Social Capital, Income Inequality, and Mortality

ABSTRACT

Objectives. Recent studies have demonstrated that income inequality is related to mortality rates. It was hypothesized, in this study, that income inequality is related to reduction in social cohesion and that disinvestment in social capital is in turn associated with increased mortality.

Methods. In this cross-sectional ecologic study based on data from 39 states, social capital was measured by weighted responses to two items from the General Social Survey: per capita density of membership in voluntary groups in each state and level of social trust, as gauged by the proportion of residents in each state who believed that people could be trusted. Age-standardized total and cause-specific mortality rates in 1990 were obtained for each state.

Results. Income inequality was strongly correlated with both per capita group membership ($r = -.46$) and lack of social trust ($r = .76$). In turn, both social trust and group membership were associated with total mortality, as well as rates of death from coronary heart disease, malignant neoplasms, and infant mortality.

Conclusions. These data support the notion that income inequality leads to increased mortality via disinvestment in social capital. (*Am J Public Health.* 1997;87:1491–1498)

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Introduction

A number of cross-national studies have indicated that the degree of income inequality in a given society is strongly related to the society's level of mortality.[1–5] In one investigation of nine nations included in the Luxembourg Income Study,[4] a correlation of .86 was reported between average life expectancy and proportion of income allotted to the 70% of the population at the lowest income levels. Two recent US studies independently demonstrated an association between income inequality and mortality.[6,7] Kennedy et al.[6] examined the relationship between degree of household income inequality and state-level variation in all-cause and cause-specific mortality. The degree of income inequality in each state was estimated by the Robin Hood Index, which is equivalent to the proportion of aggregate income that must be redistributed from households above the mean and transferred to those below the mean in order to achieve perfect equality in the distribution of household incomes.[8] The higher the Robin Hood Index, the more unequal the distribution of income. The overall correlation of the Robin Hood Index to all-cause mortality in 1990 was .54 ($P < .0001$). After adjustment for poverty, a 1% rise in the Robin Hood Index was associated with an increase in age-adjusted total mortality rate of 21.7 deaths per 100 000 (95% confidence interval [CI] = 6.6, 36.7).[6] The Robin Hood Index was also associated with deaths from specific causes, including coronary heart disease, cancer, and infant mortality.

In an independent study, Kaplan et al.[7] examined the association between income inequality—as measured by the share of aggregate income earned by the bottom 50% of households—and state-level variations in total mortality. A strong association was found between their measure of income inequality and age-adjusted total mortality rates in 1990 ($r = -.62$, $P < .001$). Moreover, the degree of income inequality in each state in 1980 was a powerful predictor of levels of total mortality 10 years later.

The pathways and mechanisms underlying the association between income inequality and mortality levels remain to be established.[9,10] One hypothesis is that rising income inequality results in increased levels of frustration, which may have deleterious behavioral and health consequences.[9,10] Societies that permit large disparities in income to develop also tend to be the ones that underinvest in human capital (e.g., education), health care, and other factors that promote health.[7,9] Recently, it has been hypothesized that the growing gap between the rich and the poor has led to declining levels of social cohesion and trust, or disinvestment in "social capital."[6,7,9,10] Social capital has been defined as the features of social organization, such as civic participation, norms of reciprocity, and trust in others, that facilitate cooperation for mutual benefit.[11–13] Social capital is thus a community-level ("ecologic") variable whose counterpart at the individual level is measured by a person's

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social networks. A vast literature has linked social networks to health outcomes at the individual level.[14–16] By contrast, studies of social capital have so far been limited to attempts to explain the performance of civic institutions and the economic development of societies.[11–13]

In the present study, we tested three linked hypotheses: (1) that state variations in income inequality predict the extent of investment in social capital, (2) that the degree of investment in social capital predicts state variations in total and cause-specific mortality, and (3) that there is little residual direct association between state income inequality and mortality after investment in social capital has been controlled.

