# 8
# Social Capital and Physical Health
## A Systematic Review of the Literature

Daniel Kim, S.V. Subramanian, and Ichiro Kawachi

In this chapter, we describe the key findings from a systematic review of empirical studies linking social capital to physical health outcomes. As noted in the Introduction, as well as the chapters by van der Gaag and Webber (chapter 2), and Lakon and colleagues (chapter 4), much of the public health literature has focused on the health effects of *social cohesion*. That is, both ecological and multilevel studies have sought to examine the health impacts of group cohesion measured at different scales (e.g., neighborhoods, states, nations). In turn, a number of individual-level studies have sought to test the relationships between individual perceptions of social cohesion (e.g., trust of others) and health outcomes. Accordingly, our systematic review of the literature focuses on empirical studies of social cohesion and physical health outcomes. There is a huge body of literature describing the linkages between social integration, social networks, social support, and health (Berkman & Glass, 2000); however, the authors of these studies do not typically classify their investigations under the heading of "social capital", and indeed a substantial portion of this literature pre-dates the recent explosion of interest in social capital within the public health field.[1] Similarly, there have been a number of empirical investigations in the health field using sociometric analysis. These studies have tended to focus on the "dark side" of social capital e.g., the contagion of high risk behaviors within networks – such as the spread of suicidal ideation (Bearman & Moody, 2004), injection drug use (Friedman & Aral, 2001), or alcohol and other drug use among adolescents (Valente, Gallaher, & Mouttapa, 2004). The authors of chapter 4 would no doubt argue that these are studies of social capital. However, since they did turn up in our search strategy for "social capital and health" (described further below), we shall not discuss them here (except to agree with the authors of chapter 4 that more studies of this type should be encouraged).

[1] Outside the public health field, scholars seem happy to mix them up. Thus in his chapter on social capital and health (chapter 20) in the book *Bowling Alone* (2000), Robert Putnam cites evidence from every type of study, including not only social cohesion, but also social networks and social support.

## 8.1. Systematic Literature Review

We conducted a systematic literature review of all studies in English that have examined social capital in relation to measures of physical health, including all-cause mortality, self-rated health, and major chronic diseases or conditions (e.g., cardiovascular disease, cancer, obesity, and diabetes), as well as acute infectious diseases. Citations were searched using the US National Library of Medicine's PubMed database (which provides electronic citations from MEDLINE and other life science journals for biomedical articles) for the period between 1966 and November 1, 2006, corresponding to the keyword combinations of "social capital" with each of the following: "life expectancy", "mortality", "cardiovascular disease", "cancer", "diabetes", "obesity", and "infectious diseases". Articles were then obtained and reviewed. Reference sections of retrieved articles were searched to identify additional potential articles for inclusion. Tables 8.1 through 8.6 display the key characteristics and findings from these studies, stratified by the type of study design (ecological, multilevel, individual-level) and the highest spatial level of social capital (country, state/region, neighborhood/community), and are listed chronologically by year of publication within each grouping. From each study, we abstracted the study authors and year of publication, sample size and population/setting, age range for social capital and health outcome measures, type of study design (cross-sectional versus prospective/longitudinal), measures of social capital and health/disease, factors included as covariates in statistical models (or stratified on), and individual-level and area-level effect estimates for social capital. For studies that only analyzed individual-level measures of social capital, our keyword search excluded a much more established body of literature that has focused on social networks and social support (which we would argue conceptually belong to social capital). Nevertheless, our review identifies studies that have used indicators of social cohesion such as individual perceptions of trust and reciprocity, as well as reports of civic engagement and social participation. For the outcome of self-rated health, to facilitate comparison and discussion of the findings across studies in which the outcome was dichotomous (fair/poor health versus excellent/very good/good health), all odds ratios and 95% confidence intervals presented in Table 8.2 for social trust and associational memberships correspond to associations between *higher* social capital and the relative odds of *fair/poor* self-rated health. These estimates were then plotted on the same graph for the same indicators at each of the individual and contextual levels.

## 8.2. Social Capital, All-Cause Mortality, and Life Expectancy

Table 8.1 provides details of the 15 studies of social capital and life expectancy or all-cause mortality that met our inclusion criteria. Of these, only three studies conducted multilevel analyses (two of which were prospective; Blakely et al., 2006; Mohan, Twigg, Barnard, & Jones, 2005), while the remaining studies were ecological (only one of which was prospective; Milyo & Mellor, 2003).

TABLE 8.1. Social capital, life expectancy, and all-cause mortality.

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| **ECOLOGICAL STUDIES:** | | | | | | | |
| *Country level* | | | | | | | |
| Lynch et al., 2001 | 16 countries | Social capital measures: 18+y Health outcome measures: All ages | Social mistrust, organizational memberships, trade union memberships, volunteering | Life expectancy, all-cause mortality rates | GDP per capita; stratified by gender | – | *1) Social mistrust:* Life expectancy r = −0.14, p = 0.65 (men) r = 0.45, p = 0.12 (women) All-cause mortality rates r = −0.06, p = 0.84 (men) r = −0.33, p = 0.27 (women) *2) Organizational memberships:* Life expectancy r = −0.07, p = 0.82 (men) r = −0.33, p = 0.29 (women) All-cause mortality rates r = 0.17, p = 0.59 (men) r = 0.20, p = 0.53 (women) *3) Trade union memberships:* Life expectancy r = 0.13, p = 0.68 (men) r = − 0.31, p = 0.30 (women) All-cause mortality rates r = 0.25, p = 0.42 (men) r = 0.36, p = 0.23 (women) *4) Volunteering:* Life expectancy r = 0.28, p = 0.40 (men) r = 0.41, p = 0.20 (women) |

*(Continued)*

TABLE 8.1. (*Continued*).

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | | | | | All-cause mortality rates<br>r = −0.53, p = 0.09 (men)<br>r = − 0.59, p = 0.06 (women) |
| Kennelly et al., 2003 | 19 OECD countries | Social capital measures: 18+y<br>Health outcome measures: All ages | Social trust, associational memberships, volunteering | Gender-specific life expectancy, infant mortality rates, perinatal mortality rates | GDP per capita, Gini coefficient, physicians per capita, proportion of public expenditure in total health expenditure, fruit and vegetable consumption per capita, tobacco consumption per capita, alcohol consumption per capita, country of Japan; analyses stratified by gender and account for survey wave | – | *1) Social trust:*<br>Life expectancy<br>ß > 0, p = 0.47 (men)<br>ß > 0, p = 0.25 (women)<br>Infant mortality rates<br>ß < 0, p = 0.31<br>Perinatal mortality rates<br>ß < 0, p = 0.14<br>*2) Associational memberships:*<br>Life expectancy<br>ß > 0, p = 0.14 (men)<br>ß > 0, p = 0.32 (women)<br>Infant mortality rates<br>ß < 0, p = 0.65<br>Perinatal mortality rates<br>ß > 0, p = 0.22<br>*3) Volunteering:*<br>Life expectancy<br>ß > 0, p = 0.76 (men)<br>ß > 0, p = 0.48 (women)<br>Infant mortality rates<br>ß > 0, p = 0.46<br>Perinatal mortality rates<br>ß > 0, p = 0.15 |

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| *State or regional level* | | | | | | | |
| Kawachi et al., 1997 | 39 US states | Social capital measures: 18+y Health outcome measure: all ages | Social mistrust, lack of helpfulness, voluntary group memberships | Age-standardized all-cause mortality rates | State prevalence of poverty | – | 1) Social mistrust: ß > 0, p < 0.01<br>2) Lack of helpfulness: ß > 0, p < 0.01<br>3) Voluntary group memberships: ß < 0, p < 0.01 |
| Wilkinson et al., 1998 | 39 US states | Social capital measures: 18+y Health outcome measure: all ages | Social mistrust | Age-standardized all-cause mortality rates | – | – | r = 0.76, p < 0.05 |
| Siahpush & Singh, 1999 | 7 states/ territories in Australia in each of seven years (n=49) | Social capital measures: 15+y Health outcome measure: all ages | Percentage of labor force with union memberships | Age-standardized all-cause mortality rates | Calendar year | – | ß > 0, p < 0.05 |
| Milyo & Mellor, 2003 | 2 samples: 48 US states; 39 US states | Social capital measures: 18+y Health outcome measures: All ages | Putnam social capital index (derived from 14 indicators), social mistrust | Age-standardized all-cause mortality rates | Proportion of population in poverty | – | 1) Putnam social capital index: ß < 0, p < 0.01<br>2) Social mistrust: ß > 0, p < 0.01 |
| Veenstra, 2002 | 29 health districts in the province of Saskatchewan, Canada | Social capital measure: 18+y Health outcome measures: All ages | Social capital index (associational memberships, social involvement, electoral participation) | Age-standardized all-cause mortality rates | Income inequality, gender composition, total crime | – | ß > 0, p = 0.81 |
| Kennedy et al., 1998 | 40 regions in Russia | Social capital measure: 16+y Health outcome measures: All ages | Mistrust in local and in regional government, lack of social cohesion at | Life expectancy, age-standardized all-cause mortality rates | Per capita income, proportion in poverty, perceived economic hardship in | – | *1) Mistrust in local government:*<br>Life expectancy<br>ß < 0, p = 0.02 (men)<br>ß < 0, p = 0.053 (women)<br>All-cause mortality rates |

*(Continued)*

TABLE 8.1. (*Continued*).

