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Measuring age as a structural concept

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Network analysis provides a useful guide for collapsing ostensibly non-network data into analytical categories. I illustrate the point here using a familiar variable, years of age. Viewed structurally, age is a network pattern characteristic of being a specific number of years old. So viewed, years of age can be collapsed into socially distinct age categories where each category is a status in the social structure of age in a study population. For illustration, I describe the structure of relations defining age statuses in the American population. Each status is a unique pattern of relations with kin of specific ages, spouses of specific ages, and friends and coworkers of specific ages. In the mid 1980s, Americans were distributed across nine age statuses; I children (ages 1–18), II students (19–24), III young adults (25–30), IV twilight youth (31–36), V middle-age adults (37–46), VI older adults (47–52), VII senior adults (53–60), VIII retiring adults (61–66), and IX the elderly (over 66). The most severe changes in 1985 were happening to Americans in their late 40s—born at the beginning of World War II and in transition from age status V to status VI. When observed in 1985, they were in the process of replacing their parents with their children as important discussion partners and learning to live with much greater age heterogeneity in their other contacts, both in their marriages and their friends and coworkers beyond the family. Women were about to leave their prominent position in heterosexual society defined by age status V and men were about to enter a menopausal period characteristic of status VI.

1. Introduction

There is a destructive practice in social science research that can be eliminated with a simple network analysis, with the effect of enhancing the magnitude and stability of research findings across studies.

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The destructive practice concerns a research task typically relegated to footnote discussion, if given any attention at all—the task of collapsing multiple category variables into fewer categories for loglinear or covariance structure analysis. Examples are collapsing levels of education into an education variable, collapsing years of age into an age variable, collapsing ethnic categories into an ethnicity variable, or collapsing number of subordinates into a span of control variable. For example, by what criteria did you collapse age into meaningful age categories for your last research project? Judging from published work, the answer is contingent on your sample size and interest in age effects. Those with large samples can study age effects by decade, distinguishing ages 10–19, 20–29, 30–39, et cetera. Those some would view as truly retentive can go for 5-year intervals, age 10–14, 15–19, 20–24, and so on. At the other extreme, those with small samples interested only in eliminating age effects might be satisfied to distinguish old people from young people. Equally free of attention to age effects are the researchers who enter years of age as a linear predictor, presumably because each year of additional survival brings a unit change in the outcome under study. The fact is that we are free to code age in whatever way we wish because there is no consensus on how such coding should be carried out to recover the social meaning of age.

Further, there is little pressure in social science methodology training to encourage students to think about the issue. The focus is on obtaining statistically efficient estimates of associations between variables. The task of properly mapping units of analysis onto the continua being correlated is presumed solved. This is sometimes true, but it is the exception rather than the rule. It is widely true in economics and demography. Economists have the dollar as a measurement unit and demographers have body counts. Sociology too has at least one example. Research in the 1950s revealed a stable, unidimentional, prestige continuum underlying occupational stratification. This made possible powerful studies in the next two decades of occupational achievement over time and between generations following Blau and Duncan's (1967) *American Occupational Structure*. It is the statistical work in, and spawned by, the *American Occupational Structure* that is most celibrated in contemporary sociology, but the power of that statistical work was entirely determined by the clarity of the preceding substantive research providing reliable dimensions of occupational prestige. These are exceptions that stand in obvious contrast to research in other areas by sociologists, political scientists and anthropologists. Measurement is typically less well researched or consensually accepted. Before this turns into another whining missive from a measurement prig, let me simply say that the most consequential decisions in much of social science research involve assigning units of analysis to categories rather than the subsequent, and currently emphasized, estimation of associations among the categories.

My purpose here is to illustrate how network analysis provides a practical guide to collapsing categories. The argument is as follows: (a) Categories should be combined to the extent that units of analysis within them are similarly involved in social processes. When played out with respect to a specific outcome variable, this is Lazarsfeld's idea of index substitutability. Two categories are combined when they have identical associations with the outcome variables in a study. For example, little distinction is made between people who have 10 years of education and those who have 11 years of education because both kinds of people have levels of education that will position them similarly with respect to other people. A great deal is made of the difference between 11 years and 12 years because high school graduation changes the kinds of roles available to a person, and so their characteristic relations with others. (b) The education example illustrates the presumption of structural analysis. The social processes responsible for the effects to be estimated in a study operate through relationships between people and organizations. (c) Therefore, the people or organizations in two categories can be combined as similarly involved in social processes to the extent that they have identical relations with units of analysis in other categories. (d) In other words, two categories should be collapsed together to the extent that the people or organizations within them are structurally equivalent with respect to all other categories.

This is more than a guide for working with small samples. There is a more important substantive motivation. Structurally equivalent categories should be combined to improve the magnitude and stability of research findings across studies. Effects are stronger because the variation in effects is minimized within aggregate categories and maximized between categories. Effects become more stable across studies because estimated effects are less often an aggregate of contradictory effects from improperly combined categories and less often based on a distinction between redundant effects from separate categories that should have been combined.

The remaining text is an illustrative application of the equivalence criterion through routine methods of network analysis. The application is an example of detecting status/role-sets with ersatz network data (Burt 1981). Using network data obtained in the 1985 General Social Survey (GSS), I collapse years of age into categories of Americans who stand in common position within the social structure of age. I have selected age because it is an important predictor or control variable in much social science research. However, the more general point is that continuous variables of many kinds—age, education, occupational prestige, income, geographic distance, span of control within an organization—have social effects that can only be recovered accurately in empirical research to the extent that they are measured in terms of categories where people in the same category are homogenously exposed to effects and people in different categories are heterogeneously exposed to effects.

A structural definition of age

Age is defined empirically with respect to a specific event—call it the study event. For example, the study event could be employment with a specific firm, marriage, college education, or graduate education, but it is usually birth, with age distinguishing people by how long they have survived. Each person involved in the study event has a date at which they began their involvement. Repeating the preceding list of example study events, the entry dates would be the date when an employee was first hired by the firm, the date of marriage, the date of entering college, the date of entering graduate school, and, most typically, the date of birth. Let the entry year be $t0$ and each subsequent year be $t + k$ where k is a person's years of involvement, or age, with the study event. Again repeating the preceding list of example study events; k would be years of employment with the study firm, years of marriage, years of college education, years of graduate education, and, most typically, years of age. For the purpose of exposition, I'll be talking about age in years, but it could just as well be weeks, months, or decades without affecting the course of analysis to be described.

Age networks

Network data are readily available in area probability survey designs. Let me presume that network data have been gathered from a sample

$$\begin{bmatrix} f_{00} & f_{01} & f_{02} & f_{03} & \cdots \\ f_{10} & f_{11} & f_{12} & f_{13} & \cdots \\ f_{20} & f_{21} & f_{22} & f_{23} & \cdots \\ f_{30} & f_{31} & f_{32} & f_{33} & \cdots \\ \vdots & \vdots & \vdots & \vdots & \end{bmatrix}$$

Fig. 1. Age network (f_{ij} is the frequency with which people age i cite people age j).

of people representative of a study population involved in the study event. For example, each interviewed person could have been asked to name his or closest friends, most valued work contacts, most frequent contacts, et cetera. Marsden (1990) provides a succinct review of research designs for obtaining such data.

From the sociometric citation data, tables of the form illustrated in Figure 1 can be estimated. The first row of the table contains respondents who have been involved with the study event for less than a year. Some number of their sociometric citations go to other people involved with the study event for less than a year. Call that frequency f_{00}. Some number of their citations go to people involved in the study event for 3 years. Call than frequency f_{03}. In general, f_{ij} is the frequency with which people of i years involvement cite people of j years involvement. If employee seniority is under study, then f_{ij} is the frequency with which people i years with the firm cite people who have been with the firm for j years. If age from birth is under study, then f_{ij} is the frequency with which people i years old cite people j years old. Multiple tables can be created for multiple kinds of relationships. In the analysis below, for example, I build one table for kinship relations, another for marriage relations, and a third for close relations beyond the family. Generalizing the above discussion, f_{ijk} is the frequency with which people i years old cite people j years old for the kth kind of relation.

