpsychotic and schizophrenic residents in a single room occupancy (SRO) hotel in New York City, smaller networks are reported for ex-patients with residual symptoms than for ex-patients without residual symptoms or for nonpsychotic residents. The study also found an inverse relationship between network size

and the likelihood of return to the hospital. Pat-tison et al. (1975) also found differences in size for networks of normal, neurotic, and psychotic population samples, with the largest size for normal subjects and the smallest for psychotic subjects. Tolsdorf (1976) found a lower range and smaller mean size for networks of schizophrenic male patients than for matched non-psychiatric patients, although the difference in his study was not statistically significant. These studies generally support the view that schizophrenic individuals have more limited networks of social connections than nonpsychotic individuals.

The study by Sokolovsky et al. (1978) is of additional interest in that the nonpsychotic controls were drawn from a population that has not yet been very well studied—one that is *socially* at high risk for schizophrenia.⁸ Data from our own work and from other sources permit some assessment of the degree to which the networks of the nonpsychotic SRO hotel residents are within the range reported for normal subjects. The nonpsychotic hotel residents had a lower mean network size than we commonly find for normal individuals, although it was not outside the normal range; whereas the mean figures for the schizophrenic individuals in the SRO hotel sample were outside the range of the data on normal populations.

The findings just cited are concerned with relative network *size*; network *structure* may be even more basic. A study of schizophrenic patients at Bellevue Hospital (Hammer 1961, 1963–64) indicated that the structure of a patient's social network and his or her position within it (without regard to the *number* of connections) affected the speed with which the patient was hospitalized after the onset of symptoms, the kinds of help the patient received, and the likelihood of severance of the patient's

closest social relationships. Despite variations in major social characteristics such as sex and ethnicity, and in symptom pattern or other aspects of pathology, patients whose closest connections were with individuals who were also closely connected to each other maintained their relationships during the developing episode and hospitalization. In contrast, patients whose closest relationships were with individuals not otherwise connected to each other were very likely to have these connections severed. Unquestionably, the patients' behavior produced some kind of stress in their relationships. Whether or not that stress resulted in the patients' further isolation, however, was not directly a function of the *patients'* characteristics but, rather, of the connectedness of others. It should be noted that more recent work (Hammer 1978) has shown that the intimate associates of normal individuals are not all directly connected with each other; mere absence of such a connection is thus not a function of psychopathology.

Of critical importance here is the extent to which people in contact with a patient are also in contact with each other: this affects the kind of reinforcement and support that the social environment provides for people closely connected to a patient. It seems likely, however, based on more general network analyses that interconnectedness within the subgroups or clusters of a network, and connections across such clusters, have different implications and should be treated separately (see, for example, Cubitt 1973; Granovetter 1973; Niemeijer 1973).

The three recent studies of patient networks yield complex findings regarding interconnectedness. Although all three studies are concerned with the degree of interconnectedness in the networks of psychotic (primarily schizophrenic) individuals, as compared with the networks of nonpsychotic individuals, the studies differ in sample characteristics, and in whether they are reporting on kin or non-kin, localized or nonlocalized clusters, or on the personal networks as a whole. Tolsdorf (1976) finds no significant differences between schizophrenic patients and nonpsychiatric medical patients in "adjacency density" (interconnectedness) either for the personal network, or for the kinship

⁸In major urban centers like New York, there are large numbers of single room occupancy (SRO) hotels—like the one studied by Sokolovsky et al. (1978)—whose residents probably constitute one such high risk population. Several descriptive accounts are available of the life conditions in SRO hotels, primarily in New York City (e.g., Shapiro 1971; Siegal 1975).

part of the network. He does find the kinship linkages to be a significantly higher proportion of the total linkages in the networks of schizophrenic patients: presumably, then, their non-kin linkages are significantly fewer. Pattison et al. (1975, p. 1249) report the networks of psychotic individuals to be much *more* interconnected than those of either normal or neurotic individuals, and suggest that "the psychotic is caught in an exclusive small social matrix that binds him and fails to provide a healthy interpersonal matrix." Sokolovsky et al. (1978), in their SRO hotel study, also find higher density (interconnectedness) for their schizophrenic sample with residual symptoms than for their non-psychotic sample, although the difference is nonsignificant. Recomputing their findings, however, with a modification of their density measure, we estimate—in opposition to the Pattison data—that the hotel networks of the schizophrenic ex-patients were slightly *less* interconnected than the networks of the non-psychotic residents. The amount of connectedness for the nonpsychotic residents in the SRO hotel study was at the high side of the normal range found in other studies (e.g., Cubitt 1973 and our own data), which suggests fewer but larger subgroups or clusters within these networks. It should be remembered that these networks are non-kin clusters localized at the SRO hotel. Sokolovsky et al. also suggest that the integration of ex-patients into larger, denser (more connected) networks reduced the frequency of hospitalization.