Methods

Measurement of State Variations in Social Capital

The core concepts of social capital, according to its principal theorists,[11–13,17] consist of civic engagement and levels of mutual trust among community members. Civic engagement refers to the extent to which citizens involve themselves in their communities, as most often measured by their membership in groups and associations. Following Putnam,[11,12,17] we used weighted data from the General Social Survey, conducted by the National Opinion Research Center,[18] to estimate state variations in group membership and levels of social trust. This nationally representative survey samples noninstitutionalized English-speaking persons 18 years of age or older living in the United States. The survey has been repeated 14 times over the last 2 decades and has included a set of questions on social trust and organizational membership. In the present study, we averaged 5 years of cumulated data (1986 through 1990) from the survey, representing 7654 individual observations from 39 states (mean number of respondents per state = 196, SD deviation = 146, range = 58 [Iowa] to 729 [California]). Although the survey is nationally representative, only 39 states were included, because, by chance, people residing in some of the less populous states (e.g., Alaska, Delaware) were not picked up by the sampling scheme.

Level of civic engagement was measured by the per capita number of groups and associations (e.g., church groups, labor unions, sports groups, professional or academic societies, school groups, political groups, and fraternal organizations) to which residents in each state belonged. The other component of social capital, trust in others, was assessed from responses to two General Social Survey items that asked "Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?" (perceived lack of fairness) and "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" (social mistrust). For each state, we calculated the percentage of respondents who agreed with the first part of each statement. Belief in the goodwill and benign intent of others facilitates collective action and mutual cooperation and therefore adds to the stock of a community's social capital. Collective action, in turn, further reinforces community norms of reciprocity. In addition to the social trust items, we evaluated the response to another General Social Survey item as a marker of social capital: "Would you say that most of the time people try to be helpful, or are they mostly looking out for themselves?" (perceived helpfulness).

All responses to the General Social Survey were weighted to take account of the fact that the survey was developed to generate representative data at the national and regional levels but not at the state level (Dr T. Smith, verbal communication, June 1996). Poststratification weights were developed to adjust for the extent to which survey respondents may not have been representative of the states in which they resided. In order to construct the weights, we first examined demographic characteristics in the survey that were most predictive of responses to the social capital items. Younger age, Black race, and less than high school education were the characteristics most correlated with lower social capital scores (lower levels of social trust and group membership). We therefore developed poststratification weights based on the distribution of age, race, and educational attainment of survey respondents. These stratum-specific weights were calculated as follows:

$$w_{i,j,k,l} = P_{i,j,k,l}/p_{i,j,k,l},$$

where $w_{i,j,k,l}$ is the poststratification weight for the survey respondent residing in the ith state and being of jth age group, kth race, and lth level of educational attainment; $P_{i,j,k,l}$ is the proportion of individuals with these characteristics residing in the ith state (obtained from the 1990 US census); and $p_{i,j,k,l}$ is the corresponding proportion of such respondents in the General Social Survey.

These weights were then used to adjust the individual responses to the social capital items in the General Social Survey (via the weight procedure in SAS). For example, in states where the survey oversampled younger, Black, and less educated respondents, levels of social trust were adjusted upward.

Measurement of State Variations in Income Inequality

Income, household size, and poverty data were obtained from 1990 US Census Population and Housing Summary Tape File 3A. This summary tape provides annual household income data for 25 income intervals. Counts of the number of households that fall into each income interval, along with total aggregate income and median household income, were obtained for each state. Income data represented income prior to taxes and benefits; equivalence scales adjusting for household size were not used. Our measure of income inequality, the Robin Hood Index, was estimated from shares of household income arranged by decile groups (an example of the derivation of the index can be obtained from the senior author). Income deciles were calculated via software developed by Ed Welniak (unpublished software, US Bureau of the Census, 1988). The index is calculated by taking those decile groups whose share of the total income exceeds 10%, and summing the excesses of these shares. This value approximates the proportion of aggregate household income in each state that has to be taken from households above the mean and transferred to those below the mean in order to achieve equality in distribution of incomes.[8] The higher the index value, the less egalitarian the distribution of income.