Network relations can be derived from the aggregate frequencies of citations between ages. The variable z_{ijk} measures the strength of the kth kind of relation from people of age i to people of age j, such that the z_{ijk} are comparable across ages. There are several well-established alternatives here. I'll return to them shortly. For the moment, let me treat the f_{ijk} as direct, comparable measures of relationship, so z_{ijk} equals f_{ijk}.

Age as a status in social structure

I can now offer a structural definition of age by defining when two empirically distinct ages, say 40 years old versus 41 years old, indicate the same structural age. Two ages are the same in the social structure of age to the extent that they are structurally equivalent across the networks responsible for age stratification in a study population. A status in the social structure of age, more simply termed an age status, is then a set of contiguous structurally equivalent ages. Age statuses are obviously related to age cohorts and stages in the life-cycle. I'll return to this point later. For the moment I'll simply paraphrase Ryder's (1965: 845) widely circulated definition of cohort in saying that an age status can be defined as an aggregate of individuals (within some population definition) who experienced the same event within the same time interval (e.g., being born in the same year) and now experience events through identical relations with individuals of other ages.

For example, consider structurally equivalent ages in terms of the three kinds of relations to be analyzed below; kinship, marriage, and close ties beyond the family. People in the same age status experience kinship, marriage, and nonkin relations with people of the same ages. Not only do they share proximate birth years, they share similar age parents, similar age spouses, and similar age coworkers and friends beyond the family. More, they are similarly disconnected from parents, spouses, coworkers and friends of certain other ages. In other words, they are identically exposed to whatever social processes operate through age related parameters.

More specifically, ages i and j are structurally equivalent to the extent that people of age i and people of age j have the same relations with people of every other age. Given z_{ijk} estimated for the appropriate networks, ages i and j are structurally equivalent if they are identically the object of relations from every other age ($z_{qik} = z_{qjk}$ for all ages q and all kinds of relations k), and identically send relations to every age ($z_{iqk} = z_{jqk}$ for all ages q and all kinds of relations k). The continuous measure of equivalence used in network analysis is the following

Euclidean distance, d_{ij}, between ages i and j:

$$d_{ijk}^2 = \sum_q \left(z_{qik} - q_{qjk}\right)^2 + \sum_q \left(z_{iqk} - q_{jqk}\right)^2,$$

$$d_{ij} = \left(\sum_k d_{ijk}^2\right)^{1/2},$$

which is zero when ages i and j have identical relations with every other age. Increasing nonzero values of d_{ij} indicate decreasing equivalence between ages i and j. This is a measure routinely available in network analysis computer programs (e.g., see Burt 1988, for detailed discussion). The extension to multiple kinds of relations is an obvious extension to the computations for a single kind of relation, so for easy exposition from here on, I'll just refer to z_{ij} and f_{ij}.

Measuring network relations between ages

With structurally equivalent ages defined, consider the meaning of alternative methods for deriving the z_{ij} from the f_{ij}. The simplest is to treat the f_{ij} as direct, comparable measures of relationship, setting z_{ij} equal to f_{ij}. This emphasizes size as a defining quality of age statuses. The more people there are of age i, the larger the f_{ij} will be with each other age j. Therefore, boundaries between age statuses will be strongly affected by changes from year to year in the number of people entering the study event. For example, if many new employees are hired for 3 years and very few are hired during the next 3 years, then an age status boundary is likely to appear between years 3 and 4 because, ceteris paribus, the z_{ij} for the first 3 years will be large and the z_{ij} for years 4 through 6 will be low.

The effects of size can be eliminated if age is defined by stochastic relations. The z_{ij} can be row stochastic ($z_{ij} = f_{ij}/\Sigma_q f_{iq}$), or column stochastic ($z_{ij} = f_{ij}/\times_q f_{qi}$), or both ($z_{ij}$ = interative proportional scaling of f_{ij}). The row stochastic relations sum to 1.0 across columns ($\Sigma_j z_{ij} = 1.0$) giving every age the same probability of making a sociometric citation, so z_{ij} is the probability that the one citation from age i will be to people of age j. The column stochastic relations sum to 1.0 across rows ($\times_i z_{ij} = 1.0$), giving every age the same probability of being chosen, so z_{ij} is the probability that the one citation to age j will be from age i. The row and column stochastic relations sum to 1.0

across rows and columns ($\Sigma_j z_{ij} = \Sigma_i z_{ij} = 1.0$), giving every age the same probability of making a citation and being chosen, so z_{ij} is the probability that the one citation from age i will be the one citation to age j.

However, age status boundaries defined by stochastic network relations can be misleading where there is extensive contact between statuses, The higher the mean f_{ij}, the smaller the mean stochastic z_{ij}. This serves to emphasize status boundaries around age groups focusing their relations on a specific other age group (e.g., see Burt and Carlton 1989, for illustration of this problem with respect to detecting network boundaries around economic markets). To emphasize relation pattern differences between statuses in high contact networks, age should be defined by marginal network relations. This holds constant size differences between ages while highlighting network pattern differences. The z_{ij} can be row marginal, $z_{ij} = f_{ij}$/(maximum frequency in row i), or column marginal, $z_{ij} = f_{ij}$/(maximum frequency in column j). The row marginal relations are more frequently used in empirical research merely because network data typically involve people in the row categories sending relations to people in the column categories. Each row marginal relation z_{ij} varies from 0–1, with 0 indicating no contact between ages i and j, and *1* indicating that the relation from age i to age j is as strong as any from persons age i.

Status, cohort or life-cycle?

Concepts of cohort and life-cycle are bound up in the concept of an age status. In his widely cited article on cohorts as a vehicle for studying social change, Ryder (1965: 845) defines a cohort as: "the aggregate of individuals (within some population definition) who experienced the same event within the same time interval. In almost all cohort research to date the defining event has been birth, but this is only a special case of the more general approach." The motivation for a cohort analysis is that people or organizations within the same cohort are homogeneous above and beyond their individual ages or the period in which they are observed. Ryder (1965: 847) makes an analogy between age cohort categories and categories of social class, with such categories having "explanatory power because they are surrogate indices for the common experiences of many persons in each category." Where common experiences are grounded—physically and in interpretation—in relationships with others, Ryder's reasoning mirrors the argument given above for collapsing years of age into age status categories. [1]

At the same time, cohort differences are coincident with life-cycle differences. Riley (1973) provides an articulate discussion of confusions between the two likely in research based on cross-sectional data, and, with colleagues, has developed the contrast into an analytically powerful view of society (e.g., Riley 1987; Riley et al. 1988). Some differences between people of different ages result from the different roles typical of different stages in the life-cycle, roles such as childhood, work, marriage, parenthood, old age. People who are or have been married are fundamentally changed from the people they were before ever being married. People who have children enter a variety of domestic and community relations never experienced by people who do not have children. The growing number of people who finance care for elderly parents have institutional experiences never shared by earlier generations in which parents died before the issue arose. Other differences between people of different ages arise from the timing of life-cycle events within cohorts. For example, baby-boom Americans are postponing the task of raising children. Relative to their own parents, the characteristic concerns of parenthood are coming to baby-boom Americans at an older, less energetic, more secure, age. The experience of raising children is accordingly different between the two cohorts.

Cohort and life-cycle are bound together in age status. The network of relations characteristic of an age status depends on the life-cycle roles typically played by people in the status and that depends on when

[1] Cohort analysis proceeds from a data table that defines an analysis of variance framework for studying a criterion variable distributed through the table, Columns of the table distinguish years in which observations were made (e.g., 1965, 1975, 1985), and rows distinguish age groups corresponding to the time between observations (e.g., ages 10–19, 20–29, 30–39). Cell (A,B) of the table contains responses on the criterion variable by people or organizations of age A observed at time B. Glenn (1977) provides a useful introduction (also see Riley et al. 1988: 256ff, for a briefer introduction and more recent references), and Mason et al. (1973) nicely illustrate the identification problems inherent in distinguishing age, cohort and period effects within the data table. The need for correspondence between rows and columns leads to years of age being collapsed into whatever categories are convenient. In his methodological introduction, for example, Glenn (1977: 8) explains that cohort boundaries are "arbitrarily delineated" since the "given period of time" in Ryder's above quoted definition may be of any length, and proceeds through his book to use the above illustrated decade-width age categories. My point in describing the rudiments of cohort analysis is not to call such analysis into question. Quite the contrary. The point is that even where empirically informed models of age effects are most sophisticated, as in cohort analysis, the problem of collapsing years of age into analytical categories is not considered part of the analysis.

people in their cohort are choosing to enter the roles. For the purposes here, I feel no compulsion to attribute age status boundaries to the effects of cohort or life-cycle. It is sufficient to know that the status boundaries result from both and should not be interpreted as completely determined by either.