The apparent inconsistencies in these findings are probably due to several factors. First, the populations under study are quite different—e.g., first admission male veterans in Tolsdorf's study, as against discharged patients living in SRO hotels in the Sokolovsky et al. study. More importantly, the Sokolovsky et al. measure of density is restricted to non-kin ties from the hotel network; the Pattison et al. data on the networks of the psychotic sample seem to be drawn primarily from close kin; and Tolsdorf's data include both kin and non-kin ties. In addition, the studies differ methodologically, in that only the Sokolovsky et al. study used the researchers' observations of social contacts as

well as the informants' reports. Finally, the *density* measure itself is mathematically an inverse function of N^2 , and thus might tend to be unusually high for very small networks. We have found, for normal networks, that this mathematical tendency is offset by other factors, so that empirically density does *not* vary systematically with size. However, any empirical factors that might ordinarily offset this mathematical tendency may not be able to operate consistently at the exceptionally low end of the size range involved in some of these networks.

The studies by Tolsdorf and Sokolovsky et al. agree on two potentially important measures: in both studies, the schizophrenic subjects have significantly higher proportions of asymmetric relationships than the controls, and significantly fewer multiplex relationships (relationships with more than one content area) than the controls. There were no data from either study, however, to indicate whether these differences were characteristic of the network connections as a whole, or only of the focal individual's own relationships.

Tentatively, then, the networks of schizophrenic individuals tend to be smaller than those of normal individuals, particularly with respect to both number and proportion of non-kin connections. The non-kin subsets in these networks are internally less interconnected than in normal networks, and they seem to have fewer connections with the kin clusters. Schizophrenic individuals also have more asymmetric and fewer multiplex relationships than nonpsychotic controls.

Networks and Therapy

The perspective proposed here would help to identify aspects of network structure most critical for the patient's functioning, with implications for therapeutic intervention. Whatever the intended approach, psychiatric intervention has always involved changes in the patients' networks of connections, although traditionally it has not been a primary focus of attention. An explicit network approach to therapeutic intervention has recently emerged (see, for example,

Beels 1975; Erickson 1975; Speck and Rueveni 1969; Rueveni and Wiener 1976) but cannot be adequately evaluated at this time, since published reports on network therapy have thus far been restricted to presentation of illustrative individual cases. Approaches to network therapy share the view that more adequate connectedness in the patient's network enhances both mutual supports and communication among the network members. From this perspective, better communication within the network—even when it does not specifically concern the patient—provides a context that facilitates the patient's improvement.

In considering the potential of social network analysis in treatment and program planning, Thomas and Garrison (1975) have presented a detailed case history of the social background and psychiatric illness of a Dominican immigrant. They use the case to indicate quite dramatically how the development of effective treatment and program planning requires a sophisticated understanding of the sociocultural context in which particular patients function. "But how," they ask, "can the individual clinician be aware of all the cultures of all the patients he might happen to see?" (p. 309). An important part of the solution to this problem, they suggest, lies in identifying a manageable unit of analysis—the personal network—which seems to be the "optimal level of data collection and analysis for the understanding of an individual in interaction with his physical and sociocultural environment" (p. 319). They view the social network as providing a framework in which to examine whether and how a person manages role relationships in both intimate and public life.

An important issue for both research and therapy that has not yet been explored but warrants attention concerns the structure of the second order networks around schizophrenic individuals. We know that in general two-step linkages—for example, friends of friends—constitute a major source of new connections for normal individuals (Hammer 1978; Hammer and Schaffer 1975). Thus, to the extent that the primary contacts of schizophrenic patients themselves have relatively limited sets of contacts, this additional limitation on access to new con-

nections would make for a geometrically decreased social potential.

If the preceding expectations are verified, they will have implications for therapists interested in network intervention. Approaches to therapeutic intervention in the networks of schizophrenic patients and ex-patients will clearly be different where the second order networks are comparatively normal in size and structure and where they are not. For example, if the potential secondary links are both sparse and structurally aberrant, efforts to assist a schizophrenic individual in realizing these potential connections may be relatively unproductive; in that case, effort might better be directed at helping the patient to develop new sets of linkages, rather than building on existing ones. If a schizophrenic individual's secondary contacts constitute a normal social network, however, it may be more fruitful for the therapist to attempt to strengthen the patient's contacts into that network.