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | work, lack of interest in politics | | region, per capita crime rate; analyses stratified by gender | | ß > 0, p = 0.01 (men)<br>ß > 0, p = 0.06 (women)<br>2) Mistrust in regional government:<br>Life expectancy<br>ß < 0, p = 0.15 (men)<br>ß < 0, p = 0.24 (women)<br>All-cause mortality rates<br>ß > 0, p = 0.0497 (men)<br>*3) Lack of social cohesion at work:*<br>Life expectancy<br>ß < 0, p = 0.01 (men)<br>ß < 0, p = 0.04 (women)<br>All-cause mortality rates<br>ß > 0, p = 0.02 (men)<br>*4) Lack of interest in politics:*<br>Life expectancy<br>ß < 0, p = 0.02 (men)<br>ß < 0, p = 0.06 (women)<br>All-cause mortality rates<br>ß > 0, p = 0.10 (men)<br>ß > 0, p < 0.10 (women) |
| Skrabski et al. 2003 | 20 counties in Hungary | Social capital measure: 16+ y<br>Health outcome measures: 45–64 y | Social mistrust, reciprocity, received help from civic organizations | Age-specific (ages 45–64) and gender-specific all-cause mortality rates | GDP per capita, income, education, prevalence of smoking, average alcohol consumption, unemployment rate; | – | *1) Social mistrust:*<br>ß > 0, p < 0.01 (men)<br>ß > 0, p < 0.01 (women)<br>*2) Reciprocity:*<br>ß < 0, p < 0.01 (men)<br>ß < 0, p < 0.01 (women) |

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|---|---|---|---|---|---|---|---|
| | | | | | analyses stratified by gender | | *3) Received help from civic organizations:* ß > 0, p < 0.01 (men) |
| Skrabski et al., 2004 | 150 subregions in Hungary | Social capital measures: 18+y Health outcome measures: 45–64 y | Social mistrust, reciprocity, membership in civic organizat-ions, religious group involvement | Age-specific (ages 45–64) and gender-specific all-cause mortality rates | Income per capita, mean years of education, prevalence of smoking, average alcohol consumption, collective efficacy; analyses stratified by gender | – | *1) Social mistrust:* ß > 0, p < 0.01 (men) ß > 0, p < 0.01 (women) *2) Reciprocity:* ß < 0, p < 0.01 (men) ß < 0, p < 0.01 (women) *3) Membership in civic organizations:* ß < 0, p < 0.01 (men) ß < 0, p < 0.01 (women) *4) Religious group involvement:* ß > 0, p < 0.01 (men) ß < 0, p < 0.01 (women) |
| Turrell et al., 2006 | Persons aged 25–74 years in 41 statistical local areas in the state of Tasmania, Australia | Social capital measures: 18+y Health outcome measures: 25–74 y | Social trust, social cohesion, political participation | All-cause age-standardized mortality rates | *Area:* age, gender, socioeconomic disadvantage, geographic remoteness, neighborhood safety | – | *1) Social trust:* ß > 0, p > 0.05 *2) Political participation:* ß > 0, p > 0.05 *3) Trust in public and private institutions:* ß > 0, p > 0.05 *4) Neighborhood integration:* ß < 0, p > 0.05 *5) Neighborhood isolation:* ß > 0, p > 0.05 |
| *Neighborhood level* | | | | | | | |
| Lochner et al., 2003 | 342 neighborhoods in Chicago in the US | Social capital measures: 18+y Health outcome measures: 45–64 y | Trust, reciprocity, associational memberships | All-cause mortality rates (ages 45–64) | Socioeconomic deprivation; analyses stratified by | – | *1) Trust:* White women ß < 0, p < 0.01 White men |

(*Continued*)

TABLE 8.1. (*Continued*).

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | | | race/ethnicity and gender | | ß < 0, p < 0.01<br>Black women<br>ß < 0, p < 0.05<br>Black men<br>ß < 0, p > 0.05<br>*2) Reciprocity:*<br>White women<br>ß < 0, p < 0.01<br>White men<br>ß < 0, p < 0.05<br>Black women<br>ß < 0, p > 0.05<br>Black men<br>ß < 0, p < 0.05<br>*3) Associational memberships:*<br>White women<br>ß < 0, p < 0.01<br>White men<br>ß < 0, p < 0.01<br>Black women<br>ß < 0, p > 0.05<br>Black men<br>ß < 0, p < 0.01 |
| **MULTILEVEL STUDIES:** *Neighborhood- or regional-level social capital* | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Wen et al., 2005 | 12,672 adults diagnosed and hospitalized with one of 13 serious illnesses in 51 zip codes in Chicago | Social capital measures: 18+y Health outcome measures: 67+years | Social support, social network density, participation in local organizations, voluntary associations | All-cause mortality (dichotomous) | *Individual level:* age, gender, race/ethnicity, Medicaid recipient, co-morbidity *Zip code level:* socioeconomic status | – | *1) Social support:* HR = 0.996, p > 0.05 *2) Social network density:* HR = 1.02, p > 0.05 *3) Local organizations:* HR = 0.994, p > 0.05 *4) Voluntary associations:* HR = 1.005, p > 0.05 |
| Mohan et al., 2005 | 7,578 adults in 396 electoral wards in England | Social capital and health outcome measures: 18–94 y | *Individual level:* Belonging to community, reliable friends, frequency of feeling lonely *Ward level:* Volunteering, participation in social activities, altruistic activities, political activities, electoral participation, importance of local friends, attitudes towards belonging to neighborhood, willingness to work to improve neighborhood, talking to neighbors, frequency of meeting local people, perceived | All-cause mortality | Age, gender, social class, household tenure, smoking, alcohol consumption, exercise, diet | 1) Perceived belonging to community: OR = 1.11, 95% CI = 0.93−1.32 2) Reliable friends: OR = 1.05, 95% CI = 0.63−1.78 3) Frequency of feeling lonely: OR = 1.30, 95% CI = 0.98−1.72 | *Lowest levels of:* 1) Any volunteering: OR = 1.35, 95% CI = 1.06−1.71 2) Volunteering (11+ *days over* past year): OR = 1.31, 95% CI = 1.03−1.67 3) Participation in social organizations: OR = 1.36, 95% CI = 1.07−1.73 4) Participation in altruistic organizations: OR = 1.27, 95% CI = 1.00−1.57 5) Political activities: OR = 1.27, 95% CI = 1.01−1.60 6) Electoral participation: OR = 1.03, 95% CI = 0.81−1.29 7) Importance of local friends: OR = 1.20, 95% CI = 0.96−1.51 8) Attitudes towards belonging to neighborhood: OR = 0.93, 95% CI = 0.73−1.18 9) Willingness to work to improve neighborhood: OR = 1.09, 95% CI = 0.86−1.38 10) Talking to neighbors: OR = 1.04, 95% CI = 0.83−1.30 |

*(Continued)*

TABLE 8.1. (*Continued*).

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | friendliness of area, blood donation | | | | 11) Frequency of meeting local people: OR = 0.80, 95% CI = 0.63−1.02<br>12) Perceived friendliness of area: OR = 0.84, 95% CI = 0.67−1.06<br>13) Blood donation: OR = 1.05, 95% CI = 0.83−1.32 |
| Blakely et al., 2006 | All 25–74 year-olds in 1,683 Census area units in New Zealand | Social capital measure: 15+y<br>Health outcome measures: 25–74 y | *Census area unit level:* volunteering | All-cause mortality, stratified by gender | *Individual level:* age, race/ ethnicity, marital status, income, education, car access, employment status, urban residence<br>*Neighborhood level:* socioeconomic deprivation | – | Low volunteerism: RR = 0.95, 95% CI = 0.89−1.02 (men) RR = 0.96, 95% CI = 0.88−1.04 (women) |

Among ecological studies, the unit of analysis for social cohesion varied widely, from the country level down to the neighborhood level, whereas multilevel studies assessed social capital at the regional or neighborhood, but not country levels. In the country-level ecological studies, nations that were included consisted primarily of OECD nations, and excluded developing nations. Within-country ecological studies analyzed population samples in the US, Canada, Australia, as well as Russia and Hungary, while the multilevel analyses employed samples in the US, England, and New Zealand.

The vast majority of studies focused on a single indicator of social capital, such as social trust, associational memberships, and reciprocity, and were derived by aggregating survey responses among adults to the area level, while one study (Milyo & Mellor, 2003) applied the Putnam social capital index (based on 14 state-level social capital indicators), and another study (Siahpush & Singh, 1999) investigated the association for the percentage of the labor force with union memberships. Most ecological studies examined all-cause mortality rates as the health outcome across *all* age groups, including children and adolescents (appropriately summarized through age-standardization), but without stratification by age. A small subset of studies confined the examination of mortality to those of middle age (45–64 years) (Lochner, Kawachi, Brennan, & Buka, 2003; Skrabski, Kopp, & Kawachi, 2003, 2004). Two of the three multilevel analyses analyzed the risk of all-cause mortality among adults in most age groups, while the other analysis (Wen, Cagney, & Christakis, 2005) was restricted to an elderly population (67+ years), and estimated the relative hazards of dying among those diagnosed and hospitalized with serious illnesses.

Adjustment for potential confounders in ecological studies was variable, with some studies limiting control to gender and area-level deprivation (e.g., Lynch et al., 2001), and other studies controlling for ecological factors expectedly correlated with health behaviors, that could plausibly mediate the effects of social capital (Kennelly, O'Shea, & Garvey, 2003; Skrabski et al., 2003, 2004). In multilevel studies, suitable control was made for several individual-level factors including demographic characteristics (e.g., age, gender, and race/ethnicity) and socioeconomic status (e.g., income or education), through adjustment in statistical models or stratification. Nonetheless, control at the area level was confined to area-level socioeconomic deprivation (Blakely et al., 2006; Wen et al., 2005), or was absent altogether (Mohan et al., 2005), so that residual confounding bias due to effects of other area-level factors such as racial/ethnic heterogeneity cannot be excluded.

Social cohesion was fairly consistently associated in a protective direction with mortality outcomes at the state, regional, and/or neighborhood levels in the US, Russia, and Hungary, whereas the relationships were statistically non-significant in other countries including Canada, Australia, and New Zealand as well as in cross-national studies. Among the three multilevel studies, findings were more mixed, with only one study (Mohan et al., 2005) observing significant associations for selected social capital measures (volunteering, organizational participation, and non-electoral political participation, but not informal socializing domains) after adjustment for individual-level social capital indicators.