Data

To illustrate the proposed concept, I'll use the General Social Survey (GSS) to describe American age stratification during the mid 1980s. The GSS is an area probability survey conducted annually or semi-annually of "English-speaking persons 18 years of age or over, living in non-institutional arrangements within the continental United States." The rich diversity of data obtained in the General Social Survey (GSS) on American attitudes and behaviors is enhanced in the 1985 survey with network data on the interpersonal environments of respondents.

Each of the 1,534 respondents in 1985 was asked the following name generator: "From time to time, most people discuss important matters with other people. Looking back over the last six months, who are the people with whom you discussed matters important to you?" Name interpreter questions were then asked about the first five persons named. [2] A crude image of the form of the respondent's network is defined by the (up to) five important discussion partners named, their closeness to the respondent, and their closeness to one another. The formal data were fleshed out in the GSS with name interpreters about the history and substance of relations with each discussion partner. With these added data, a variety of useful network composition measures can be computed to describe the proportion and position of specific kinds of contacts in the respondent's network (e.g., kin, co-workers, males vs. females, racial groups, age groups, occupation groups, etc.). Marsden (1987) provides summary statistics on the form of the discussion networks and Burt (1990) summarizes the content of the discussion relations.

[2] Burt (1984) provides a detailed discussion of the network data and various issues taken into account by the GSS Board of Overseers in their deliberations over the network items. The draft questionnaire items proposed in Burt (1984) are very similar to the items eventually adopted for the GSS, but the the exact wording is given in a later issue of the newsletter for the International Network for Social Network Analysis (Burt, 1985).

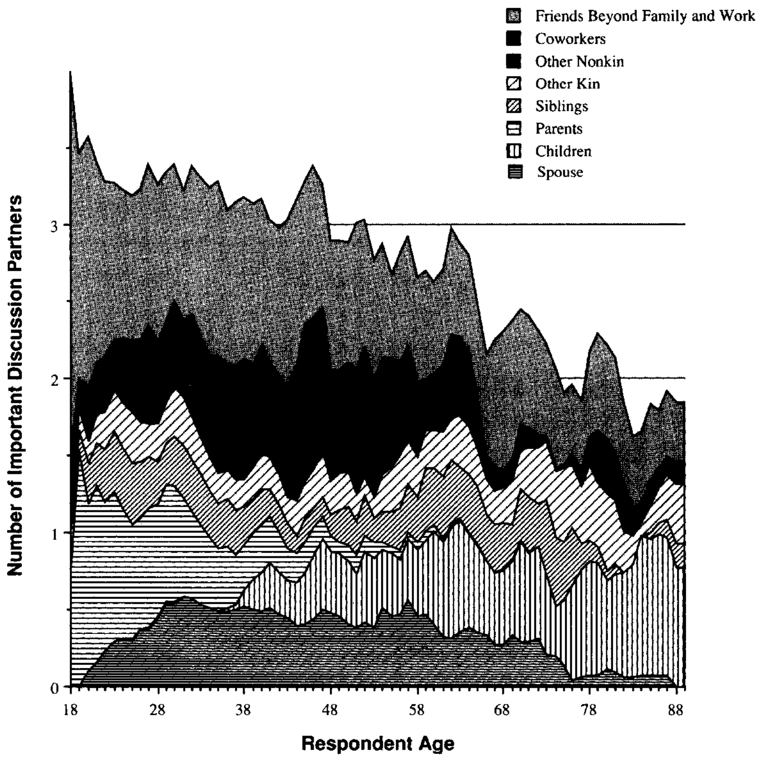


Fig. 2. Shifting composition of discussion networks.

Figure 2 shows how the composition of important discussion changes with age. First, you can see the often observed age effect on network size. Young respondents cite an average of four important discussion partners and elderly respondents cite an average of two. Further, the networks of older respondents are drawn increasingly from relatives. Relatives are indicated by the striped areas at the bottom of Figure 2. Changes in absolute numbers are significant with age, but slight in comparison to the changes in proportions. Respondents under 30 name an average of two relatives as important discussion partners. Respondents over 65 name an average of one and a half relatives. However, with the loss of coworkers at retirement, and the declining use of nonkin friends as discussion partners, the slightly fewer relatives cited by elderly respondents constitute the bulk of their networks. Another age specific event is the shift from parents to children as important discussion partners. Figure 2 shows parents declining quickly as discussion partners for respondents in their 20s and early 30s, and replaced by children for respondents in their 40s (with a sliver of contact with parents for some respondents in their 50s). Also in this period, respondents in their 30s and 40s are the most likely to draw important discussion partners from their coworkers.

Detecting age statuses

To detect age statuses with these data, I constructed three age networks. Each has 93 rows and columns for ages from 1 to the oldest cited discussion partner, age 93. Within each network, z_{ijk} is a row marginal relation, as defined above, measuring the relative extent to which people of age i cite people of age j for the kth kind of relation. Where no respondents were sampled for an age, I put a 1.0 in the diagonal, implying that their strongest relations would have been to people of the same age. This occurred in all ages below 18 and many ages over 75.

The three networks are defined by kinship, marriage and relations beyond the family. In the kinship network, z_{ij} measures the tendency for respondents of age i to cite relatives of age j (excluding spouses). [3] In the marriage network, z_{ij} measures the tendency for respondents of age i to marry persons age j. In the third network, z_{ij} measures the tendency for persons of age i to select important discussion partners from friends and coworkers of age j.

Two ages are structurally equivalent to the extent that respondents of those years are (a) equally likely to cite people of every other age as relatives, spouses, and discussion partners beyond the family, and (b) equally likely to be cited as relatives, spouses, and nonkin discussion partners by people of every other age. To measure age equivalence, the three (93,93) networks of citation frequencies were read into a general purpose network analysis program, STRUCTURE. The input data were converted by the program to row marginal relations within each

[3] An analysis of overlaps between kinds of relations elicited by the GSS name generator shows that spouses are a kind of kinship relation uniquely distinct from other kinship relations (Burt 1990). Spouses are especially close friends, polar opposites from casual acquaintances such as neighbors. Other relatives are high obligation relations, polar opposites from coworkers.

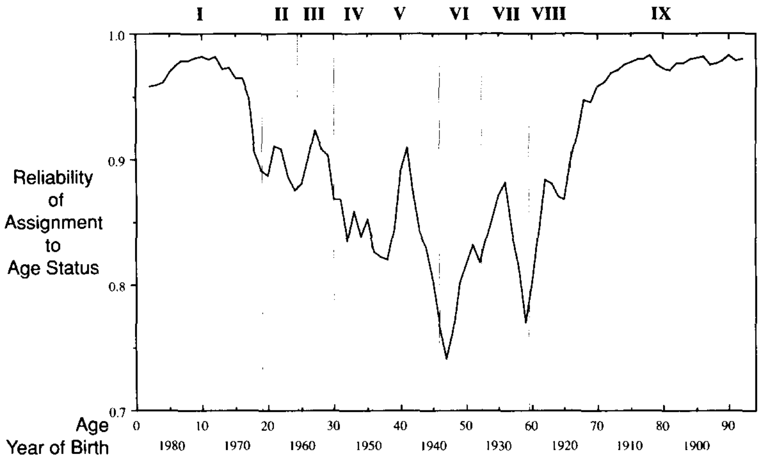


Fig. 3. Reliability of assignments to age statuses as an indicator of differences between statuses (3-year moving averages are presented).

network, from which Euclidean distances were computed for a structural equivalence analysis.

From the printed cluster analyses of the distances, I located nine groups of ages clustered together at a high criterion of equivalence. The age groups were not contiguous, however, with each as the core of a status, I used the ASSISTANT program provided with STRUCTURE to test the equivalence of adjacent ages. Gargiulo (1991) provides a didactic discussion of the iterative testing procedure. For ages at the boundary between two statuses, the boundary age was assigned to the younger status and its reliability was computed. The boundary age was then assigned to the older status and its reliability was computed. The boundary age was finally assigned to the status in which it had the higher reliability. Reliability here is an item-scale correlation for a specific age describing the extent to which distances to the age's status (excluding the age being assessed) is correlated with distances to the age alone. An age has a 1.0 reliability when it lies at the center of a distinct age status.