An Illustrative Model of Social Networks and Schizophrenia

In order to interpret a variety of studies of schizophrenia from a social network perspective it has been necessary to make certain ad hoc assumptions about the kinds of social networks one might expect to be associated with schizophrenia—for example, a restricted range of contacts, relative instability of the network, and relatively low connectedness within or across subsets of the network. These assumptions are consistent with available research and with general impressions, and this is perhaps sufficient for a preliminary review. It would be preferable, however, if such expectations could be derived from general theoretical principles. With further development of network theory, it should become possible to use network analysis in generating systematic sets of hypotheses relevant to schizophrenia. Before concluding, we would like to sketch illustratively a more theoretical approach to the role of social networks in schizophrenia than we have indicated above in reviewing findings from studies of other social vari-

ables. This approach draws on more general network principles and research findings, in conjunction with a particular view of schizophrenia, to suggest a hypothesized social background of schizophrenia.

The model we will briefly suggest here is not a necessary foundation for social network analysis of schizophrenia. It attempts to cope with certain issues that we have not raised earlier because they are not immediately germane to network analysis—such as the apparent paradox of the rather high rate of survival in the population of an apparently maladaptive genotype (Hammer and Zubin 1968; Huxley et al. 1964). We present this model as being of possible theoretical interest; but network analysis as a potential tool is quite consistent with other views of schizophrenia than the one indicated here.

Cultural Predictability and Schizophrenia

Any theoretical approach to schizophrenia requires an appropriate characterization or definition of the phenomenon. As indicated earlier, however, one of the more fundamental sources of difficulty in all schizophrenia research is the absence of a universally applicable characterization of this sort. To encompass a range of individual, situational, temporal, and cultural variations in specific symptoms and behaviors, the characterization requires abstract formal dimensions, rather than concrete description. Certain physiological/psychological formulations involving attentional dysfunction or atypical cognitive organization (see, for example, Keith et al. 1976, pp. 534–535; Payne 1968; Zubin 1975) are potentially universal; but we will suggest here a formulation that is more inherently social. This formulation will more readily lend itself to a focus on the way an individual's personal network mediates the social reinforcement and feedback processes that shape the individual's cultural behavior.

It should be noted that no definition is currently possible that would uniquely characterize schizophrenia. Although schizophrenic and normal individuals show significant differences over a wide range of performance, virtually all find-

ings show considerable overlap between schizophrenic and normal performance—no matter how ingenious the attempt to isolate patterns that are specific to schizophrenia. Such overlap is particularly problematic where the difference in performance of schizophrenic and normal individuals of one cultural group is of the same order as the difference in performance of normal individuals from distinct cultural groups, as we have found, for example, for certain speech characteristics (Hammer and Salzinger 1964). Thus any definition broad enough to encompass schizophrenia will at least initially include non-pathological variants as well.

In our view, schizophrenia may be seen as one manifestation of a broader phenomenon characterized by reduced cultural predictability (Hammer 1972; Hammer and Zubin 1968). The kind of predictability we are concerned with here involves culturally codified behaviors—behaviors that are as relatively conscious as job and marriage choices or punctuality for appointments, and as relatively unconscious as patterns of eye contact during conversation, or proxemic rules. For a complex of reasons (neurological, social, etc.) the process of acquiring and using these culturally codified forms varies considerably across groups and individuals. Consequently, and more markedly so for some groups than for others, there will be some individuals whose code content or manner of code use is noticeably different from others of the same social group. These differences may constitute the bases, at two extremes, of “creative style” or of socially incongruent behavior; which of these occurs should theoretically depend on the nature and degree of the differences between the individual's code use and the codes of others, on the individual's position within his or her social group, and on the general social conditions of the group at that time.

This formulation has several purposes: First, it focuses on cultural performance—the medium through which major impairments associated with psychopathology are manifest—but not on the concrete and thereby culturally specific behaviors which may be considered pathological in any given society. Second, the assessment of cultural predictability can be approached

by means of currently available conceptual/methodological tools.⁹ Third, this formulation may lead to a more distinctive definition by explicitly considering both schizophrenia and formally related nonpathological patterns of behavior within a single broader framework.

Relationship of Social Networks to Cultural Predictability

The relationship between the social network and the development of culturally predictable or unpredictable behavior may be conceptualized in terms of a feedback mechanism. The social matrix for the acquisition and modification of cultural usages consists of the individual's social network—his or her direct contacts, their relationships with each other, and their links with others who are not directly connected to the initial individual. Social organisms use and require ongoing feedback from interaction and communication with others in forming their own continually changing behavior. The major source of feedback for any individual consists of that individual's recurring interactions with the other people who comprise his or her social network, and who respond to the individual's behavior both directly and as mediators of potential responses from other people.