## 8.3. Social Capital and Self-Rated Health

Altogether 32 studies met our inclusion criteria for social capital and self-rated health (Table 8.2). Only one of these studies was ecological, while 24 were multilevel (with higher-level units ranging from the country level to the state and neighborhood or community level), and seven were conducted at the individual level. Only two studies (both multilevel; Mellor & Milyo, 2005; Zimmerman & Bell, 2006) were prospective, while all other studies were cross-sectional.

As with studies involving mortality, studies of self-rated health have predominantly analyzed single indicators of social cohesion such as trust, associational membership, and reciprocity. Studies that incorporated a large number of indicators combined indicators either through factor analysis or by taking the mean of standardized values for multiple indicators, with one such study measuring both community- and individual-level bonding and bridging social capital (Kim, Subramanian, & Kawachi, 2006a). In nine of the 25 multilevel studies, individual and collective social capital were simultaneously examined, with individual-level social capital being measured via the same survey items (without aggregation) as at the area level.

Most studies dichotomized the outcome of self-rated health into fair/poor versus excellent/very good/good health, though some studies analyzed the outcome as a continuous or ordinal variable.

The sole ecological study (Lynch et al., 2001) was conducted with countries as the unit of analysis, and adjusted for gross domestic product (GDP) per capita. The majority of multilevel studies adjusted for key individual-level covariates including age, gender, race/ethnicity, and income or education. Meanwhile, adjustment for potential confounders at the area level ranged widely, with some studies making no adjustment at all, and other studies controlling for multiple potential confounders (see for e.g., Browning & Cagney, 2003).

In multilevel studies, measures of social capital at the individual level were for the most part significantly associated with better self-rated health. By contrast, the association between area social cohesion and self-rated health was more mixed, especially after adjustment for individual-level covariates (Table 8.2). These contrasts between the individual and area level are apparent in Figures 8.1 through 8.4, which plot the odds ratios and 95% confidence intervals for the associations between higher social trust and associational memberships and fair/poor self-rated health (Figures 8.1 and 8.3 at the individual level, and Figures 8.2A and 8.4A at the area level after adjustment for individual-level social capital, respectively).

There was also evidence of attenuation of the odds ratios with the addition of individual-level social capital indicators, in some instances to statistical non-significance: Figures 8.2B and 8.4B show the odds ratio estimates for area-level social trust and associational memberships in the multilevel analyses *without* adjustment for individual-level social capital. All of these studies were cross-sectional in design. Here, a general pattern emerges of stronger inverse and statistically significant odds ratios prior to multivariate adjustment, compared to the

TABLE 8.2. Social capital and self-rated physical and general health.

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Form of self-rated health measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| **ECOLOGICAL STUDIES:** *Country-level social capital* | | | | | | | |
| Lynch et al., 2001 | 16 countries | Social capital measure & health outcome measure: 18+ y | Social mistrust, organizational memberships, trade union memberships, volunteering | Proportion reporting fair/ poor health | GDP per capita | – | 1) Social mistrust: $r = 0.47$, $p = 0.11$<br>2) Organizational memberships: $r = -0.36$, $p = 0.25$<br>3) Trade union memberships: $r = -0.17$, $p = 0.58$<br>4) Volunteering: $r = -0.80$, $p = 0.003$ |
| **MULTILEVEL STUDIES:** *Country-level social capital* | | | | | | | |
| Helliwell & Putnam, 2004 | 83,520 adults in 49 countries | Social capital measure & health outcome measure: 18+y | *Individual level:* social trust (general, in police) associational memberships, *National level:* social trust, associational memberships | Continuous (higher = better health) | *Individual level:* age, gender, marital status, employment status, importance of God/religion, frequency of attending religious service *National level:* median income, importance of God/religion, | 1) General social trust: $ß > 0$, $p < 0.01$<br>2) Trust in police: $ß > 0$, $p < 0.01$<br>3) Associational memberships: $ß > 0$, $p < 0.05$ | 1) General social trust: $ß > 0$, $p < 0.01$<br>2) Associational memberships: $ß > 0$, $p < 0.01$ |

*(Continued)*

TABLE 8.2. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Form of self-rated health measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | | | governance quality | | |
| Poortinga, 2006a | 42,358 adults in 22 European countries | Social capital measure & health outcome measure: 15+y | *Individual level:* social trust, associational memberships *National level:* social trust, associational memberships | Dichotomous | *Individual level:* age, gender, education, income | 1) High social trust: OR = 0.66, 95% CI = 0.62–0.70 2) High associational memberships: OR = 0.76, 95% CI = 0.70–0.82 | 1) High social trust: OR = 0.91, 95% CI = 0.73–1.14 2) High associational memberships: OR = 0.91, 95% CI = 0.71–1.17 |
| *State-level social capital* | | | | | | | |
| Kawachi et al., 1999 | 167,259 adults in 39 US states | Social capital measure & health outcome measure: 18+ y | *State level:* social trust, reciprocity, group memberships | Dichotomous | *Individual level:* age, gender, race/ethnicity, income, marital status, smoking, obesity, health insurance coverage, health checkup in last two years | – | 1) High social trust: OR = 0.71, 95% CI = 0.67–0.75 2) High reciprocity: OR = 0.68, 95% CI = 0.64–0.71 3) High group memberships: OR = 0.82, 95% CI = 0.76–0.88 |
| Subramanian et al., 2001 | 144,692 adults in 39 US states | Social capital measure & health outcome measure: 18–98 y | *State level:* social mistrust (continuous %) | Dichotomous | *Individual level:* age, gender, race/ethnicity, marital status, income, smoking, health insurance coverage, health | – | Higher social trust: OR = 0.99; 95% CI = 0.98–0.996 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | checkup in last year<br>*State level:* median household income, income inequality<br>*State-individual interaction:* state income inequality x individual income interactions | | |
| Mellor & Milyo, 2005 | 2 samples: ~68,000 adults in 39 US states; ~76,000 adults in 48 US states | Social capital measure: 18+y Health outcome measure: 16+y | *State level:* social mistrust, group memberships, Putnam social capital index (derived from 14 indicators) | Ordinal (five categories; higher = better health) | *Individual level:* age, gender, race/ethnicity, marital status, income, education, health insurance coverage, central city/MSA residence,<br>*State level:* median household income | – | 1) Social mistrust: ß < 0, p < 0.05<br>2) Group memberships: ß > 0, p > 0.05<br>3) Putnam social capital index: ß > 0, p < 0.05 |
| *Neighborhood- or community-level social capital* | | | | | | | |
| Subramanian et al., 2002 | 21,456 adults in 40 US communities | Social capital measure & health outcome measure: 18–89 y | *Community level:* social trust (general, trust in neighbors, coworkers, fellow congregants, store employees, local police) | Dichotomous | *Individual level:* age, gender, race/ethnicity, marital status, income, education | High social trust: OR = 0.55, 95% CI = 0.50-0.61 | High social trust: OR = 0.87, 95% CI = 0.62-1.21<br>Interaction models: significant positive interaction between high community social trust and high individual social trust |

*(Continued)*

TABLE 8.2. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Form of self-rated health measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| Browning & Cagney, 2003 | 2,218 adults in 333 neighborhoods in the city of Chicago, US | Social capital measure & health outcome measure: 18+y | *Neighborhood level:* friendship social support and networks | Dichotomous | *Individual level:* age, gender, race/ethnicity, marital status, income, education, household tenure, years in neighborhood, foreign-born status, interview year *Neighborhood level:* total population, residential stability, immigrant concentration, prior neighborhood health, disorder, anomie, tolerance of risk behavior, collective efficacy | – | High social support and networks: OR = 0.89, 95% CI = 0.78-1.02 |
| Wen et al., 2003 | 3,459 adults in 275 neighborhood clusters in Chicago | Social capital measure & health outcome measure: 18+y | *Neighborhood level:* social resources (reciprocity, density of social networks, social cohesion, informal social control) | Ordinal (four categories; higher = better health) | *Individual level:* age, gender, race/ethnicity, marital status, income, education, smoking, hypertension, interview year | – | Higher social resources: OR = 1.19 $p < 0.05$ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | *Neighborhood level:* poverty, affluence, income inequality, education, health-enhancing services, crime exposure, prior health | | |
| Drukker et al., 2003 | 3,401 adolescents in 36 neighborhoods in Maastricht, Netherlands | Social capital measure: 20–65 y<br>Health outcome measure: ~10–12 y | *Neighborhood level:* social cohesion and trust | Continuous | *Individual level:* gender, grade retention<br>*Household level:* occupational status, education, family welfare status, single parent<br>*Neighborhood level:* socioeconomic deprivation, residential instability | – | ß < 0, p > 0.05 |
| Lindström et al., 2004 | 3,602 adults in 75 neighborhoods in Malmö, Sweden | Social capital measure & health outcome measure: 20–80 y | *Individual level:* social participation | Dichotomous | *Individual level:* age, gender, country of origin, education | High social participation: OR = 0.34, 95% CI = 0.27–0.43 | – |
| Helliwell & Putnam, 2004 | 28,766 adults in 40 US communities | Social capital measure & health outcome measure: 18–99 y | *Individual level:* associational memberships, social trust (general, in neighbors, police)<br>*Community level:* associational | Continuous (higher = better health) | *Individual level:* age, gender, marital status, employment status, importance of God/religion, frequency of attending religious | 1) Associational memberships: ß > 0, p < 0.01<br>2) General trust: ß > 0, p < 0.01<br>3) Trust in neighbors: ß > 0, p < 0.01 | 1) Associational memberships: ß > 0, p > 0.05<br>2) Social trust: ß > 0, p < 0.01 |