The age reliabilities are plotted in Figure 3. The horizontal axis is time, presented in terms of age at the time of the survey and year of birth. The vertical axis is the reliability with which the network pattern typical of being a certain age is typical of the status to which the age is assigned. The nine detected age statuses are distinguished in the graph by vertical lines and identified by Roman numerals.

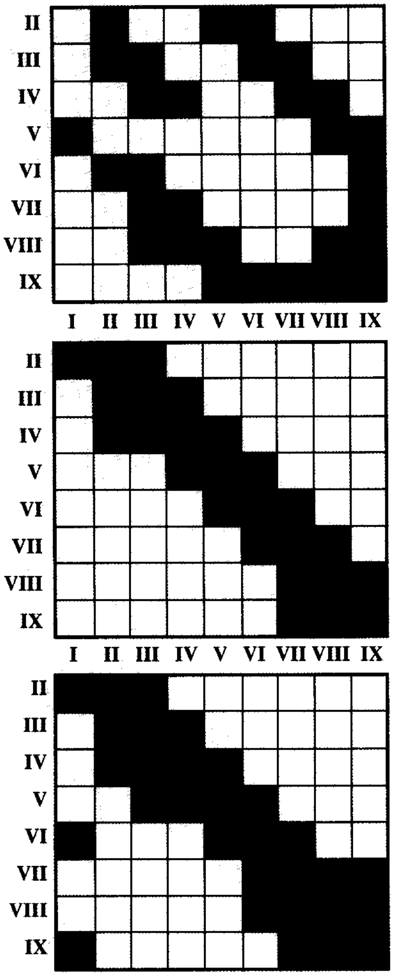
Two points are illustrated. First, the aggregate reliability is high. It varies from correlations over 0.95 down to a few ages where it is 0.75. The mean reliability is 0.91 across all ages.

Second, the reliabilities have a characteristic distribution. Within statuses, they are highest for the central years, the years most distant from the boundaries between statuses. This is apparent in Figure 3 even though the figure plots 3-year moving averages. Across statuses, reliabilities decrease with social complexity. They are highest for children (status I) and the elderly (status IX); typically years of isolation in the GSS data. The most complex mixture of relations occurs in the networks of respondents in their 40s and 50s. This is apparent in Figure 2 and will become more apparent in the next section, but you can see in Figure 3 that reliabilities are weakest for people in their late 40s and early 50s. This is a clue to the fact that something interesting is going on in their networks.

Status and network structure

The structure of relations between age statuses is summarized in Figure 4. The figure contains three density tables describing contact in each of the three networks between people in each age status. These tables give you a thumbnail sketch of how Americans of different ages are socially connected. The exact frequency of contact is reported in the matrices. [4] For example, the 217 in row four, column five of the third matrix indicates that the respondents who were 31–36 years old in 1985 cited beyond their families 217 important discussion partners who were also 31–36 years old that year. The grey areas in the density tables show where interaction effects in a loglinear model of the citation frequencies are larger than their standard errors. Black areas indicate especially concentrated contact (loglinear z-score effects that are 4 or more times their standard errors). Blank areas indicate no contact or citation frequencies no greater than expected by random chance.

[4] The four 18-year-old GSS respondents are combined with the 19–24-year-old respondents in status II for the second row of the matrices in Figure 4 because they do not represent relations from all children (persons of age 1–18) and are somewhat structurally equivalent with the status II respondents.



Relatives (excluding spouse)

7	36	20	14	83	36	35	12	4
11	24	46	18	29	70	79	19	8
3	5	31	35	23	15	45	34	20
43	19	16	25	37	9	24	33	35
5	20	27	10	13	12	6	5	18
4	13	34	35	15	16	29	14	26
3	5	24	40	29	4	15	19	23
5	5	6	23	67	53	55	25	43

Spouses

3	21	9	2	0	0	0	0	0
1	20	56	19	7	0	0	0	0
0	5	21	60	18	2	0	0	0
1	1	5	22	85	9	3	0	0
2	0	0	1	14	26	8	1	0
0	0	0	0	5	20	38	14	2
0	0	0	1	1	1	13	13	13
1	0	0	0	0	0	6	7	32

Contacts Beyond the Family

36	121	40	14	11	7	3	0	3
4	55	157	77	41	20	11	3	1
2	10	74	133	83	20	14	6	2
5	10	37	95	217	52	36	7	0
13	3	11	23	72	51	34	5	0
3	1	8	14	41	34	61	25	8
0	0	3	1	20	15	35	44	19
7	0	3	6	21	18	43	27	69

Fig. 4. The american social structure of age. (Respondents are in rows citing columns as important discussion partners. Citation frequencies are given in the matrices. Density table cells are shaded according to their effect in a loglinear model of the citation frequencies. Black indicates a z-score interaction effect of 4.0 or higher. Grey indicates an effect greater than its standard error and blank indicates negligible or negative effect.)

The kinship network shows three stages of banded pattern. The interaction bands run from the upper left of the network to the lower right.

The first stage is one of kinship dependence. This stage runs from childhood through the onset of middle-age (statuses I through IV). The stage is characterized by two bands of interaction. Kinship relations are with important discussion partners their own age (as indicated by the shaded diagonal elements). These are the respondent's brothers and sisters, with an occasional cousin. There is a second band of kinship relations with important discussion partners in statuses that are two steps older than their own. These are the respondent's parents. Of the 762 kin cited by respondents in age statuses [through IV (excluding spouses), 422 are parents, 2 are children, and 338 are other relatives (of whom the majority, 239, are in the respondent's own or adjacent age status).

The second kinship stage introduces more demanding obligations. This stage runs from middle-age through senior adults (statuses V through VII). Again, the stage is characterized by two bands of interaction. One band is with important discussion partners in statuses that are two steps older than the respondent's own (until a ceiling is reached in VII). These are primarily the respondent's surviving parents. The second band of kinship relations is with important discussion partners in statuses that are two steps younger than the respondent's own. These are children. Notice that the children come in with a bang. The tendency for status V respondents to cite their children as important discussion partners is the strongest effect in the entire kinship table (z-score test of 8.2 in a loglinear model of the table).

The striking feature of the second stage is the lack of ties to relatives of your own age. There are no shaded kinship squares in Figure 4 among the age statuses in the second stage. However, the loglinear analysis is easily misinterpreted here. Of the 543 kin cited by respondents in statuses V through VII (again excluding spouses), 196 are children, 91 are parents, and 256 are other relatives (of whom the majority, 161, are in the respondent's own or adjacent age status). So in fact, these respondents have much lower contact with their parents than younger respondents, and much more contact with siblings than would be expected from the empty cells in Figure 4. Parent contact is emphasized by the loglinear model because the parents of these respondents are getting to an age where no relatives are citing them other than their own children. From the columns of kinship relations in Figure 4, you can see that relatively few citations are directed at people in age statuses VIII and IX. The bulk of what they get in the kinship network is from their children, which creates the loglinear effects indicated by the shaded areas for stage two respondents citing their parents. The