Social networks tend to be structured in fairly regular ways throughout the society. Radical departures from such structuring should markedly affect the adequacy of the feedback system and consequently the development of predictable behavior modes. For example, a network with low interconnectedness among the participants in each subset or cluster would provide few redundant communication channels, so that missing or misleading messages would have little chance of being corrected. Such deficiencies would furthermore be intensified over time, to the extent that any of these processes are cumu-

lative. Thus the structuring of social contacts is a crucial dimension in the development and maintenance of cultural behavior, whether normal or exceptional.

What constitutes adequate feedback, from the individual's perspective, varies over the life cycle, and across situations, but with ascertainable regularities. For example, it should require more redundancy in early childhood than in middle adulthood, and more in unfamiliar than in familiar settings. It should also vary among individuals to the extent that they differ in processing strategies or capacities. Despite such differences, however, adequacy of feedback may be investigated more generally in relation to network structure in terms of the number and distribution of communication channels available to the participants for the transmission of both direct and mediated responses to each other's behavior.

Inadequacy of Feedback in Schizophrenia

The hypothesized social background of schizophrenia is briefly that the networks of personal contacts of schizophrenic individuals typically fail to provide adequate feedback for the development or maintenance of behavior modes that are congruent with the behavior and expectations of the social group. (See Caplan 1974 for a related formulation.)

Inadequate feedback may derive from the characteristics of the network—for example, instability of connections, with increased risk of loss in the transmission process; a restricted range of contacts, with insufficiently varied input; limited cross-connections between subsets, with reduced elaboration of modifying feedback. It may also derive from the individual's position in the extended network—for example, a peripheral position in the network with relationships largely mediated through one other individual, without alternative feedback sources for modifying the effects of that individual's responses. Such peripherality would tend to become more pronounced over time to the extent that new relationships develop through already existing ones (Hammer and Schaffer 1975). A peripheral position would moreover be associ-

⁹Measures of speech predictability have been discussed above; somewhat analogous techniques could be developed, with the use of videotape, for such things as kinesic and proxemic analysis, and for larger scale behavior patterns.

ated with asymmetrical interaction patterns and reduced predictability of communication—phenomena that both reflect and contribute to the inadequate feedback in the system.

For potentially schizophrenic individuals, the attainment of normal social behavior seems to require a rather high level of ongoing social reinforcement (Salzinger and Pisoni 1958, 1960, 1961). Their network positions and their styles of interaction, however, tend to restrict the output of such reinforcement from those with whom they interact. Over time, these tendencies may form a kind of feedback loop that increases the effective social distance between the schizophrenic individual and others, and thus reduces effective social interchanges below some level necessary to normal functioning. Aspects of this process are recurrent and can be studied through microanalysis of an individual's social behavior and immediate social environment, in relation to schizophrenic symptomatology.

No assumptions are made here about the underlying sources of any special characteristics in the social networks of schizophrenic individuals. These may be presumed to develop from a variety of factors, both internal and external to the individual. Internal sources at any point in time would include neurological, metabolic, or sensory variations among individuals as well as variations in their prior social conditioning, insofar as these variations have any impact on their modes of social relatedness. External sources would include such things as the death or migration of kin and neighbors, or the social withdrawal or gregariousness of other household members. In varying combinations, internal and external sources would affect the individual's immediate network and his or her position within the extended network.

Unpredictability and Innovation

Conceptually, reduced cultural predictability has innovative adaptive forms as well as disruptive maladaptive forms.¹⁰ In attempting to ac-

¹⁰The criterion for distinguishing between innovative and disordered forms of cultural unpredictability must ultimately rest on the social responses of others—the degree