Measurement of State Variations in Poverty

There is some evidence to suggest that poverty is linked to depletion in social capital.[19] Since poverty is also a predictor of mortality,[20] we evaluated poverty as a potential confounder in the relationship between social capital and mortality. Census Summary Tape File 3A contains data on state-specific prevalence of poverty; households are classified as being above or below the poverty level based on the revised federal poverty index originally developed by the Social Security Administration in 1964. The current

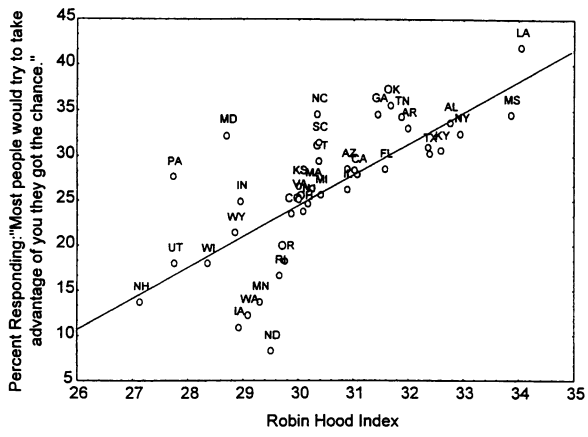


FIGURE 1—The relationship between income inequality, as measured by the Robin Hood Index, and lack of social trust.

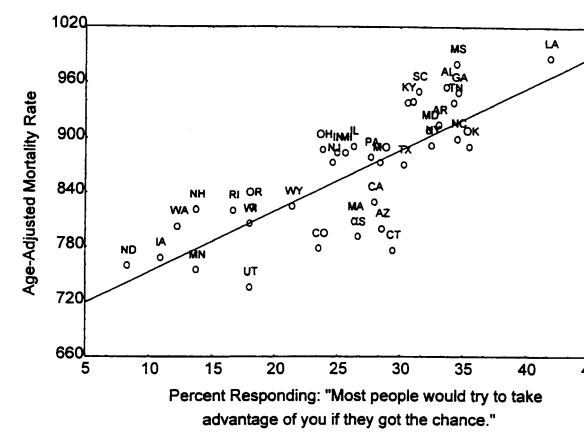


FIGURE 2—The relationship between age-adjusted mortality rates and lack of social trust.

poverty index is purely wage-income based and does not reflect other sources of income such as noncash benefits from food stamps, Medicaid, and public housing. Poverty thresholds are updated annually to reflect changes in the Consumer Price Index. The poverty variable used in the analyses represents the percentage of households in a given state below the federal poverty level (in 1990, an income of less than $13 359 for households with four family members[21]).

Measurement of State Variations in Mortality

The age-adjusted mortality rates for each state in 1990 were obtained from the Compressed Mortality Files compiled by the National Center for Health Statistics of the Centers for Disease Control and Prevention (CDC). The data were obtained from the CDC's database via CDC WONDER/PC software.[22]

All mortality rates were directly age standardized to the US population and expressed as the number of deaths per 100 000 persons (except in the case of infant mortality, for which death rates were expressed per 1000 live births). In addition to all-cause mortality, we examined the following major causes of death: coronary heart disease (*International Classification of Diseases*, 9th revision [ICD-9] codes 410 through 414), malignant neoplasms (ICD-9 codes 140 through 239), cerebrovascular disease (ICD-9 codes 430 through 438), and unintentional injuries (ICD-9 codes 800 through 949, 970 through 999).

TABLE 1—Correlations among Indicators of Social Capital, Poverty, Income Inequality, and Mortality

	Poverty	Mortality	Robin Hood Index	Group Membership	Fairness	Trust
Mortality	.57*					
Robin Hood Index	.74*	.65*				
Group membership	−.20	−.49*	−.40*			
Perceived lack of fairness[a]	.49*	.77*	.73*	−.54*		
Social mistrust[b]	.52*	.79*	.71*	−.65*	.79*	
Perceived lack of helpfulness[c]	.63*	.71*	.71*	−.54*	.78*	.81*

[a]Measured by the percentage responding, "Most people would try to take advantage of you if they got a chance."
[b]Measured by the percentage responding, "You can't be too careful in dealing with people."
[c]Measured by the percentage responding, "People mostly look out for themselves."
*$P < .05$.