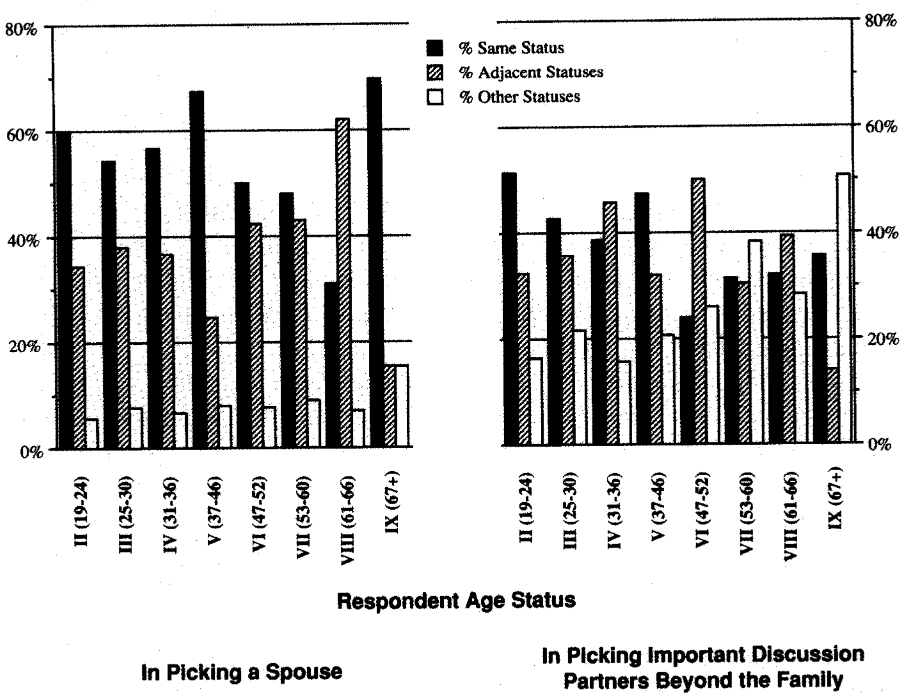


Fig. 5. Age status homophily.

lack of significant contact with siblings has the same explanation, but in the opposite direction. People in age statuses V through VII are so often cited as important discussion partners that the citations from their siblings are negligible. Looking down the columns of the kinship network in Figure 4, these people are most often cited by their children or their surviving parents.

The third kinship stage brings back siblings. This stage runs from the years just before retirement (age status VIII) through the remainder of life (age status IX). It is characterized by extensive contact with your children and relatives your own age.

The marriage network is dominated by homophily. The darkest cells of the marriage density table in Figure 4 lie along the diagonal. The point illustrated is the homophily variation from status to status. The graph at the left of Figure 5 shows the distribution of spouses in 1985. Of the 126 spouses cited by middle-age respondents (status V), for example, 67% are in the same age status (shaded bar in Figure 5), 25% are drawn from the next younger or next older status, and only 8% are drawn from more distant statuses. Of all 589 cited spouses, 56% are in the same age status as the respondent. Americans clearly prefer spouses in their own age status. But this preference varies across statuses. It is strongest up through middle-age and among the elderly. These are the statuses for which the shaded bars in Figure 5 dominate the spouse distribution. The tendency is weakest for respondents in their late 40s through retirement. These respondents are as likely, or more likely, to have a spouse from an adjacent age status as they are likely to have a spouse from their own status.

The network of contacts beyond the family has a similar, but less extreme, pattern. Again, the darkest cells of the nonkin density table in Figure 4 lie along the diagonal. The graph at the right of Figure 5 shows the greater tendency for age heterogeneity in contacts beyond the family. Two points in particular deserve note. First, the white bars in the right-hand graph of Figure 5 are much larger than the corresponding bars in the left-hand graph. In other words, nonkin contacts are more likely than spouses to come from distant age statuses. Note further that this tendency increases with age. The white bars in the right-hand graph increase from left to right in the graph (ignoring the dip just before retirement). Second, the transition from status V to VI is once again a major one. In the graph at the left of Figure 5, the transition to marrying people not in your own age status began in status VI. In the graph to the right, the tendency for nonkin contact within the respondent's age status drops dramatically in status VI and never again reaches its levels in younger statuses. Up through middle-age (status V), contacts are primarily drawn from the respondent's own age status or adjacent statuses. Further, the tendency for nonkin contact in distant statuses increases in status VI and never again drops to its levels in younger statuses.

Network characteristics of the age statuses are summarized in Table 1. Standing back from the details, the network results show two especially severe status transitions in the social structure of age. The most severe occurs for Americans in their late 40s, born at the beginning of World War II, and in 1985 in transition between statuses V and VI. The sharp drop in reliability during the late 40s in Figure 3 means that it is difficult to draw a clear boundary in continuous time between the statuses. The networks of respondents age 46 and 47 are different

Table 1
Network characteristics of age statuses

Birth dates	Age in 1985	Age status	Characteristic important discussion relations
After 1966	Under 19	I Children	Not interviewed for the GSS
1961–1966	19–24	II College	large networks; frequent contact with parents, and age homophilous close and casual friends
1955–1960	25–30	III Young adults	Fewer daily contacts; continuing age homophilous friends; spouses and coworkers enter
1949–1954	31–36	IV Twilight youth	Parents decline; last period of concentrated age homophilous relations (other than spouse) until old age
1939–1948	37–46	V Middle-age	Daily contact begins continuing steep decline; children a concentrated focus of relations; children begin to replace parents and siblings; coworkers prominent; minimum age homophily in relations with relatives, spouse, and contacts beyond family
1933–1938	47–52	VI Older adults	Continue changes begun in middle-age; transition to less differentiation between especially close and less close relations
1922–1932	53–60	VII Senior adults	Parents disappear; coworkers decline
1919–1922	61–66	VIII Retiring adults	Coworkers disappear; concentrated age homophilous relations reappear with relatives and contacts beyond the family
Before 1919	Over 66	IX Elderly	Small networks; declining friends beyond family; high proportion kin; equally close to all important discussion partners; declining friends beyond family

from one another at the same time that they are different from networks observed in the preceding and subsequent age statuses. In Figure 2 notice that three major transitions happen between age statuses V and VI. Children begin, and largely finish, replacing parents as important discussion partners. The shift occurs from making extensive distinctions between especially close and less close discussion partners to feeling equally close to all discussion partners. The sharp decline in daily contact with important discussion partners begins, to continue thereafter. In Figure 4, status V is the one status in the kinship network that concentrates relations in a single other status—the children status (I). In earlier years, kinship contacts are with parents and siblings. In later years, kinship contacts drift to the younger age statuses of the respondents' children. Contact with relatives of the respondent's own age do not become significant again until the final two statuses, the period immediately before and following retirement. For respondents younger and older than age 40 to 50, spouses are concentrated in the age statuses surrounding the respondent. In earlier and later years, important discussion partners beyond the family show the greatest age homophily with respondents. It is during the 40s that children are a new and concentrated source of important discussion partners, spouses come from the most varied ages, and contacts beyond the family come from the most varied ages. Moreover, Figure 5 shows that the transition from status V to VI is marked by increased age heterogeneity both in marriage and contacts beyond the family. In 1985, in short, respondents in their late 40s were undergoing the most profound network changes observed on average anywhere in the age stratification of Americans.

The next most severe transition, judging from the other sharp drop in Figure 3, happens around age 60, in the transition from status VII to status VIII, experienced in 1985 by Americans born in the mid 1920s. In Figure 2 you can see that status VIII, ages 60–66, is the period in which coworkers disappear. The kinship density table in Figure 4 shows that this is the period in which contact with relatives their own age is again significant for respondents. The third density table (and the increasing shaded bars in the graph at the right of Figure 5) shows that this is also a period of increased age homophily in respondent contacts beyond the family.

Age related analyses

Before closing, I wish to highlight a side benefit of results such as the preceding. They provide valuable input to studies of phenomena related to age.

Using status boundaries

For a variety of reasons, some flattering, some not, age is often presumed to be correlated with holding conservative, traditional, beliefs. There is mixed empirical support for this presumption. In the

Table 2
Belief in sex role stereotypes

Question	Scale value
It is more important for a wife to help her husband's career than to have one herself.	
Strongly Agree	2.347
Agree	1.902
Disagree	1.501
Strongly Disagree	1.000
Don't Know or No Answer	1.800
It is much better for everyone involved if die man is the achiever outside the home and the woman takes care of the home and family.	
Strongly Agree	2.345
Agree	1.850
Disagree	1.458
Strongly Disagree	1.000
Don't Know or No Answer	1.816

Scale values are based on the parameters in a unidimensional loglinear association model of the (5,5) crosstabulation of the two questions. A constant has been added to the raw parameters of both variables so that the "strongly disagree" response has a value of 1. The two variables are correlated 0.588 if the responses are given integer scores (excluding the Don't Know and No Answer categories) and correlated 0.586 if the responses are given the above scale values (which include the Don't Know and No Answer categories). The summary stereotype measure discussed in the text is the product of the scale values for a respondent's answers to the two questions (and so range from 1.0 to 5.504).