count for the apparently undiminished rates of transmission of schizophrenia across the generations, despite the reduced survival and fertility rates of schizophrenic patients, we have elsewhere suggested that adaptive and maladaptive forms of cultural unpredictability may have some common genetic base as well as conceptual complementarity (Hammer 1972; Hammer and Zubin 1968). Thus the idiosyncrasy and restricted communicability associated with schizophrenia—as indicated by measures of schizophrenic speech for example—may have an adaptive counterpart in the idiosyncrasy and restricted communicability of many creative productions—represented at an extreme by an Einstein, a Picasso, or a James Joyce. There is limited supportive evidence for such a position, from a combination of data indicating increased fertility or decreased infant mortality for close kin of schizophrenic individuals (Erlenmeyer-Kimling 1968; Erlenmeyer-Kimling, Rainer, and Kallmann 1966; Hammer 1972, pp. 444-445; Karlsson 1966), an excess of “giftedness” among siblings and other relatives of schizophrenic individuals (Heston 1966; Karlsson 1966; Schaffner, Lane, and Albee 1967), and certain similarities in modes of cognitive performance between schizophrenic and highly creative individuals (for example, Dykes and McGhie 1976). Dykes and McGhie find that both “creative and schizophrenic individuals . . . appear to sample a wider range of environmental input than do other individuals” (p. 55). We would speculate that development of the ability to cope with more complex environmental inputs requires more frequent and more varied sources of social feedback than development of the ability to cope with more restrictively screened environmental inputs.

The components of the theoretical model outlined here are all testable. Their validation would require considerably more research on normal

to which other people can achieve congruence with the individual's behavior, given more general social constraints on their own behavior. It should, however, become possible to specify the distinctive modes, contexts, and levels that characterize these forms, and the reinforcement and feedback conditions that contribute to their development and maintenance.

network processes, particularly longitudinally, and research on the social networks of especially creative individuals and of individuals drawn from populations at high risk for schizophrenia, as well as studies of the impact of changes in the social networks of schizophrenic individuals on their symptomatology and prognosis.

Conclusion

In this article we have set forth an approach to the social aspects of schizophrenia based on social network concepts and methods. We have argued that a social network perspective can provide a unifying framework for social research on schizophrenia: it is consistent with the findings from more traditional approaches to the role of social variables in the development and course of schizophrenic illnesses; and it may help to resolve some persistent methodological issues.

A selective survey of the literature has indicated the relationship of social network analysis to other research approaches: (1) epidemiological findings on such diverse variables as migration, minority status, and social class can be reinterpreted in terms of hypothesized variations in social networks; (2) variations in network structure may be inferred from some of the studies of schizophrenic friendship patterns, family interaction, and communication suggesting that a common social process may underlie these varied findings; and (3) studies dealing with the social contact patterns of schizophrenic individuals seem to show an impact of network size or structure on the level and type of schizophrenic symptomatology and on prognosis.

We have also briefly described a theoretical model which attributes a critical role in the onset and recurrence of schizophrenia to social network processes. In this view, the individual's personal network is the primary source of social feedback essential to the development and maintenance of culturally appropriate behavior.

However, the potential value of social network analysis for schizophrenic research does not depend on a particular theoretical viewpoint. We have attempted to indicate how network

analysis may contribute to resolving some basic methodological and conceptual problems in social research on schizophrenia. The use of network variables permits systematic, comparable studies of individuals in their social contexts, despite cultural variations in such factors as family composition and role definitions, a range of socializing agents, and other cultural differences. Analysis of the effects of continuities, disruptions, or distortions in people's social networks may help to explain the role of such large-scale variables as social class or ethnicity. Network variables can also contribute to definition and measurement of concepts like stress or overstimulation, which are difficult to assess directly across individuals and especially across cultural contexts. A social network approach to schizophrenia might be used, for example, to provide objective social measures of the impact of events; to assess the similarity of social environments for identical and fraternal twins; and to contribute to social outcome measures in followup studies of patients.

In conclusion, we believe social network variables should contribute importantly—both methodologically and empirically—to other approaches to research and therapy; that they probably play a critical role in shaping and eliciting symptomatology and in the recurrence of episodes; and that they may be significantly involved in the etiology of schizophrenia.

Summary

This article suggests that social network concepts and methods can provide a unifying framework for social research on schizophrenia. A selective review of the literature indicates that a social network perspective is not only consistent with a range of other research approaches and findings, but may help resolve some basic and persistent methodological and conceptual problems. A theoretical model is briefly described which attributes a critical role in the onset and recurrence of schizophrenia to social network processes. Some examples are given of the potential contribution of social network variables to research and therapy in schizophrenia.

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dean research award

The 16th annual Stanley R. Dean Research Award was presented recently to Dr. Solomon H. Snyder. The award of \$2,500 was established by the Fund for the Behavioral Sciences and is granted each year, jointly with the American College of Psychiatrists, in recognition of "basic research accomplishment in the behavioral sciences contributing to our understanding of schizophrenia."

Dr. Snyder is Professor of Pharmacology and Psychiatry, The Johns Hopkins University School of Medicine, Baltimore, Md. Dr. Snyder succeeds Professor John Wing, winner of the 1976 award.