*(Continued)*

TABLE 8.2. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Form of self-rated health measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | memberships, social trust | | service, commute time to work *Community level:* median income, importance of God/religion | 4) Trust in police: ß > 0, p < 0.01 | |
| Veenstra, 2005a | 1,184 adults in 25 communities in the province of British Columbia, Canada | Social capital measures & health outcome measure: 18+y | *Individual level:* social trust, political trust, social participation | Dichotomous | *Individual level:* age, gender, foreign-born, income, education | *Social trust:* OR = 0.73, 95% CI = 0.56–0.97 p = 0.03 *Political trust:* OR = 0.57, 95% CI = 0.44–0.75 p < 0.01 *Participation in voluntary associations:* OR = 0.96, 95% CI = 0.84–1.10 p = 0.58 | – |
| Ziersch et al., 2005 | 2,400 adults in suburban neighborhoods in Adelaide, Australia | Social capital measure & health outcome measure: 18+y | *Neighborhood level:* social trust, social connections/cohesion | Self-reported physical health (continuous) | *Individual level:* age, gender, income, education, household tenure, years at address *Neighborhood level:* pollution, safety | – | *1) Neighborhood trust:* ß > 0, p > 0.05 *2) Neighborhood connections/ cohesion:* ß > 0, p > 0.05 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Steptoe & Feldman, 2001 | 654 adults in 37 neighborhoods in London, England | Social capital measure & health outcome measure: 18–94 y | *Neighborhood level:* social cohesion | Self-reported physical function (dichotomous) | *Individual level:* age, sex, socioeconomic deprivation<br>*Neighborhood level:* socioeconomic deprivation | – | Low social cohesion: OR = 2.31, 95% CI = 1.16-6.63 |
| Kavanagh et al., 2006b | 15,112 adults in 41 statistical local areas in the state of Tasmania, Australia | Social capital measure & health outcome measure: 18–97 y | *Area level:* social trust, social cohesion, political participation | Dichotomous | *Individual level:* age, marital status, income, education, indigenous status, smoking<br>*Area level:* socioeconomic disadvantage, geographic remoteness, neighborhood safety | – | *Men:*<br>1) Social trust: ß < 0, p = 0.01<br>2) Political participation: ß > 0, p = 0.88<br>3) Trust in public and private institutions: ß > 0, p = 0.92<br>4) Neighborhood integration: ß < 0, p = 0.53<br>5) Neighborhood alienation: ß < 0, p = 0.02<br>*Women:*<br>1) Social trust: ß < 0, p = 0.01<br>2) Political participation: ß > 0, p = 0.91<br>3) Trust in public and private institutions: ß > 0, p = 0.96<br>4) Neighborhood integration: ß < 0, p = 0.30<br>5) Neighborhood alienation: ß < 0, p = 0.31 |

*(Continued)*

TABLE 8.2. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Form of self-rated health measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| Zimmerman & Bell, 2006 | 4,817 adults in 855 US counties and 45 states | Social capital measure: 18+y Health outcome measure: 40–45 y | *State level:* social capital index (derived from nine indicators of social trust, civic engagement, and anomie) | Dichotomous | *Individual level:* gender, race/ ethnicity, marital status, urban residence, region, income, education, poverty status, employment status, health insurance status *County level:* proportion wealthy, unskilled wages, housing affordability, crime rate, proportion unemployed, proportion Black, proportion Hispanic, mean income, mean years of education, index of availability of psychiatric services, index of availability of health services *State level:* generosity of state spending | – | OR = 1.09, 95% CI = 0.56–2.12 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Drukker et al., 2005 | 801 adolescents in 343 neighborhoods in Chicago; 533 adolescents in 36 neighborhoods in Maastricht, Netherlands | Social capital measure: 18+y Health outcome measure: 12 y (Chicago); 10–13 y (Maastricht) | *Neighborhood level:* social cohesion and trust | Continuous (higher = better health) | *Individual level:* gender, age/grade retention, race/ethnicity *Household level:* occupational status, education, family welfare status, single parent *Neighborhood level:* socioeconomic deprivation | – | Maastricht: ß < 0, p > 0.05 Chicago, non-Hispanics: ß > 0, p > 0.05 Chicago, Hispanics: ß > 0, p > 0.05 |
| Poortinga, 2006d | 7,394 adults in 4,332 households in 720 postal code sectors in the UK | Social capital measure & health outcome measure: 16+y | *Individual level:* Social support, social trust, civic participation *Community level*: reciprocity | Dichotomous | *Individual level*: age, gender, physical activity *Household level:* social class, household tenure | 1) Severe lack of social support: OR = 2.17, 95% CI = 1.72-2.73 2) High social trust: OR = 0.69, 95% CI = 0.58-0.82 3) High civic participation: OR = 0.62, 95% CI = 0.51-0.76 | Reciprocity: OR = 0.52, 95% CI = 0.33-0.83 |
| Kim et al., 2006a | 24,835 adults in 40 US communities | Social capital measure & health outcome measure: 18–99 y | *Individual level:* formal bonding social capital, trust in members of one's race/ethnicity, formal bridging, informal bridging, social trust | Dichotomous | *Individual level:* age, gender, race/ethnicity, marital status, income, education *Community level:* mean age, percent low income, state community | 1) High formal bonding social capital: OR = 0.77, 95% CI = 0.66-0.88 2) High trust in members of one's race/ethnicity: OR = 0.88, 95% CI = 0.79-0.98 | 1-SD* higher bonding social capital: OR = 0.86, 95% CI = 0.80-0.92 1-SD* higher bridging social capital: OR = 0.95, 95% CI = 0.88-1.02 Interaction models: significantly weaker bonding social capital associations among Blacks and those in the "Other" |

*(Continued)*

TABLE 8.2. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Form of self-rated health measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | *Community level:* bonding social capital, bridging social capital | | | 3) High formal bridging: OR = 1.07, 95% CI = 0.87-1.31<br>4) High informal bridging: OR = 0.99, 95% CI = 0.91-1.08<br>5) High social trust OR = 0.54, 95% CI = 0.49-0.59 | racial/ethnic category than among Whites |
| Kim et al., 2006b | 24,835 adults in 40 US communities | Social capital measure & health outcome measure: 18–99 y | *Individual level:* social trust, informal social interactions, diversity of friendship networks, electoral political participation, and non-electoral political participation, formal group involvement/religious group involvement/ giving and volunteering<br>*Community level:* three social capital subscales based on same | Dichotomous | *Individual level:* age, gender, race/ ethnicity, marital status, income, education, proximity to core urban areas<br>*Community level:* mean age, proportion with low income, proportion with low education, state community | 1) Social trust: OR = 0.56, 95% CI = 0.52-0.62<br>2) Informal social interactions: OR = 0.96, 95% CI = 0.88-1.05<br>3) Electoral participation: OR = 0.78, 95% CI = 0.71-0.86<br>4) Diversity of friendships: OR = 0.98, 95% CI = 0.90-1.07<br>5) Non-electoral participation OR = 1.18, 95% CI = 1.06-1.31 | *Subscale 1* (social trust, informal social interactions, electoral political participation): OR = 1.00, 95% CI = 0.93-1.06<br>*Subscale 2* (formal group participation, religious group participation, giving and volunteering): OR = 0.94, 95% CI = 0.89-0.99<br>*Subscale 3* (diversity of friendships, non-electoral political participation): OR = 0.91, 95% CI = 0.85-0.98<br>*High on all three subscales:* OR = 0.82, 95% CI = 0.69-0.98 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 8 indicators as at individual level | | | 6) Formal group involvement/ religious group involvement/ giving and volunteering OR = 0.68, 95% CI = 0.62–0.75 | |
| Poortinga, 2006c | 2 UK samples: 1) 7,988 adults in 4,787 households in 360 sampling points/postal code sectors 2) 7,394 adults in 4,332 households in 720 postal code sectors | Social capital measure & health outcome measure: 16+y | *Individual level:* social support, social trust, civic participation *Community level:* social trust, civic participation, reciprocity | Dichotomous | *Individual level:* age, gender, physical activity *Household level:* social class, household tenure | 1) Severe lack of social support: OR = 2.21, 95% CI = 1.76–2.78 2) High social trust: OR = 0.75, 95% CI = 0.62–0.90 3) High civic participation: OR = 0.62, 95% CI = 0.51–0.77 | 1) High social trust: OR = 0.39, 95% CI = 0.22–0.71 2) High civic participation: OR = 0.90, 95% CI = 0.53–1.54 3) High reciprocity OR = 0.52, 95% CI = 0.33–0.83 |
| Poortinga, 2006b | 14,836 adults in 720 postal code sectors in the UK | Social capital measure & health outcome measure: 16+y | *Individual level:* social support, social trust, civic participation, reciprocity | Dichotomous | *Individual level:* age, gender, marital status, social class, unemployment status, household tenure, access to amenities, presence of local social problems, urban residence | 1) Severe lack of social support: OR = 1.64, 95% CI = 1.42–1.90 2) High social trust: OR = 0.74, 95% CI = 0.67–0.82 3) High social participation: OR = 0.67, 95% CI = 0.60–0.76 4) High reciprocity: OR = 0.82, 95% CI = 0.73–0.93 | – |
| Franzini et al., 2005 | 3,151 adults in 100 neighborhoods in Texas | Social capital measure & health | *Neighborhood level:* social capital | Continuous | *Individual level:* age, gender, race/ | – | ß > 0, p < 0.05 |