1985 GSS data, age is strongly correlated with holding conservative beliefs about women.

Two items from the survey are given in Table 2. The first asked respondents for their opinion of women dedicating themselves to their husband's career rather than their own and the second asked for their opinion of women confining themselves to domestic activities. I cross-tabulated the five possible responses to each item and used a loglinear model of the table to estimate response positions on a single dimension common to both items (e.g., see Goodman 1984). The results are given in Table 2. The product of scores for responses on the two items are used here as a summary measure of the respondent's belief in a stereotypical image of women. This measure, which includes scale values for "Don't Know" responses on either item, has a 0.44 correlation with age. The original integer responses excluding missing responses are correlated 0.40 with the first item and 0.37 with the second item. The aggregate measure derived from a loglinear model of the crosstabulation simplifies the data (combining two variables into one), retains "Don't Know" respondents for the analysis, and generates slightly higher correlations with age.

Sex role stereotyping has several correlates other than age. Holding constant their correlations with one another, four variables remain with significant associations with sex role stereotyping; respondent sex, education, age and network. The final regression model is the following ($N = 1{,}524$; $R^2 = 0.24$):

$$Y = 1.712 + 021 \text{ Age} + 0.206 \text{ Male} + 0.292 ED1 - 0.246 ED3 - 0.039 \text{ Strangers},$$
$$(15.0) \quad (4.4) \quad (4.7) \quad (-4.4) \quad (-2.7)$$

where Y is the sex role stereotyping variable in Table 2 and routine t-tests are given in parentheses. Years of age retains a strong association. [5] Men are more likely than women to hold a stereotypical view of women. Education is associated in three levels with sex role stereotyping. The lowest level (measured with a dummy variable $ED1$ in the above equation), contains respondents who didn't graduate from high school. The middle level contains high school graduates and the third level contains respondents with at least some college education (measured with a dummy variable $ED3$ in the above equation). People with less than a high school education are significantly more likely to hold a stereotypical view and people who have been to college are significantly less likely. Network range also has an effect. Sex role stereotypes are less likely in respondents connected with diverse kinds of people. Ceteris paribus, this is indicated by network size. The more important discussion partners cited by a respondent, the lower the respondent's score on the sex role stereotyping measure. More directly, the effect is indicated by a respondent's contact with members of the opposite sex. Number of opposite sex discussion partners is negatively correlated

[5] With respect to the sex role stereotyping variable, years of age is as accurate a predictor as alternative measures incorporating structural information. I considered several scalings of age in which years varied in their proximity to one another as a function of their equivalence and the aggregate equivalence of years within age statuses. These alternatives slowed the aging process at the beginning and end of the life cycle with the most rapid aging occurring from the mid 20s through the mid 60s. In other words, aging from 20 to 21 years old or 70 to 71 years old involved less structural change than aging from 39 to 40 years old. Among the GSS respondents, the alternatives are strongly correlated with the simple years of age so I have retained the simple measure for this illustration.

with the stereotyping measure. These significant zero-order associations, however, do not survive controls for other variables. The effect of contact with the opposite sex is eliminated by controlling network size. The size effect is eliminated by controlling age. A network density effect survives controls for respondent sex, age and education. Respondents were asked to indicate which of their important discussion partners were total strangers to one another. The number of cited stranger relations is indicated in the above equation by the Strangers variable. The more such relations there were in a respondent's network —again indicating contact with diverse people—the lower the respondent's score on the sex role stereotyping measure. [6]

Standard tests indicate that these effects are stable across years of age. Tests for interaction between each variable and years of age are negligible; with *t*-tests of -1.5 for Male, 0.8 for $ED1$, 0.01 for $ED3$, and 0.5 for Strangers.

In fact, the effects are not stable across years of age. They vary within specific age statuses. The standard tests don't reveal these interactions because the standard tests are for interactions across years of age as a continuous variable. I modified the above regression model to include level and slope adjustments defined by an eight category age status variable. Each respondent was assigned to the category corresponding to his or her age status (with status [respondents assigned to status II, see footnote 4). There are significant differences in the level of sex role stereotyping within age statuses, above and beyond the effects of age and the other variables in the above equation ($F = 2.03$, df = 7,1483, $P = 0.049$). There are significant slope adjustments for the effects of education within age statuses ($F = 1.66$, df = 14,1483, $P =$ 0.055). Slope adjustments for respondent sex are negligible ($F = 0.46$, df = 7,1483, $P = 0.86$) as are the adjustments for contact with strangers ($F = 1.57$, df = 7,1483, $P = 0.14$).

A look at the status effects (not presented) shows that the interaction effects with education are concentrated in the last four age statuses. The effects of statuses VI and VII are similar for the sex role variable, so I'll combine them in a dummy variable, S_{67}, equal to 1 for respon-

[6] The analysis was carried out with raw counts; number of people cited, number of people of the opposite sex, and number of stranger relations among the cited people. The same conclusions are reached with the more traditional measure of density in which relations observed are divided by relations possible. The number of stranger ties in able 3 has a 0.79 correlation with the proportion of possible ties that are stranger ties (as opposed to acquaintance or especially close relations).

dents in age statuses VI or VII. The effects of statuses VIII and IX are similar, so I'll combine them in a dummy variable, S_{89}, equal to 1 for respondents in either status. Adding these age status dummy variables and their significant slope adjustments to the above equation yields the following model ($N = 1{,}483$; $R^2 = 0.25$):

$$Y = 1.864 + \underset{(4.4)}{0.206}\ \text{Male} + \underset{(2.3)}{0.177}ED1 + \underset{(-3.1)}{0.185}ED3 - \underset{(-2.6)}{0.038}\ \text{Strangers}$$

$$+ \underset{(4.4)}{0.015}\ \text{Age} + [\underset{(3.1)}{0.340} - \underset{(-2.5)}{0.326}ED3]\, S_{67} + [\underset{(1.1)}{0.162} + \underset{(2.3)}{0.282}ED1]\, S_{89}$$

where routine t-tests are presented in parentheses. The effects of respondent sex, age, education and strangers remain significant, although not all at the same level as in the earlier model.

Four points are illustrated. First, years of age is a much weaker correlate than it first appeared. In the first equation, years of age dominated the model with its t-test of 15. Here, the 4.4 t-test for years of age is about the same as the effect of the respondent being male.

Second, it is now clear that the positive effect of age is heavily concentrated in the last four statuses. Sex role stereotyping is higher in these statuses than expected from years of age, especially in statuses VI and VII ($t = 3.1$).

Third, the higher stereotyping among older respondents is especially sensitive to respondent education. In general, higher education decreases sex role stereotyping, but the effect is magnified for older people. Respondents with college education do not show the high sex stereotyping characteristic of statuses VI and VII. The slope adjustment for $ED3$ virtually eliminates the S_{67} effect ($0.014 = 0.340 - 0.326$). Respondents with less than a high school education show even higher sex role stereotyping than the already high level characteristic of statuses VIII and IX. The slope adjustment for $ED1$ significantly increases the S_{89} effect ($0.444 = 0.162 + 0.282$).

Fourth, and most important for the purposes of this paper, the total explained variance in sex role stereotyping is not much changed from the earlier model—24% in the earlier model versus 25% here. What has changed is that this model provides a much clearer picture of the manner in which age is associated with sex role stereotyping, and for whom.

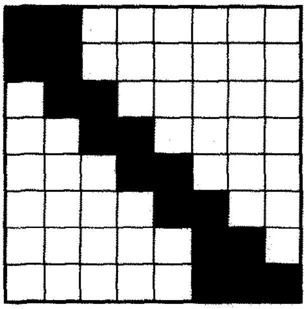
Using patterns of contact between statuses

Network analysis has long been useful in studying diffusion between specific individuals, but it can also be useful at a more macro level. Given a knowledge of where status boundaries exist in the population, and given the evidence of contagion within such boundaries, we can expect diffusion to be rapid within the boundaries. There is also the cohort related diffusion of ideas spreading from status to status as people age, moving from younger to older statuses. But beyond these, the network data defining age statuses show where social contact is most likely between age statuses. From the structure of this contact, predictions can be made about the diffusion of anything related to that contact.