Data Analysis

Ordinary least squares regression was used to examine the relationships of social capital indicators to mortality rates. Two sets of models were examined for each outcome of interest. In the first set of models, we regressed the weighted social capital measures (e.g., weighted average group membership and weighted average social trust) against all-cause and cause-specific mortality rates. In the second set of models, we adjusted the regression models for state variations in prevalence of poverty. To examine the effects of inequality (as measured by the Robin Hood Index) and social capital (as measured by the social trust variable) on mortality, we carried out a path analysis[23] based on a causal model in which inequality affects mortality through its impact on social capital.

Results

Relationships among Social Capital Measures and between Income Inequality and Social Capital

The four indicators of social capital—extent of participation in civic associations and the weighted proportions of respondents who agreed that "most people would try to take advantage of you if they got a chance," "you can't be too careful in dealing with people," or "people mostly look out for themselves"—were highly correlated with each other (Table 1). Since these variables may not represent an exhaustive list of "social capital" indica-

TABLE 2—The Effects of Perceived Lack of Fairness[a] on All-Cause and Cause-Specific Age-Adjusted Mortality Rates

Cause of Death (ICD-9 Codes)	B	SE	t	P	Adjusted R^2
Total mortality					
Unadjusted	6.71	0.91			.58
Adjusted for poverty	5.61	0.98	5.69	.0001	.63
Infant mortality					
Unadjusted	0.12	0.02			.42
Adjusted for poverty	0.10	0.03	4.01	.0005	.43
Heart disease (410–414)					
Unadjusted	1.32	0.47			.15
Adjusted for poverty	1.08	0.54	2.00	.053	.15
Malignant neoplasms (140–239)					
Unadjusted	0.95	0.29			.20
Adjusted for poverty	1.03	0.34	3.03	.005	.18
Cerebrovascular disease (430–438)					
Unadjusted	0.48	0.16			.16
Adjusted for poverty	0.33	0.19	1.78	.083	.20
Unintentional injuries (800–949, 970–999)					
Unadjusted	0.51	0.15			.22
Adjusted for poverty	0.17	0.13	1.30	.202	.57

[a]Measured by the percentage responding, "Most people would try to take advantage of you if they got the chance."

tors, we chose not to combine them into a single index. Instead, results of analyses are presented separately for each indicator.

A strong inverse relationship was found between degree of income inequality, as measured by the Robin Hood Index, and per capita group membership ($r = -.40$, $P < .01$). Income inequality was also strongly associated with lack of social trust, as measured by the perceived fairness variable ($r = .73$, $P < .0001$) (Figure 1).

Relationship between Social Capital and Mortality

Social trust. We examined the relationship between social trust (as measured by the perceived fairness variable) and all-cause and cause-specific mortality (see Table 2 and Figure 2). States that had high levels of social mistrust (i.e., high proportions of respondents who agreed that "most people would try to take advantage of you if they got the chance") had higher age-adjusted rates of total mortality ($r = .77$, $P < .0001$) (Figure 2). In our ecologic regression model, variations in level of social trust explained 58% of the variance in total mortality. Each percentage increment in people agreeing that others would take advantage of them was associated with an increase in overall mortality of 6.7 deaths per 100 000 (95% CI = 4.9, 8.5). Conversely, if the overall level of trust were to increase by one standard deviation or 10%, this would be associated with a decline in the overall age-adjusted mortality rate of about 67.1 per 100 000 (95% CI = 48.7, 85.5), representing about an 8% reduction in overall mortality. Lower levels of social trust were associated with higher rates of most major causes of death, including coronary heart disease, malignant neoplasms, cerebrovascular disease, unintentional injury, and infant mortality (Table 2). Adjusting for state variations in poverty resulted in some attenuation of the regression coefficients; nevertheless, the coefficients for social trust remained highly statistically significant for total mortality, malignant neoplasms, infant mortality, and stroke; these coefficients were of borderline statistical significance for coronary heart disease mortality (Table 2). Only in the case of unintentional injury was there a substantial attenuation in the association between the social trust measure and mortality, suggesting a major role of poverty in explaining state variations in deaths from this cause.