*(Continued)*

TABLE 8.2. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Form of self-rated health measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | outcome measure: 18–94 y | (based on 2 sub-scales of social trust, reciprocity) | | ethnicity, family income-to-needs ratio<br>*Neighborhood level:* collective efficacy, child-related processes, disorder, fear, racism | | |
| Yip et al., in press | 1,218 adults in 48 villages in the Shandong province, China | Social capital measure & health outcome measure: 16-80 y | *Individual level:* Social trust, party memberships, voluntary organization memberships<br>*Village level:* Social trust, party memberships, voluntary organization memberships | Dichotomous | *Individual level:* age, gender, marital status, occupation, education<br>*Household level:* income, assets, size | 1) Social trust: OR = 0.71, 95% CI = 0.61-0.83<br>2) Party memberships: OR = 0.62, 95% CI = 0.43-0.90<br>3) Voluntary organization memberships: OR = 0.81, 95% CI = 0.50-1.32 | 1) Social trust: OR = 0.76, 95% CI = 0.51-1.13<br>2) Party memberships: OR = 0.96, 95% CI = 0.13-7.10<br>3) Voluntary organization memberships: OR = 1.15, 95% CI = 0.04-35.30 |
| **INDIVIDUAL-LEVEL STUDIES:** | | | | | | | |
| Rose, 2000 | 1,904 adults in the Russian Federation | Social capital measure & health outcome measures: 18+y | General social trust, social support | Self-rated physical health (continuous; higher =better health) | Age, gender, income, education, subjective social status | 1) General social trust: ß > 0, p < 0.05<br>4) Social support: ß > 0, p < 0.05 | – |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Veenstra, 2000 | 534 adults in the province of Saskatchewan, Canada | Social capital measure & health outcome measure: 18+y | Civic participation, participation in clubs; political trust, trust in neighbors, trust in community members, trust in members of part of province, general social trust; frequency of socialization with co-workers, willingness to turn to co-worker in time of need, religious service attendance | Dichotomous | Selected outcomes: income, education | Civic participation: ß not reported, $p > 0.05$<br>Participation in clubs: ß not reported, $p > 0.05$<br>Political trust, trust in neighbors, trust in community members, trust in members of part of province, general social trust: ß not reported, $p > 0.05$<br>*Also adjusted for income, education:*<br>Frequency of socialization with co-workers: $ß < 0$, $p > 0.05$<br>Willingness to turn to co-worker in time of need: $ß < 0$, $p > 0.05$<br>Religious service attendance: $ß < 0$, $p < 0.05$ | – |
| Hyyppä & Mäki, 2001 | 2,000 adults in municipalities in Finland | Social capital measure & health outcome measure: 16+y | Social mistrust, associational participation, religious group | Dichotomous | Age, income, smoking, body mass index, urban residence, migration, | 1) 1–SD* higher social trust: OR = 0.69, 95% CI = 0.43–1.16 (men); | – |

*(Continued)*

TABLE 8.2. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Form of self-rated health measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | participation, community participation | | comorbidity; analyses stratified by gender | OR = 0.64, 95% CI = 0.39–1.06 (women)<br>2) 1–SD* higher associational participation: OR = 0.74, 95% CI = 0.47-1.17 (men); OR = 0.80, 95% CI = 0.54–1.19 (women)<br>3) 1–SD* higher religious group participation: OR = 0.42, 95% CI = 0.21-0.85 (men); OR = 0.68, 95% CI = 0.41–1.13 (women)<br>4) 1-SD* higher community participation: OR = 1.02, 95% CI = 0.55–1.88 (men) OR = 0.83, 95% CI = 0.44–1.59 (women) | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hyyppä & Mäki, 2003 | 2,000 adults in municipalities in Finland | Social capital measure & health outcome measure: 16-65 y | Associational participation, friendship networks, religious group participation, hobby group participation | Dichotomous | Age, gender, language, migration, education, income, employment status, smoking, drinking, body mass index, comorbidity | 1) 1–SD* higher associational participation: OR = 0.84, 95% CI = 0.71-1.00<br>2) 1–SD* higher friendship network: OR = 0.80, 95% CI = 0.69-0.92<br>3) Religious group participation: OR = 0.75, 95% CI = 0.64-0.89<br>4) Hobby group participation: OR = 1.09, 95% CI = 0.89-1.33 | – |
| Pollack & Knesebeck, 2004 | 608 adults in the US and 682 adults in Germany | Social capital measure & health outcome measure: 60+y | Social trust, reciprocity, associational memberships | Dichotomous | Age, gender, income, education | 1) High social trust: OR = 0.5, 95% CI = 0.3-0.8<br>2) High reciprocity OR = 0.4, 95% CI = 0.2-0.6<br>3) High associational memberships OR = 0.7, 95% CI = 0.4-1.2 | – |
| Veenstra et al., 2005b | 1,504 adults in the city of Hamilton, Canada | Social capital & health outcome measures: 18+y | Membership/involvement in voluntary associations | Dichotomous | Age, gender, income, education, neighborhood | Higher voluntary association involvement: OR = 0.92, p = 0.20 | – |

*(Continued)*

TABLE 8.2. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Form of self-rated health measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| Rojas & Carlson, 2006 | 1,794 adults in Taganrog, Russia | Social capital measure & health outcome measure: 20+ y | Membership in trade union/ political organizations, in other organizations, contact with neighbors | Continuous (higher = better health) | Age, gender, marital status, income, education | 1) Membership in trade union/ political organizations: ß > 0, p < 0.01<br>2) Membership in other organizations: ß > 0, p = 0.01<br>3) Contact with neighbors: ß > 0, p = 0.10 | – |

* 1–SD =1–standard deviation.

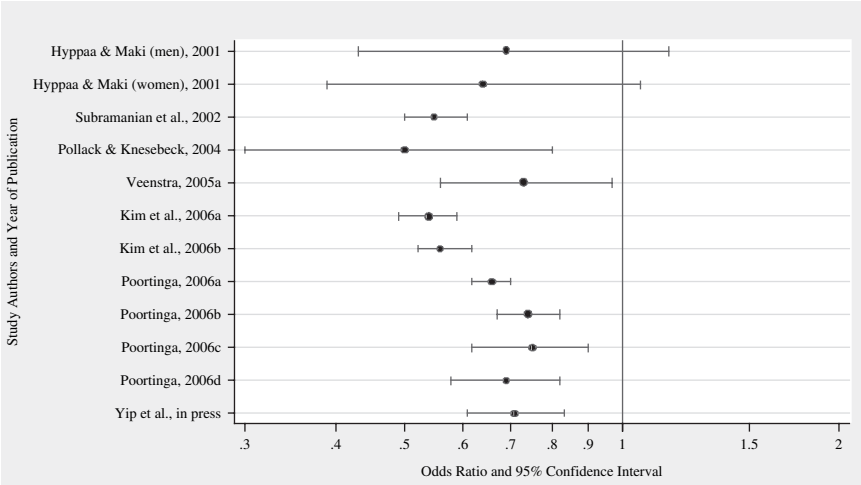


FIGURE 8.1. Studies of Individual-Level Trust and Fair/Poor Self-Rated Health (Dichotomous)

odds ratios *after* adjustment for individual-level social capital indicators. Since perceptions of social cohesion among individuals are arguably shaped by social cohesion at higher spatial levels, the contextual effect of social cohesion after adjustment for individual-level variables may be considered "lower bound" estimates for the odds ratios and confidence intervals.

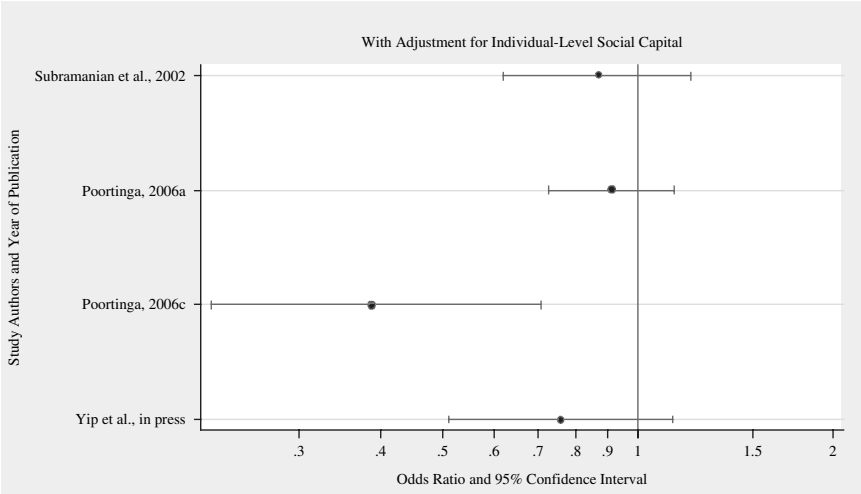


FIGURE 8.2A. Studies of Area-Level Trust and Fair/Poor Self-Rated Health (Dichotomous)

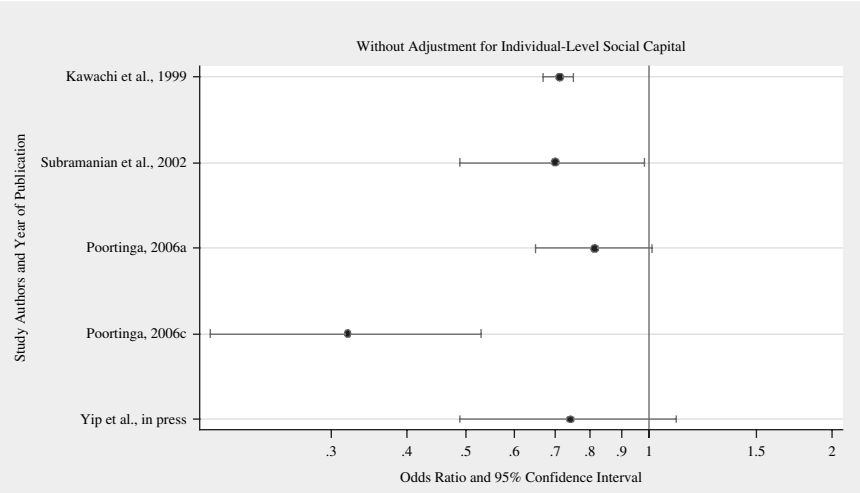


FIGURE 8.2B. Studies of Area-Level Trust and Fair/Poor Self-Rated Health (Dichotomous)

In the multilevel studies, it is also noteworthy that the studies that were null (i.e., with 95% confidence intervals that included the null value) were mainly based on study samples in relatively more egalitarian countries (for individual-level social trust, in Finland; and for individual-level associational memberships, in Finland, China, and Canada) (Figures 8.1 and 8.3). In the two studies that used

