The influence of social relationships on aging and the development of cardiovascular disease – a review

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As little as ten years ago, there was virtually no information on the relationship of social networks or social isolation to mortality risk. In 1976, John Cassel in a widely cited paper on the contribution of the social environment to host resistance summarized information on disease risks associated with diverse social phenomena ranging from social disorganization to acculturation and psychosocial resources. He concluded that epidemiologists needed to recognize the importance of the social support provided to individuals by the primary groups of importance to them. This paper, coupled with several other seminal papers in the field (Antonovsky, 1972; Syme, 1974; Hinkle, 1973), led to the direct examination of social networks, social support, isolation, and social integration and their association with mortality risk.

Now, almost ten years later, after this call for action, where do we stand? With regard to the association between social networks and coronary heart disease (CHD) morbidity, the amount of evidence is still not impressive. However, the association between social ties and mortality risk from all causes has been explored in at least seven large epidemiological studies including one focusing on mortality risk among men who have had at least one myocardial infarction (Berkman & Syme, 1979; House *et al.*, 1982; Blazer, 1982; Schoenbach *et al.*, 1985; Welin *et al.*, 1985; Reed *et al.*, 1983; Rubberman *et al.*, 1984).

Of the seven mortality studies published to date, social isolation or lack of support is consistently associated with increased mortality risk among white men. There are only three studies in which risks among men and women can be compared (Alameda County, Evans County and Tecumseh) and of these, only in Alameda County is social isolation associated with increased mortality risks for women. Three studies have explored social ties and mortality risks in non-

white groups (e.g. blacks in Alameda and Evans County studies and Japanese-Americans in Hawaii). All three studies show markedly weaker effects among non-whites.

The studies published to date have been thought-provoking and stimulating. Most importantly, when added to the studies on bereavement and marital status (Chandra *et al.*, 1983; Parkes *et al.*, 1969; Helsing *et al.*, 1981; Carter *et al.*, 1970), they convince us that something about human relationships influences physical health and especially longevity. However, we do not know (1) how they influence health or which relationships or what aspects of relationships are important or detrimental to well-being and (2) why they seem to carry greater mortality risks for some groups of people than others (e.g. men versus women). It is these two questions that guide our comments.

Social conditions and specifically social networks and support may lead to disease by altering known biological risk factors (e.g. blood pressure or serum cholesterol), health behaviour (e.g. cigarette smoking, alcohol consumption, or dietary practices), or they may have their impact on risk by altering some, as yet unidentified, physiological processes. Since most studies show a modest reduction in risk when controlling for biomedical risk factors, primarily risk factors for CHD, networks may influence mortality, in part, via these pathways. However, since the correlations between networks, support and these biomedical factors are small, and in some studies non-significant, it is equally clear that other pathways must be in place. We would like to propose something controversial for which there is little evidence at the present time – that social networks and support influence health status and longevity by influencing what longevity is most obviously related to – the rate of aging of the organism. Following this line of reasoning one would hypothesize that social isolation or lack of support is a chronically stressful situation to which the organism responds by aging faster. What are the physiological alterations associated with aging that are capable of causing such fatal consequences? Certainly, the de-

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velopment of atherosclerosis is a hallmark of aging in most humans, at least in populations where people survive to advanced ages (Timiras, 1972). Another consistent finding is a progressive reduction in function of many organs (Rowe, 1985) including major losses in renal, pulmonary, and immune functions. These declines lead to dramatic decreases with age in the homeostatic regulatory function of the body. When the older person is faced with a stress there is often an inability to react adequately and keep basic physiological responses within safe bounds. The decreased ability is often *not* manifest under basal or resting conditions. Changes with age in vital capacity, postural blood pressure, immune function, blood-sugar levels following administration of glucose, risk of hypothermia, maximal heart rate may all reflect such a decline in regulatory ability due to the aging organism's inability to integrate complex systems or to declining 'organ reserve' (Timiras, 1972; Rowe, 1985; Fries & Crapo, 1981; Weiss, 1982).