The much feared spread of AIDS is an example of practical importance. The structural definition of age can be used to improve the definition of boundaries around age groups and the structure of AIDS relevant contact between statuses. My colleague, Martina Morris, has set about the task of modelling the flow of AIDS through heterogeneous populations. One of her empirical illustrations simulates the spread of AIDS through the age stratification of Americans via sexual relations between people of different ages (Morris 1989). Drawing on U.S. Bureau of Census categories in the Current Population Reports, she distinguishes four sexually active age categories (persons 18–24, 25–34, 35–44, and 45–54), and uses data on marriages among the age categories to estimate sexual contact between the categories.

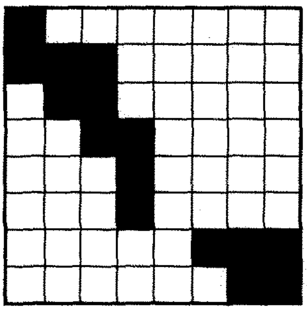
The first point to be taken from the above network analysis of age statuses is that the four age categories span five age statuses, the student status (II) through the severe transition from middle-age to older adulthood (from status V to VI). Since the age statuses are defined by homogeneous patterns of close relations, they are the more proper age categories for studying anything believed to flow through close relations, e.g., AIDS. Using the structurally defined age status boundaries should result, for the reasons I laid out in the introduction, in stronger and more stable research results.

The second point is that sexual contact through marriages are only one piece of the puzzle, albeit one in which sex often occurs. More significant for the transmission of sex related disease are contacts outside marriage. Sex in these relationships is much less likely to come to the attention of disease monitoring agencies at an early stage of a



Important Discussion Spouses

II (19-24)	24	6	0	0	1	0	0	0
III (25-30)	24	56	6	2	0	0	0	0
IV (31-36)	7	34	60	10	0	0	0	0
V (37-46)	2	10	30	85	1	1	0	0
VI (47-52)	1	0	3	22	26	3	1	0
VII (53-60)	0	0	0	7	25	38	5	1
VIII (61-66)	0	0	1	1	1	22	13	2
IX (67+)	1	0	0	0	0	7	18	32



Male-Female Important Discussion Relations Beyond the Family

II (19-24)	52	6	2	1	1	1	0	0
III (25-30)	20	35	25	3	6	2	1	0
IV (31-36)	5	30	31	15	5	8	2	2
V (37-46)	4	10	25	37	13	9	4	8
VI (47-52)	4	8	6	22	9	9	0	7
VII (53-60)	0	5	4	15	8	10	4	5
VIII (61-66)	0	2	0	3	3	12	8	6
IX (67+)	1	0	0	1	2	7	10	15

Fig. 6. The social structure of heterosexual contacts. (Respondents are in both row and columns citing important discussion relations between men in the rows and women in the columns. Density table cells are shaded according to their effect in a loglinear model of the citation frequencies. Black indicates a z-score interaction effect of 4.0 or higher. Grey indicates an effect greater than 2.0 and blank indicates a negligible or negative effect.)

disease's development and much more likely to expose people to populations they do not know well. The network patterns defining each age status offer insights into the patterns of sexual contact within and between statuses.

Following the format of Morris's interaction tables, Figure 6 contains heterosexual contact frequencies between adult age statuses. The rows of each network contain men and columns contain women.

The first network describes high commitment heterosexual contacts. These are marriage ties. Citations flow from row to column (male respondents citing their column spouses) and from column to row (female respondents citing their row spouses). [7] Recall that GSS respondents were not forced to name their spouses as important discussion partners. Of 870 married respondents, 587 named their spouses as important discussion partners. The first network in Figure 6 describes close, not all, marriage ties.

The second network describes lower commitment contacts. Citations again flow from row to column (male respondents citing female, nonkin alters) and from column to row (female respondents citing male, nonkin alters). [8] Of all heterosexual contacts beyond the family, these are the ones cited as important discussion relations, and so presumably the ones most likely to characterize relations in which sexual contacts develop between men and women of different ages. It would be better to have network data on the ages of people in sexual contacts to measure the frequency of actual sexual contact between age statuses. In the absence of network data on actual sexual contact, the data in the second network indicate opportunities for sexual contact—under the presumption that sexual relations develop from the same factors that make people attractive to one another for important personal discussion.

The data in Figure 6 could be used to model the diffusion of AIDS through the population. Morris describes aging and contact processes. People move from status to status as they get older, carrying the infection with them. In addition, people in different statuses are in contact with one another and the infection will spread across age statuses as a function of the variable contact between statuses. This is

[7] This raises the possibility of misaggregation. If the age network of discussion citations to spouses from the male perspective looks different from the perspective of woman making the citations, then the two networks shouldn't be comined. I created two matrices corresponding to the top network in Figure 6. One matrix was male respondents in the rows citing spouses in the columns. The other matrix was female respondents in the columns citing spouses in the rows. The difference between the matrices is the sex of the person making the spouse citation. The chi-square statistic for the two matrices being independent is 41.82 with 63 degrees of freedom, which is quite acceptable ($P = 0.982$). Although the exact probability level could be adjusted for the many low frequencies in the table, it seems safe to say that there is no problem with combining the matrices into a single network as in Figure 6.

[8] Here again is the possiblity of misaggregation discussed in the preceding footnote. I created two matrices. One matrix was male respondents in the rows citing nonkin females in the columns. The other matrix was female respondents in the columns citing nonkin males in the rows. The chi-square statistic for the two matrices being independent is 72.02 with 63 degrees of freedom, which is acceptable ($P = 0.204$). The less demanding hypothesis that there are no three-way interactions across the two matrices is close to a perfect description of the data (35.30 chi-square, 49 df, $P = 0.929$).

not the place to replicate her analysis, but it would be instructive to describe the shifting preferences for heterosexual contact across age statuses, and so highlight the shifting importance of diffusion by aging versus contact processes.

I draw four points about heterosexual preference from the data in Figure 6. First, age asymmetry favors men, and women put up with it. The marriage network at the top of Figure 6 shows a step-ladder decline from the upper left of the matrix to the lower right. Citations connect men (in the rows) with spouses who are in their own age status or in the immediately prior age status. The graphic density table of marriage ties shows that all frequencies significantly higher than expected under independence (with two exceptions) are between men and women in the same age status and men with women in the immediately younger status. The two exceptions are at the extremes of the network. The youngest men are most likely to be married to important discussion partners their own age (z-score of 5.7), but are also connected with spouses in the next older age status (2.5 z-score). At the other extreme, the oldest men are most likely to be married to important discussion partners their own age (6.7 z-score), are next most likely to be connected with spouses in the immediately younger age status (4.9 z-score), but also spouses in the age status two statuses younger than their own (2.1 z-score). The density table for other heterosexual ties has the same asymmetry observed in marriage ties, but the age asymmetry favoring men is not as dominant a characteristic and the structure is more complex. I'll return to this in a moment.

The observed age asymmetry in heterosexual relations would be expected if there were few older women in the population, but just the opposite is true. This is the second point I take from Figure 6. Women live longer, but are excluded from heterosexual society sooner. The point is illustrated in Figure 7 by comparing the distributions of men and women respondents with the distributions of men and women alters in heterosexual relationships. Women are much more numerous in the population than they are connected to men. Indicating the composition of the American population, 45% of 1,531 GSS respondents are men and 55% are women (687 men to 844 women). Of the 1,128 heterosexual citations between spouses and people beyond the respondent's family, 57% are to men and 43% are to women (648 to men versus 480 to women). This contrast is most striking for women in the last age status. Of the 844 female GSS respondents in Figure 7, 157