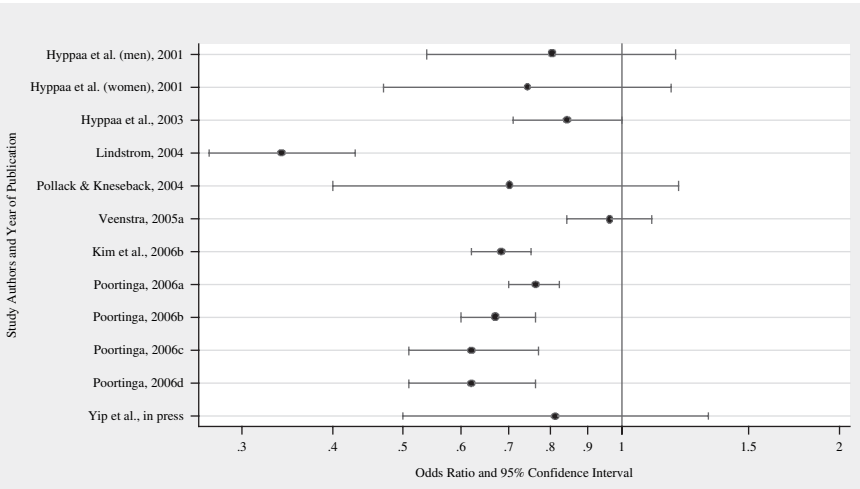


FIGURE 8.3. Studies of Individual-Level Associational Memberships and Fair/Poor Self-Rated Health (Dichotomous)

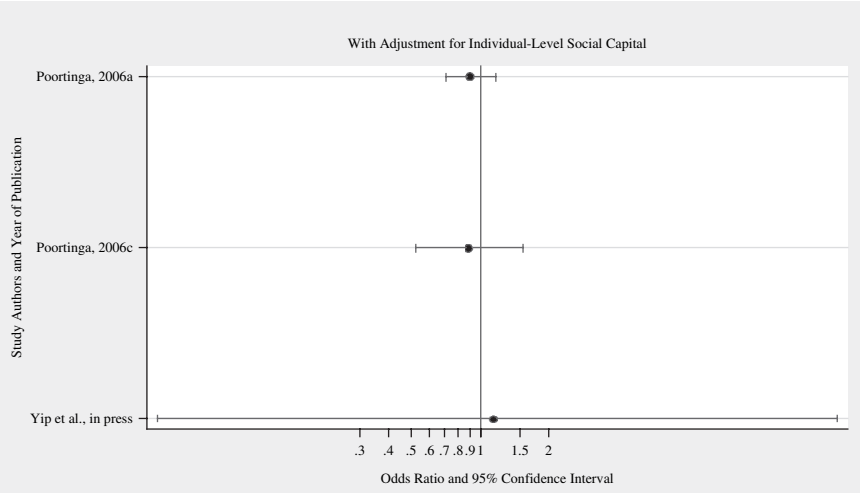


FIGURE 8.4A. Studies of Area-Level Associational Memberships and Fair/Poor Self-Rated Health (Dichotomous)

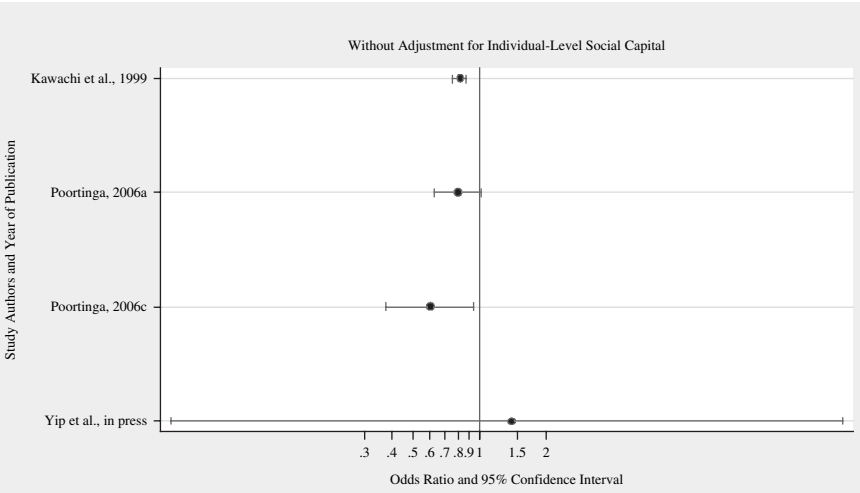


FIGURE 8.4B. Studies of Area-Level Associational Memberships and Fair/Poor Self-Rated Health (Dichotomous)

composite indices constructed from multiple social capital indicators (Kim & Kawachi, 2006b; Mellor & Milyo, 2005), significant associations were found, and were stronger than for any given subscale in the study by Kim & Kawachi (2006b), suggesting that measurement error in studies that utilized single-item measures of social cohesion may have downwardly biased the effect estimates.

## 8.4. Social Capital and Cardiovascular Disease

Seven studies of social capital and cardiovascular disease (incidence or mortality) were included in our review (Table 8.3). Two of these studies were multilevel, while four were ecological, and one was conducted solely at the individual level. Both of the multilevel studies and the individual-level analysis were prospective.

All studies explored the associations for single indicators of social capital including social trust, associational membership, and reciprocity (aggregated to the area level), as well as the percentage of the labor force with union memberships. Most ecological studies examined age-standardized cardiovascular mortality rates (spanning all ages, and specific to gender), with one study focusing on cardiovascular mortality in those of middle age (45–64 years). One multilevel analysis (Blakely et al., 2006) analyzed the risk of mortality from cardiovascular diseases [i.e., coronary heart disease (CHD) and stroke], while the other multilevel study (Sundquist, Johansson, Yang, & Sundquist, 2006) and the individual-level analysis (Sundquist, Winkleby, Ahlen, & Johansson, 2004) examined the risk of first incident non-fatal CHD events requiring hospitalization and fatal CHD.

Adjustment for key potential confounders in ecological studies was variable. Both multilevel studies controlled for multiple individual-level characteristics including age, gender, and income or education. However, control at the area level was either absent or confined to area-level socioeconomic deprivation. In ecological studies, area-level effect estimates were either non-significant (or significant in the opposite direction, suggesting worse health with higher social cohesion) at the country level and in one regional-level study in Australia (Siahpush & Singh, 1999). Both multilevel studies found some evidence of modest significant associations between lower electoral participation (Sundquist et al., 2006; OR = 1.19, 95% CI = 1.14–1.24 in men; OR = 1.29, 95% CI = 1.21–1.38 in women) and volunteerism (Blakely et al., 2006; RR = 0.87, 95% CI = 0.75–1.02 in women) and the risk of CVD events, although none of these studies adjusted for individual-level social capital. In an individual-level analysis, Sundquist et al. (2004) observed a moderate and significant association between low social participation and the risk of non-fatal or fatal CVD (OR = 1.74, 95% CI = 1.24–2.43).

## 8.5. Social Capital and Cancer

Four studies of social capital and cancer met our inclusion criteria (Table 8.4), and overlapped with studies that looked at cardiovascular disease. Only one of these studies was multilevel (and was additionally prospective) (Blakely et al., 2006), with volunteering measured through aggregation of individual-level measures to the neighborhood level, while the remaining studies were ecological and cross-sectional, investigating social capital in relation to age-standardized cancer mortality rates at the country, state, and regional levels. One of these studies (Lynch et al., 2001) examined mortality rates for cancer at specific sites (lung, prostate, and breast).

TABLE 8.3. Social capital and cardiovascular disease.

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| **ECOLOGICAL STUDIES:** | | | | | | | |
| *Country level* | | | | | | | |
| Lynch et al., 2001 | 16 countries | Social capital measures: 18+ y<br>Health outcome measures: All ages | Social mistrust, organizational memberships, trade union memberships, volunteering | Gender-specific age-standardized mortality rates for each of heart disease and stroke | GDP per capita; analyses stratified by gender | – | *1) Social mistrust:*<br>Heart disease<br>r = −0.63, p = 0.02 (men)<br>r = −0.61, p = 0.03 (women)<br>Stroke<br>r = −0.29, p = 0.33 (women)<br>r = −0.15, p = 0.62 (men)<br>*2) Organizational memberships:*<br>Heart disease<br>r = 0.30, p = 0.35 (women)<br>r = 0.36, p = 0.25 (men)<br>Stroke<br>r = 0.02, p = 0.95 (women);<br>r = −0.08, p = 0.81 (men)<br>*3) Trade union memberships:*<br>Heart disease<br>r = 0.46, p = 0.11 (women)<br>r = 0.53, p = 0.06 (men)<br>Stroke<br>r = 0.31, p = 0.29 (women);<br>r = 0.31, p = 0.30 (men)<br>*4) Volunteering:*<br>Heart disease<br>r = −0.14, p = 0.67 (women)<br>r = −0.11, p = 0.74 (men) |