Social conditions and atherosclerosis

The associations between most of these factors and social conditions or social relationships have rarely been studied; however, two recent studies, one in monkeys and the other in humans shows that aspects of social ties may influence coronary artery atherosclerosis and occlusion. In the first of these studies (Kaplan *et al.*, 1983), monkeys were placed in five-member groups in which the stressed monkeys were in constantly changing groups and the unstressed monkeys remained in stable groups. Both groups were fed a low fat, low cholesterol diet. At the end of the 21 month experiment the monkeys were killed. Coronary artery atherosclerosis in each monkey was expressed as mean intimal area and mean intimal thickness of 15 sections of coronary artery. Substantial differences in coronary artery atherosclerosis were observed in stressed versus unstressed monkeys, and many more stressed monkeys were found to have fatty streaks that had progressed to small plaques than unstressed monkeys.

In a recent study of men and women undergoing angiography (Seeman, 1985), support was also found to be associated with coronary atherosclerosis. In this study men and women suspected of having coronary artery disease who were referred for angiography were given a psychosocial questionnaire. The extent of coronary atherosclerosis was determined from the film of each subject. Evaluations of the 4 major coronary arteries were done in terms of 15 subdivisions, with each lesion in these segments assessed in terms of percent occlusion of the artery. Occlusion was significantly associated with instrumental, but not emotional support for men, but not women. Instrumental support tapped help the respondent had

received with transportation, household tasks and financial assistance.

These two studies mark the beginning of a period in which investigators will (hopefully) be more thoughtful in exploring the biological link between social networks, support and health status. One of the common threads running through nearly all the published studies is the broad array of diseases and causes of death associated with social support. Building on these findings, studies focusing on the relationships of social networks and support to risk factors with multiple disease outcomes and to physiological processes that vary with age would seem to be particularly promising.

Sex and racial differences

The second issue of major proportions confronting investigators is the difference in risk found among men and women, and whites and non-whites. In addition to the seven mortality studies cited earlier, two new unpublished studies, one of angiography patients (Seeman, 1985) and the other of men and women in Finland (Kaplan, personal communication) also find social ties to be related to heart disease for men but not women. Thus, the Alameda County study (Berkman & Syme, 1979) is the only one finding a major risk associated with isolation for women. There are a number of conclusions one can draw from such variability in risks. Obviously, one such conclusion is that social ties and relationships are not as important for women and non-whites as they are for white men.

Such a conclusion is hard to justify since it is precisely the groups of people in these studies – Japanese, women, and blacks in predominantly rural communities who have been found in other studies to maintain elaborate systems of social support central to their functioning. Several investigators (House *et al.*, 1982; Schoenbach *et al.*, 1985) have offered perceptive comments on this issue which have to do with the extent to which women, blacks, and even Japanese-Americans are deeply integrated into stable communities. Under such circumstances, if these groups routinely obtain large doses of social support, specific measures tapping frequency of contact and size of network may be less differentiating than in less well-integrated communities. These groups of people, and women in particular, may also have different standards for defining close friends and confidants. Furthermore, these sources of support may be so much a part of the normal daily lives of these people that they commonly go unnoticed and as a result, are underreported in surveys of this sort. In urban areas, where people are more mobile, or where friendships are not long-standing, their awareness of sources of support and frequency of contact may be heightened.

Conclusions

These insights lead to an alternative conclusion which is that we have not yet done an adequate job of capturing the critical dimensions of social networks and support for these groups of people for whom social support is apparently very important. Since the results are so striking for white men, it seems worth the attempt to develop network and support measures that may be more in line with the reality of social relationships for these other groups of people. The development of more sophisticated measures of social networks, support, and social activities is essential. The Alameda County Study was meant to stimulate research in the area of how human relationships might influence physical health. It was not meant to be an ideal model of how studies in this area ought to proceed. The studies produced since that time, although often as crude as the Alameda County one, also point towards the importance of the web of human

relationships and the support they provide, although they too provide relatively little insight into specific ties or qualities of ties that are critical to well-being.

This is an exciting time for cardiovascular epidemiologists with an interest in psychosocial issues. The time is now here to confront truly complex and important problems that have to do with the role social relationships play in longevity, aging and the development of atherosclerosis. With a newly refined approach, strengthened assessments of social networks and support, and a focus on how, biologically, social conditions influence mortality, epidemiologists can make progress in this field in the years ahead.

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