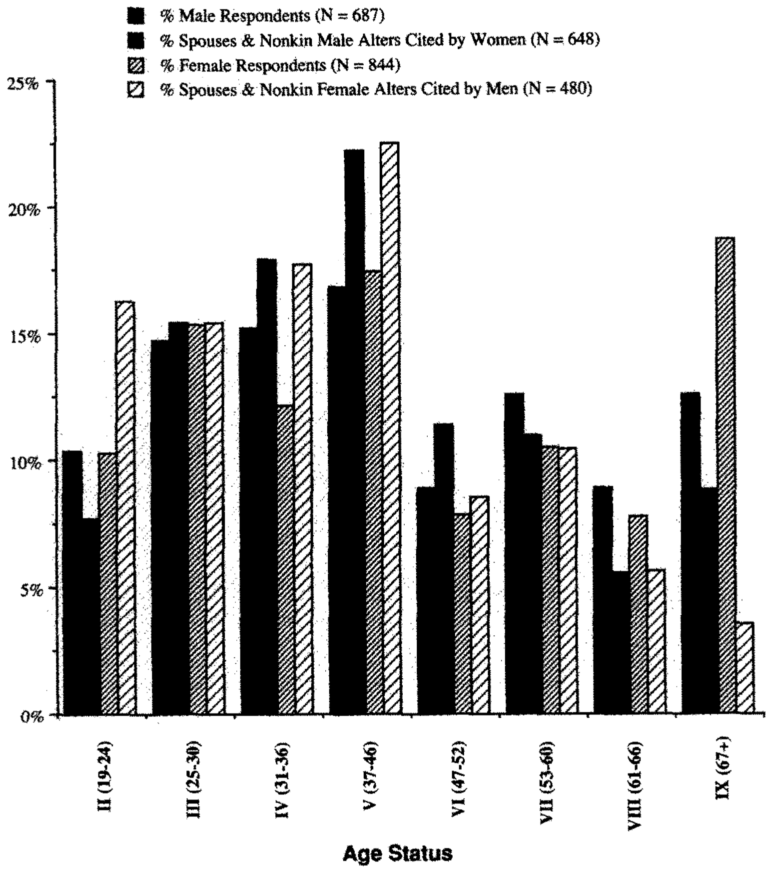


Fig. 7. Women live longer but are excluded sooner.

occupy age status IX. However, only 17 of the 480 citations between women and men involve status IX women. More generally, the late 40s are a critical transition for women in heterosexual society. More specifically, the transition from age status V to age status VI is a critical transition. Women in their 30s and early 40s are the most often connected with men. Notice in Figure 7 that the heterosexual citations to women in age statuses IV and V are disproportionate to the numbers of such women in the population. Women in the next and subsequent age statuses are the least often connected to men, culminating in the extreme heterosexual isolation of women in the last status.

My third point from Figure 6 is that the critical transition for women is in a different way a critical transition for men. It marks the onset of what is colloquially termed "male menopause." Evidence for this comes from comparing the two density tables in Figure 6. Marriage ties show a stable step-ladder structure across all ages. Citations are concentrated in the cells connecting husbands with wives in their own age status or the next younger age statuses. The same structure can be seen in the structure of heterosexual contacts beyond the family for men in their 60s and older (age statuses VIII and IX). The same structure is evident in the heterosexual contacts of men in their 20s, 30s and early 40s, except that men in their 30s and early 40s are most connected with women their own age (as indicated by dark cells in the diagonal elements for age statuses IV and V with gray cells connecting each with the immediately younger age status). But the structure of heterosexual ties beyond the family goes through a fundamental change for men in their late 40s and 50s (age statuses VI and VII). Men this age, occupying age statuses VI and VII, have the unique characteristic of having negligible connections with women their own age. Their wives are most often their own age, but their heterosexual contacts beyond the family are with younger women, in particular with women in their late 305 and early 40s—age status V. The only significant concentration of heterosexual contacts for men in age status VI is with women in age status V. The same is true for men in age status VII. The primary difference between statuses VI and VII is the lack of concentrated relations with women in status VI (the only blank column in the density table) and the concentrated connections with older men for women in status VII.

It is important to remember here that the men are not alone responsible for the structure of these relations. Of the 539 heterosexual citations made beyond the family and tabulated at the bottom of Figure 6, 207 come from male respondents and 332 come from female respondents. Of the 116 citations involving men in the menopausal statuses VI and VII, 38 come from male respondents and 78 come from female respondents. In sum, men and women jointly define a critical transition for one another between age statuses V and VI. The women in status V—women in their late 30s and early 40s—concentrate their heterosexual relations beyond the family in men who occupy their own age status and the next two older age statuses. The men in statuses VI and VII—men in their late 40s and 50s—concentrate their heterosexual relations beyond the family in women who occupy age status V, to the exclusion of all other women. At the same time, all concerned tend to be married to people in their own age. Once the men reach their 60s, in age status VIII, their relations once again fall into the step-ladder structure of connections with women their own age and one status younger.

In other words, and this is my fourth point from Figure 6, American women in their late 30s and early 40s in 1985 defined the bridge that integrated old and young beyond the family. They are the only age status at the time with concentrated heterosexual ties beyond the family to men in their 30s and men in their 50s. In the younger population of people up through their 30s, men and women have strong concentrations of relations with one another beyond the family. In the older population of people beyond their late 50s, men and women have strong concentrations of relations with one another beyond the family.

The implication of these results for AIDS diffusion is that contact processes are much more important than would otherwise have been thought. Diffusion through the marriage network is primarily an aging process, enhanced by contact. People move from status to status as they grow older, carrying the infection with them. This process is augmented by the concentrated ties each status has with the prior status, however, the homogeneity of the step-ladder structure across all age statuses means that the primary motor for diffusion is aging. Diffusion through heterosexual ties outside the family is quite different, and much more dependent on contact because females in age status V are a bridge population to older people. Eliminate transmission from status V females to status V and VI males and diffusion will be limited to aging processes, thus sparing the current older population from the infection. [9]

Summary

Network analysis provides a useful guide for collapsing ostensibly non-network data into analytical categories. I illustrate the point here using a familiar variable, years of age. Viewed structurally, age is a network pattern characteristic of being a specific number of years old. So viewed, years of age can be collapsed into socially distinct age categories where each category is a status in the social structure of age in a study population. For illustration, I describe the structure of relations defining age statuses in the American population. Each status is a unique pattern of relations with kin of specific ages, spouses of specific ages, and friends and coworkers of specific ages. In the mid 1980s, Americans were distributed across nine age statuses; I children (ages 1–18), II students (19–24), III young adults (25–30), IV twilight youth (31–36), V middle-age adults (37–46), VI older adults (47–52), VII senior adults (53–60), VIII retiring adults (61–66), and IX the elderly (over 66). The most severe changes in 1985 were happening to Americans in their late 40s—born at the beginning of World War H and in transition from age status V to status VI. When observed in 1985, they were in the process of replacing their parents with their children as important discussion partners and learning to live with much greater age heterogeneity in their other contacts, both in their marriages and their friends and coworkers beyond the family. Women were about to leave their prominent position in heterosexual society defined by age status V and men were about to enter a menopausal period characteristic of status VI.

Are the network differences between age statuses evidence of differences between cohorts or stages in more general life cycle processes?

[9] Given the significance of homosexual relations for the transmission of AIDS, insights might be derived from the network of important discussion contacts between men. Discussion doesn't imply sexual contact. However, to the extent that sexual relations develop between men from the same factors that make them attractive to one another for important personal discussion, then the network of cited discussion partners indicates the relative tendency for sexual contact between men of different ages. This idea could be pursued by studying the structure of male to male discussion relations in light of the parameters of heterosexual perference discussed in the text. This line of analysis depends on homosexual preferences being generated by the same factors responsible for heterosexual preferences, and I don't know that that is true, however, here are the data for persons interested in pursuing the idea. This is the tabulation across age statuses II through IX (corresponding to Figure 6) of the 852 citations from male respondents in the rows to nonkin male alters in the columns:

58	12	5	2	4	1	0	0
24	55	26	11	7	3	3	0
1	33	54	37	14	7	4	2
7	16	29	88	22	14	2	0
4	3	13	29	25	17	1	0
2	5	6	15	14	33	8	3
0	0	1	14	13	16	20	4
3	2	2	5	5	18	5	25

This is a familiar question articulately laid out by Riley (1973), and cast as a central analytical question for sociology in her American Sociological Association presidential address (Riley 1987). For example, do Americans typically pass through an identifiable stage of their lives in which parents are replaced by children as important discussion partners—or is that observation peculiar to 1985, reflecting parents in a youth oriented society turning to their baby boom children? In the past, did contact with both children and parents last longer in the life cycle when relatives were more likely to live close to one another and parents produced children at a younger age? In the future, as the baby boomers age, will they too turn to their children as important discussion partners—or will the lack of suitable children and the massive number of baby boomers lead them to turn to one another as important discussion partners, driving America to recognize the wisdom of their accumulated experience—just as they focused America's attention on the vitality of their youth in the 1960s?

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