Other social capital measures. We also examined the relationships of the perceived mistrust item (percentages of respondents agreeing that "you can't be too careful in dealing with people") and the perceived lack of helpfulness item (percentages of respondents agreeing that "people mostly look out for themselves") to total age-adjusted mortality. The effects of both of these variables on overall mortality were essentially identical to the effects of the trust variable discussed earlier, with correlations of .79 ($P < .0001$) and .71 ($P < .0001$). Table 3 shows age- and poverty-adjusted regressions for the social mistrust variable, and Table 4 shows regressions for the perceived lack of helpfulness variable.

Group membership. Per capita group membership was strongly inversely correlated with all-cause mortality ($r = -.49$, $P < .0001$). A one-unit increment in average per capita group membership was associated with a decline in total age-adjusted mortality of 83.2 deaths per 100 000 persons (95% CI = 34.2, 132.2). Level of group membership was also a predictor of coronary heart disease, malignant neoplasms, and infant mortality. These associations remained statistically significant after adjustment for poverty (with the exceptions of infant mortality and unintentional injury) (Table 5).

Black–White differences. We separately examined the effects of social capital measures on White and Black Mortality rates. The social mistrust variable was strongly related to age-adjusted total mortality rates both in Whites ($r = .70$, $P < .0001$) and in Blacks ($r = .34$, $P < .01$). After adjustment for poverty, the relationship was somewhat attenuated for overall Black mortality (adjusted $\beta = 2.92$, $P < .08$) but remained strong for overall White mortality (adjusted $\beta = 4.93$, $P < .0001$). A 10% rise in level of perceived fairness (equivalent to about a one-standard-deviation increment) was associated with a decline in White mortality of 36.5 deaths per 100 000 (95% CI = 20.2, 52.9) and a decline in Black mortality of 23.9 deaths per 100 000 (95% CI = −3.4, 51.3) after adjustment for poverty. Levels of perceived fairness, adjusted for poverty, explained more of the variance in White mortality (adjusted $R^2 = 52.3\%$) than in Black mortality (adjusted $R^2 = 11.4\%$). Per capita group membership was similarly predictive both of White and Black mortality rates.

Interrelationships between Income Inequality, Social Capital, and Mortality

The path analysis indicated that the primary effect of income inequality (as measured by the Robin Hood Index) on mortality is mediated by social capital (as measured by level of perceived fairness). According to our model, income inequality exerts a large indirect effect on overall mortality through the social capital variable (Figure 3). In Figure 3, as income inequality increases, so does the level of social mistrust, which is in turn associated with increased mortality rates. The small path coefficient (.18) from income inequality to mortality suggests that the former is an instrumental variable. That is, income inequality was directly and strongly related to the postulated causal factor (disinvestment in social capital) but, when the causal factor was controlled, there was little residual direct association between the instrumental variable and the outcome (mortality).

TABLE 3—The Effects of Social Mistrust[a] on All-Cause and Cause-Specific Age-Adjusted Mortality Rates

Cause of Death (ICD-9 Codes)	*B*	SE	*t*	*P*	Adjusted R^2
Total mortality					
Unadjusted	5.32	.68			.61
Adjusted for poverty	4.54	0.77	5.89	.0001	.64
Infant mortality					
Unadjusted	0.08	0.02			.30
Adjusted for poverty	0.06	0.02	2.81	.007	.32
Heart disease (410–414)					
Unadjusted	0.98	0.37			.14
Adjusted for poverty	0.78	0.43	1.81	.07	.13
Malignant neoplasms (140–239)					
Unadjusted	0.84	0.23			.27
Adjusted for poverty	0.97	0.26	3.77	.0005	.26
Cerebrovascular disease (430–438)					
Unadjusted	0.42	0.12			.21
Adjusted for poverty	0.32	0.14	2.17	.03	.23
Unintentional injuries (800–949, 970–999)					
Unadjusted	0.42	0.11			.26
Adjusted for poverty	0.14	0.10	1.43	.16	.58

[a]Measured by the percentage responding, "You can't be too careful in dealing with people."