*(Continued)*

TABLE 8.3. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | | | | | Stroke<br>r = −0.55, p = 0.08 (women)<br>r = −0.60, p = 0.05 (men) |
| *State or regional level* | | | | | | | |
| Siahpush & Singh, 1999 | 7 states/territories in Australia in each of 7 years (n = 49) | Social capital measures: 15+y<br>Health outcome measures: All ages | Percentage of labor force with union memberships | Age-standardized mortality rates for each of heart disease and stroke | Calendar year | – | Heart disease:<br>ß > 0, p < 0.05<br>Stroke:<br>ß > 0, p < 0.05 |
| Kennedy et al., 1998 | 40 regions in Russia | Social capital measure: 16+y<br>Health outcome measures: All ages | Mistrust in local and in regional government, lack of social cohesion at work, lack of interest in politics | Gender-specific age-standardized cardiovascular disease mortality rates | Per capita income, proportion in poverty, perceived economic hardship in region, per capita crime rate; analyses stratified by gender | – | 1) Mistrust in local government<br>ß > 0, p < 0.01 (men)<br>ß > 0, p = 0.02 (women)<br>2) Mistrust in regional government<br>ß > 0, p = 0.01 (men)<br>ß > 0, p = 0.04 (women)<br>3) Lack of social cohesion at work<br>ß > 0, p = 0.58 (men)<br>ß > 0, p = 0.72 (women)<br>4) Lack of interest in politics<br>ß > 0, p = 0.046 (men)<br>ß > 0, p = 0.10 (women) |
| *Neighborhood level* | | | | | | | |
| Lochner et al., 2003 | 342 neighborhoods in Chicago in the US | Social capital measures: 18+y | Trust, reciprocity, associational memberships | Gender and race/ ethnicity specific | Socioeconomic deprivation; analyses | – | *1) Trust:*<br>White women<br>ß < 0, p < 0.05 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Health outcome measures: 45–64 y | | heart disease mortality rates | stratified by race/ethnicity and gender | | White men<br>ß < 0, p < 0.01<br>Black women<br>ß < 0, p > 0.05<br>Black men<br>ß < 0, p > 0.05<br>*2) Reciprocity:*<br>White women<br>ß < 0, p > 0.05<br>White men<br>ß < 0, p < 0.05<br>Black women<br>ß > 0, p > 0.05<br>Black men<br>ß < 0, p > 0.05<br>*3) Associational memberships:*<br>White women<br>ß < 0, p < 0.01<br>White men<br>ß < 0, p < 0.01<br>Black women<br>ß < 0, p > 0.05<br>Black men<br>ß < 0, p > 0.05 |
| **MULTILEVEL STUDIES:**<br>*Neighborhood- or regional-level social capital* | | | | | | | |
| Sundquist et al., 2006 | 1,358,932 men and 1,446,747 women aged 45–74 years in 9,667 small | Social capital measure: 18+ y<br>Health outcome measures: 45–74 y | *Area level:* local electoral participation | First hospitalization for a fatal or non-fatal coronary heart disease event | *Individual level:* age, country of birth, marital status, education, housing tenure; | – | Low electoral participation:<br>OR = 1.19, 95% CI = 1.14–1.24 (men)<br>OR = 1.29, 95% CI = 1.21–1.38 (women) |

*(Continued)*

TABLE 8.3. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | area market statistics in Sweden | | | | analyses stratified by gender | | |
| Blakely et al., 2006 | All 25–74 year-olds in 1,683 Census area units in New Zealand | Social capital measure: 15+y Health outcome measure: 25–74 y | Volunteering | Cardiovascular mortality | *Individual level:* age, race/ ethnicity, marital status, income, education, car access, employment status, urban residence *Neighborhood level:* socioeconomic deprivation Analyses stratified by gender | – | Low volunteerism: RR = 1.00, 95% CI = 0.90–1.12 (men) RR = 0.87, 95% CI = 0.75–1.02 (women) |
| **INDIVIDUAL-LEVEL STUDIES:** | | | | | | | |
| Sundquist et al., 2004 | 6,861 men and women in Sweden | Social capital & health outcome measures: 35–74 y | Social participation (derived from 18 items on informal social interactions and associational memberships) | Death due to coronary heart disease or first hospitalization for a non-fatal coronary heart disease event | Age, sex, education, housing tenure | Low social participation: HR = 1.74, 95% CI = 1.24–2.43 | – |

TABLE 8.4. Social capital and cancer.

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| **ECOLOGICAL STUDIES:** | | | | | | | |
| *Country level* | | | | | | | |
| Lynch et al., 2001 | 16 countries | Social capital measure: 18+y<br>Health outcome measures: All ages | Social mistrust, organizational memberships, trade union memberships, volunteering | Age-standardized mortality rates for each of lung, prostate, and breast cancer | GDP per capita; analyses stratified by gender | – | *1) Social mistrust:*<br>Lung cancer<br>r = −0.07, p = 0.83 (men)<br>r = −0.44, p = 0.13 (women)<br>Prostate cancer (men)<br>r = −0.16, p = 0.60<br>Breast cancer (women)<br>r = −0.21, p = 0.49<br>*2) Organizational memberships:*<br>Lung cancer<br>r = 0.33, p = 0.30 (men)<br>r = 0.17, p = 0.59 (women)<br>Prostate cancer (men)<br>r = 0.48, p = 0.12<br>Breast cancer (women)<br>r = 0.37, p = 0.23<br>*3) Trade union memberships:*<br>Lung cancer<br>r = −0.34, p = 0.26 (men)<br>r = −0.06, p = 0.84 (women)<br>Prostate cancer (men)<br>r = 0.52, p = 0.07<br>Breast cancer (women)<br>r = 0.20, p = 0.50<br>*4) Volunteering:*<br>Lung cancer<br>r = 0.27, p = 0.43 (men) |

*(Continued)*

TABLE 8.4. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | | | | | r = 0.53, p = 0.10 (women)<br>Prostate cancer (men)<br>r = 0.07, p = 0.84<br>Breast cancer (women)<br>r = −0.22, p = 0.51 |
| *State or regional level* | | | | | | | |
| Siahpush & Singh, 1999 | 7 states/territories in Australia in each of 7 years (n = 49) | Social capital measures: 15+y<br>Health outcome measures: All ages | Percentage of labor force with union memberships | Age-standardized cancer mortality rates | Calendar year | – | ß > 0, p < 0.05 |
| Kennedy et al., 1998 | 40 regions in Russia | Social capital measure: 16+y<br>Health outcome measures: All ages | Mistrust in local and in regional government, lack of social cohesion at work, lack of interest in politics | Age-standardized cancer mortality rates | Per capita income, proportion in poverty, perceived economic hardship in region, per capita crime rate | – | 1) Mistrust in local government<br>ß > 0, p = 0.06 (men)<br>ß > 0, p = 0.23 (women)<br>2) Mistrust in regional government<br>ß > 0, p = 0.18 (men)<br>ß > 0, p = 0.70 (women)<br>3) Lack of social cohesion at work<br>ß > 0, p = 0.13 (men)<br>ß > 0, p = 0.89 (women)<br>4) Lack of interest in politics<br>ß > 0, p = 0.29 (men)<br>ß > 0, p = 0.91 (women) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **MULTILEVEL STUDIES:** *Neighborhood-level social capital* | | | | | | | |
| Blakely et al., 2006 | All 25-74 year-olds in 1,683 Census area units in New Zealand | Social capital measure: 15+y<br>Health outcome measures: 25–74 y | Volunteering | Gender-specific all-cancer mortality | *Individual level:* age, race/ethnicity, marital status, income, education, car access, employment status, urban residence<br>*Neighborhood level:* socioeconomic deprivation<br>Analyses stratified by gender | – | Low volunteerism: RR = 0.98, 95% CI = 0.88–1.10 (men) RR = 1.00, 95% CI = 0.89–1.12 (women) |

As with the health outcomes already reviewed, all studies in this group analyzed associations for single indicators of social cohesion (trust, associational membership, and reciprocity), as well as the percentage of the labor force with union memberships. With the exception of one study that was confined to adults (Blakely et al., 2006), studies examined cancer mortality rates across all age groups (summarized through age-standardization).

Adjustment for key potential confounders in ecological studies was variable. The single multilevel analysis controlled for multiple individual-level characteristics including age, gender, income, and education, as well as neighborhood-level socioeconomic deprivation.

As observed for cardiovascular disease, area-level effect estimates were non-significant or significant in the opposite direction (i.e., suggesting increased harm from social cohesion) at the country level (e.g., for prostate cancer in Lynch et al., 2001), and at the regional level in Australia (Siahpush & Singh, 1999). However, in contrast to the findings in the regional-level ecological study on social capital and cardiovascular disease in Russia, associations between social cohesion (e.g., mistrust in local and regional government) and cancer mortality rates in the same study were predominantly non-significant. Likewise, the sole multilevel analysis (Blakely et al., 2006) showed null associations between low neighborhood-level volunteerism and individual risk of cancer mortality in women (RR = 1.00, 95% CI = 0.89–1.12), whereas for cardiovascular disease as earlier indicated, it was marginally non-significant for women.

## 8.6. Social Capital and Obesity and Diabetes

We identified only four studies of social capital and obesity or diabetes to date (Table 8.5). One study that examined US state-level social capital in relation to adult obesity and diabetes prevalence rates was ecological (Holtgrave & Crosby, 2006), while the remaining studies [one of which was prospective (Kim, Subramanian, Gortmaker, & Kawachi, 2006c)] applied multilevel analysis and examined social capital in relation to individual-level obesity status (body mass index, BMI, $\geq$30 kg/m$^2$).

Studies ranged from those investigating single indicators of social capital, to those applying indices or scales which combined multiple social capital indicators. All studies were based on primarily adult populations.

The only ecological study (Holtgrave & Crosby, 2006) adjusted for the state proportion in poverty, and found statistically significant inverse associations between the Putnam state-level social capital index and obesity and diabetes prevalence rates (the latter which were not explicitly age-standardized). The multilevel analyses controlled for several individual-level characteristics including age, gender, and income and/or education, although only one of these studies (Kim et al., 2006c) controlled for multiple potential contextual confounders. That study found a modest marginally significant association between higher state-level social capital and lower individual risk of obesity (OR = 0.93, 95% CI = 0.85–1.00), but no association for county-level social capital (OR = 0.98,

TABLE 8.5. Social capital, obesity, and diabetes.