TABLE 4—The Effects of Perceived Lack of Helpfulness[a] on All-Cause and Cause-Specific Age-Adjusted Mortality Rates

Cause of Death (ICD-9 Codes)	*B*	SE	*t*	*P*	Adjusted R^2
Total mortality					
Unadjusted	7.01	1.14			.49
Adjusted for poverty	5.69	1.45	3.91	.0003	.50
Infant mortality					
Unadjusted	0.14	0.02			.43
Adjusted for poverty	0.13	0.03	3.84	.0005	.42
Heart disease (410–414)					
Unadjusted	1.50	0.53			.15
Adjusted for poverty	1.29	0.69	1.85	.07	.14
Malignant neoplasms (140–239)					
Unadjusted	0.76	0.36			.08
Adjusted for poverty	0.86	0.46	1.86	.07	.06
Cerebrovascular disease (430–438)					
Unadjusted	0.54	0.19			.16
Adjusted for poverty	0.35	0.24	1.46	.15	.17
Unintentional injuries (800–949, 970–999)					
Unadjusted	0.69	0.16			.32
Adjusted for poverty	0.21	0.16	1.31	.19	.57

[a]Measured by the percentage responding, "People mostly look out for themselves."

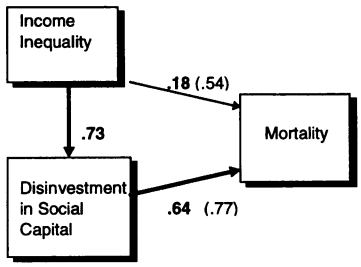
Discussion

In his classic observations of America in the 1830s, Alexis de Tocqueville remarked on the density of associational life as the cornerstone of democracy in this country: "Americans of all ages, all stations in life, and all types of disposition are forever forming associations."[24(p114)] He went on to speculate that the equality brought about by democracy necessitated the formation of associations so that citizens could band together to achieve collective undertakings. According to evidence from a 35-nation survey conducted in 1991, America continues to rank high in associational membership and social trust.[17] Nevertheless, within the United States, we have demonstrated the existence of between-state variations in levels of social capital.

There is a wealth of literature linking social integration at the individual level to health outcomes[14–16]; to our knowledge, however, this is the first empirical demonstration of an association between social capital and mortality. Unlike physical or human capital, which are private goods, social capital is a public good created as a by-product of social relationships.[13] Like most types of public goods, social capital tends to be underproduced if left to the market. A major finding of this study (which needs to be confirmed in longitudinal studies) is that the size of the gap between the rich and the poor is powerfully and negatively related to level of investment in social capital. In other words, disinvestment in social capital appears to be one of the pathways through which growing income inequality exerts its effects on population-level mortality. It

TABLE 5—The Effects of Voluntary-Group Membership on All-Cause and Cause-Specific Age-Adjusted Mortality Rates

Cause of Death (ICD-9 Codes)	*B*	SE	*t*	*P*	Adjusted R^2
Total mortality					
Unadjusted	−83.17	24.24			.22
Adjusted for poverty	−66.75	20.77	−3.21	.003	.45
Infant mortality					
Unadjusted	−0.98	0.57			.05
Adjusted for poverty	−0.67	0.53	−1.27	.21	.21
Heart disease (410–414)					
Unadjusted	−25.99	9.14			.16
Adjusted for poverty	−23.03	9.11	−2.53	.016	.20
Malignant neoplasms (140–239)					
Unadjusted	−20.32	5.55			.25
Adjusted for poverty	−19.81	5.72	−3.46	.001	.23
Cerebrovascular disease (430–438)					
Unadjusted	−2.44	3.55			.01
Adjusted for poverty	−0.71	3.36	−.21	.83	.13
Unintentional injuries (800–949, 970–999)					
Unadjusted	−2.47	3.33			.01
Adjusted for poverty	0.58	2.26	0.25	0.80	.55



Note. Zero-order correlations are in parentheses; path coefficients are shown in boldface.

FIGURE 3—Path coefficients for the effects of income inequality and disinvestment in social capital (social mistrust, as measured by the percentage of respondents who agreed that "most people would try to take advantage of you if they got the chance") on age-adjusted mortality rates.

should be cautioned that an effect in the opposite direction is also possible (i.e., disinvestment in social capital resulting in income inequalities). Alternatively, there may exist unmeasured societal attitudes that underlie both social capital disinvestment and tolerance of income inequality. These considerations deserve further investigation.

Nonetheless, other studies have also noted an association between income inequality and reduced levels of social trust. In a pooled analysis of 20 years (1975 through 1994) of General Social Surveys data involving more than 29 000 respondents,[25] rising income inequality (as measured by the Gini coefficient) was found to be a significant predictor of declining trust in others. In turn, a decline in social trust was predictive of diminished levels of civic engagement.[25] In our data, level of trust in others was strongly correlated with per capita group membership ($r = -.54$, $P < .0001$), low levels of social trust being associated with low per capita group membership. In his study of social capital in Italy, Putnam reported a correlation of .81 between income distribution and an index of civic engagement.[12(p224)]

The Nature of Social Capital

The aspect of social capital that makes it a classic public good is its property of nonexcludability; that is, its benefits are available to all living within a particular community, and access to it cannot be restricted. Hence, a socially isolated individual could potentially benefit from living in a neighborhood rich in social capital. As a hypothetical example, a widowed person living by herself could benefit from residing in a community in which neighbors organized and mingled at block parties, transported elderly residents to voting booths on election days, made sure that sidewalks were cleared when it snowed, and so on.

Conversely, we hypothesize that there are deleterious effects of living in a neighborhood that is depleted in social capital, irrespective of the stock of individual resources. William Julius Wilson coined the term "concentration effects" to describe the phenomenon of families that reside in deprived neighborhoods and face not only the constraints imposed by the larger society (e.g., unemployment) but also the behaviors and truncated aspirations of other jobless families in the neighborhood.[19,26]

In each of the preceding instances, the actions of neighbors cannot be fully captured by measures of social networks and social support assessed at the individual level. In the foregoing example of the elderly, widowed resident, a conventional measure of social networks would classify her as a socially isolated individual. Yet she has access to the stock of social capital in her community, in the form of the passive surveillance and general regard for her welfare that her neighbors provide. In other words, measurement of social capital at the ecologic level captures something distinct, over and above measurement of individual social connections.

The Ecologic Approach

The present study was an ecologic study of the "unmixed" type[27]; that is, our analyses used purely ecologic variables (social capital, income inequality, prevalence of poverty) to predict a purely ecologic outcome (population-level mortality). Hence, no cross-level bias occurred, since we avoided inferences about individuals from grouped data.[27,28] Indeed, any study involving tests of hypotheses about income inequality or social capital must necessarily fall into the category of "obligate" ecological studies (to use Susser's[29] classification), since these variables are characteristics of groups rather than individuals.

Ecologic studies are susceptible to confounding, just as individual-level studies are.[28] In our theoretical model of the pathways leading to population-level mortality (Figure 3), we considered income

inequality to be an antecedent to, rather than a confounder of, the relationship between social capital and mortality. The status of poverty is less well defined. If poverty is linked to depletion in social capital—as some work in deprived neighborhoods suggests[26]—then it may potentially confound the relationship between social capital and mortality. But in analyses that controlled for levels of poverty (Tables 3 and 5), the effects of social capital on mortality remained. Social trust and group membership are also strongly correlated with socioeconomic characteristics such as educational attainment. However, educational attainment is likely to lie in the pathway between income inequality and social capital. For example, Kaplan et al.[7] have demonstrated that there are strong relationships at the state level between degree of income inequality and underinvestment in education, as indexed by the percentage of citizens with less than a high school education, the percentage of high school dropouts, and public spending on education. In examinations of the link between income inequality and social capital, adjusting for state differences in educational attainment may therefore result in statistical overadjustment.

Limitations

A major limitation of the present study is that the General Social Survey was designed to be representative at the national and regional levels but not at the state level. We attempted to overcome this limitation by using poststratification weights to adjust for oversampling (or undersampling) of certain demographic groups, which may have biased the responses to the survey. The results of the analyses using weighted survey responses were, in fact, quite similar to the results of the unweighted analyses. For example, the correlation between social distrust and total mortality changed from .81 (in the unweighted analysis) to .77 (in the weighted analysis), indicating that substantial bias is unlikely to have occurred. Nonetheless, appropriate caution must be exercised in interpreting the state-specific information in this study. For instance, there may be several other variables in addition to age, race, and educational attainment that are not measured in the General Social Survey, but are nonetheless potentially related to the representativeness of estimates of social capital. Such parameters as urban/rural mix, percentage of minority residents, residential segregation, and religiosity may vary between states and be related to state variations in social capital and mortality rates.

An additional potential source of error in our estimates was the variability in state sample size in the General Social Survey. To address this issue, we conducted regression analyses of social capital and mortality weighted by the sample size from each state. The results of this analysis indicated that the coefficients and the standard errors were virtually unchanged, suggesting that bias due to variability in state sample sizes was unlikely to be a problem. In a separate check of the validity of our findings, we carried out a regional analysis of social capital and mortality. The General Social Survey sample is valid for comparisons across the nine US regions. When we examined the relationship between income inequality across regions and social mistrust, we found a strong correlation ($r = .91, P < .0001$). In regression analyses, the associations of the social capital items to total mortality were not statistically significant, probably reflecting the lack of statistical power. Nonetheless, the beta coefficients continued to indicate a positive association between social mistrust and total mortality ($\beta = 3.86$, $SE = 4.31, P = .39$), as well as a negative association between group membership and total mortality ($\beta = -122.8$, $SE = 157.8, P = .46$). Moreover, the point estimates of these coefficients were consistent with the point estimates obtained in the weighted state-level analyses.

A second major limitation of the present study is that both the regression analyses and the path analysis were based on cross-sectional relationships between indicators of social capital and mortality. Cross-sectional analyses are limited in their ability to pin down direction of causality. Undoubtedly, there are bidirectional effects; for example, low levels of social capital seem to be associated with reduced confidence or trust in government performance,[25] which in turn seems to predict underinvestment in human capital (e.g., reduced public spending on education[7]) and, ultimately, widening income inequality. Ideally, longitudinal time series analyses should be carried out on long-term trends in income inequality, social capital, and mortality to test these linkages.

Finally, our model did not consider the full range of factors that may influence income inequality and social capital. Both income inequality and social capital may be derivative of some other unidentified factor that predicts state variations in mortality. For example, variables used to measure social capital may not, by themselves, cause mortality. Rather, the societies that disinvest in social capital may be those that fail to provide the social institutions directly responsible for the health of the population (e.g., health care for the elderly, income maintenance for poor women and children). In other words, a society with little trust in others may not necessarily suffer a high mortality rate unless such distrust also results in little popular support for policies that assist the needy.

Conclusions

The measures of social capital used in the present study reflect recent developments in political science and other fields.[11–13] Despite some important advances,[11–13,30,31] definition and measurement of this concept remain at nascent stages. Further work is needed to establish whether there are state-level, urban–rural, and other differences in the types of organizations to which people belong and whether these differences have an impact on health. Relatively little theoretical or empirical work has been done to distinguish between a growing array of potentially related notions, including community competency,[32,33] collective efficacy, sense of community,[34,35] and the "civil society."[36] A rigorous analysis of the core concepts common to these existing measures of community- or neighborhood-level characteristics would be timely.

There is no good theoretical account of how to build social capital. On the other hand, there are many accounts of how social capital can be destroyed by various social and economic forces.[17] Hence, there is an asymmetry in terms of our current state of knowledge about social capital. What our empirical data do appear to support is that the growing gap between the rich and the poor affects the social organization of communities and that the resulting damage to the social fabric may have profound implications for the public's health. □

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