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| **ECOLOGICAL STUDIES:** | | | | | | | |
| *State level* | | | | | | | |
| Holtgrave & Crosby, 2006 | 48 US states | Social capital & health outcome measures: 18+ y | Putnam social capital index (derived from 14 indicators) | Obesity and diabetes prevalence rates | Proportion in poverty | – | Obesity: ß < 0, p = 0.02 Diabetes: ß < 0, p < 0.01 |
| **MULTILEVEL STUDIES:** | | | | | | | |
| *State- or county-level social capital* | | | | | | | |
| Kim et al., 2006c | 2 samples: 101,198 adults in 413 counties in 48 US states/ District of Columbia; 181,200 adults in 48 US states/ District of Columbia | Social capital & health outcome measures: 18+ y | *County level:* 2 subscales (based on five indicators) corresponding to formal group and attitudinal/informal socializing forms | Obesity (dichotomous) | *Individual level* (both sets of analyses): age, gender, race/ethnicity, marital status, income, education *County-level analysis:* State-level Gini coefficient and proportion of Black residents; county-level mean household income | – | *County-level analysis:* High in social capital on at least one (vs. neither) of the 2 subscales: OR = 0.98, 95% CI = 0.93-1.03 *State-level analysis:* High in social capital on at least one (vs. neither) of the 2 subscales: OR = 0.93, 95% CI = 0.85-1.00 |

*(Continued)*

TABLE 8.5. *(Continued)*

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| | | | *State level:* 2 subscales (based on 10 indicators) corresponding to attitudinal/ informal socializing/formal group and formal civic and political participation forms | | *State-level analysis:* State-level Gini coefficient, mean household income, proportion of Black residents | | |
| *Neighborhood- or regional-level social capital* | | | | | | | |
| Poortinga, 2006b | 14,836 adults in 720 postal code sectors in the UK | Social capital & health outcome measure: 16+y | *Individual level:* social support, social trust, civic participation, reciprocity | Obesity (dichotomous) | *Individual level:* age, gender, marital status, social class, unemployment status, household tenure, access to amenities, presence of local social problems, urban residence | 1) Severe lack of social support: OR = 1.01, 95% CI = 0.88–1.17<br>2) High social trust: OR = 0.86, 95% CI = 0.78–0.95<br>3) High social participation: OR = 1.01, 95% CI = 0.90–1.14<br>4) High reciprocity: OR = 1.07, 95% CI = 0.95–1.19 | – |
| Veenstra et al., 2005b | 1,504 adults in the city of Hamilton, Canada | Social capital & health outcome measures: 18+y | Membership/ involvement in voluntary associations | Body mass index >27 kg/m2 (dichotomous) | Age, gender, income, education, neighborhood | Higher voluntary association involvement: OR = 0.91, p = 0.03 | – |

95% CI = 0.93–1.03). Evidence from the two other studies that applied a multilevel framework was somewhat mixed, with one study observing high individual-level social trust to be significantly inversely associated with obesity risk (OR = 0.86, 95% CI = 0.78–0.95), but no associations for other social capital measures (social support, social participation, and reciprocity) (Poortinga, 2006b). Meanwhile, the other study (Veenstra et al., 2005b) found higher voluntary association involvement to be significantly associated with a 9% lower risk of a higher body weight (BMI > 27 kg/m$^2$).

## 8.7. Social Capital and Infectious Diseases

We identified three studies of social capital and infectious diseases, all of which were ecological (Table 8.6). One of these studies was cross-national and cross-sectional (Lynch et al, 2001), while the other two studies were conducted at the US state level and were prospective (Holtgrave & Crosby, 2003, 2004).

The cross-national study (Lynch et al., 2001) applied single indicators of social capital including social trust, organization and trade union membership, and volunteering (based on surveys among adults), while the two state-level studies employed the Putnam social capital index. All studies included individuals of all ages in the calculation of case rates and mortality rates.

The cross-national study (Lynch et al., 2001) adjusted for GDP per capita, stratified the analyses by gender, and controlled for age composition through age-standardization of the mortality rates. Findings from this study were mixed, with non-significant weak to moderate correlations between each of country-level social mistrust and trade union memberships in the anticipated direction with age-standardized mortality rates from all infectious diseases in men and in women. Associations for organizational memberships in both sexes were null, and there were weak to moderate positive correlations between volunteering and infectious disease mortality rates in men and women, respectively. By contrast, associations in the two studies that examined the Putnam state social capital index in relation to state case rates from each of gonorrhea, syphilis, Chlamydia, AIDS, and tuberculosis (controlling for income inequality for the latter two outcomes) were all significantly inverse, although neither of these studies controlled for area-level socioeconomic deprivation (Holtgrave & Crosby, 2003, 2004).

## 8.8. Summary and Synthesis

### *8.8.1. Summary of Findings*

Our review of the literature found fairly consistent associations between trust as an indicator of social cohesion and better physical health. The evidence for trust was stronger for self-rated health than for other physical health outcomes, and stronger for individual-level perceptions than for area-level trust. Associational

TABLE 8.6. Social capital and infectious diseases.

| Authors, year | Sample size, population/ setting | Age range | Social capital measure | Health outcome measure | Covariates | Individual-level effect estimate | Area-level effect estimate |
|---|---|---|---|---|---|---|---|
| **ECOLOGICAL STUDIES:** | | | | | | | |
| *Country level* | | | | | | | |
| Lynch et al., 2001 | 16 countries | Social capital measure: 18+y<br>Health outcome measures: All ages | Social mistrust, organizational memberships, trade union memberships, volunteering | Gender-specific, age-standardized mortality rates for all infectious diseases | GDP per capita; analyses stratified by gender | – | 1) Social mistrust:<br>r = 0.30, p = 0.32 (men)<br>r = 0.26, p = 0.39 (women)<br>2) Organizational memberships:<br>r = −0.06, p = 0.85 (men)<br>r = 0.01, p = 0.96 (women)<br>3) Trade union memberships:<br>r = −0.42, p = 0.16 (men)<br>r = −0.39, p = 0.19 (women)<br>4) Volunteering:<br>r = 0.24, p = 0.48 (men)<br>r = 0.33, p = 0.32 (women) |
| *State level* | | | | | | | |
| Holtgrave & Crosby, 2003 | 48 US states | Social capital measure: 18+y<br>Health outcome measures: All ages | Putnam social capital index (derived from 14 indicators) | Gonorrhea, syphilis, chlamydia, AIDS case rates | Income inequality (for analysis of AIDS case rates only) | – | Gonorrhea case rates:<br>r = −0.67, p < 0.01<br>Syphilis case rates:<br>r = −0.59, p < 0.01<br>Chlamydia case rates:<br>r = −0.53, p < 0.01<br>AIDS case rates:<br>ß < 0, p = 0.01 |
| Holtgrave & Crosby, 2004 | 48 US states | Social capital measure: 18+y<br>Health outcome measures: All ages | Putnam social capital index (derived from 14 indicators) | Tuberculosis case rates | Income inequality | – | ß < 0, p < 0.01 |

membership as an indicator of cohesion was also consistently associated with better self-rated health at the individual level, although reverse causation cannot be excluded (see discussion below). On the other hand, the evidence was weak that associational membership at the area level is associated with self-rated health (in either direction).

### *8.8.2. Social Cohesion in Egalitarian versus Inegalitarian Social Contexts*

In a recent systematic review of forty-two published studies, Islam, Merlo, Kawachi, Lindstrom, & Gerdtham, (2006a) found that an association between social capital and health was much more consistently reported in inegalitarian countries i.e., countries with a high degree of economic inequality; whereas an association was either not observed or was much weaker in more egalitarian societies. Economic inequality was assessed by the country's Gini coefficient (based on disposable income) and by the country's public share of social expenditure. Regardless of the type of study (individual, ecological, or multilevel) or the country's degree of egalitarianism, the authors found generally significant positive associations between social capital and better health outcomes.

Moreover, from the multilevel studies that were identified in this review by Islam et al. (2006a), there was also evidence to suggest that the *between-area* variation *in health* (i.e., the random effect) was considerably lower in more egalitarian countries (such as Canada and Sweden) as compared to more unequal countries (such as the United States). For example, the intraclass correlation (ICC, corresponding to the percent of variation in health explained at the area level) was approximately 7.5% in a US study of neighborhood influences on violent crime and homicide, whereas the ICCs ranged from 0–2% for studies in Canada and Sweden (Islam et al., 2006a). Likewise, a recent multilevel analysis of 275 Swedish municipalities found a modest fixed effect association between voting participation and health-related quality of life, with 98% of variation in health attributed to the individual level, and only 2% to the municipality level (Islam et al., 2006b).

One potential explanation for this pattern (of generally null findings from multilevel studies of social capital and self-rated health in more egalitarian countries) is that in egalitarian societies characterized by strong provision of safety nets and spending on public goods (such as health care, education, unemployment insurance), social capital may be less salient for the health of its residents, by contrast to highly unequal and segregated societies such as the United States.

### *8.8.3. Limitations of Studies*

Our review of the literature has highlighted increasing methodological sophistication in study design over time, progressing from the earlier ecological studies of social cohesion and health, to the more recent multilevel study designs. Nonetheless, our review also points to a number of gaps in the existing literature. As the

tables demonstrate, many studies continue to rely on secondary sources of data to construct "indicators" of social cohesion. As pointed out by Harpham in chapter 3, proxy indicators of social cohesion – such as trade union membership, volunteering, and social participation – can be construed as either precursors or consequences of social capital, but they are not part of social capital *per se.* Accordingly, there is an urgent need to incorporate direct measures of social cohesion into existing national surveys, taking care to specify the scale of measurement (e.g., neighborhoods) as well as making sure to include relevant distinctions such as bonding versus bridging capital, or cognitive versus behavioral measures (see chapter 3 for further tips).

Virtually none of the studies have distinguished between the effects of bonding versus bridging capital, and few studies have explicitly sought to examine the deleterious consequences of social cohesion through careful analyses of cross-level interactions between community cohesion and individual characteristics. As the multilevel analysis by Subramanian, Kim, and Kawachi, (2002) suggests, community cohesion can be beneficial for some groups, yet can be harmful to the health of others. Studies have also been inconsistent with respect to controlling for potential confounding variables at both the individual and area levels.

Aside from the threat of omitted variable bias, one of the biggest challenges for establishing causality in this area remains the paucity of longitudinal data. Cross-sectional data are less than ideal for establishing causality. For example, at the individual level, one could argue that being in good health is a precursor of having trusting opinions of others, or participating in civic associations (i.e., reverse causation). Ideally, what is needed are data with repeated assessments of both social cohesion and health outcomes; in other words, data of the type that would lend itself to analytical strategies such as "difference-in-difference" (DiD) estimators (Ashenfelter, 1978; Ashenfelter & Card, 1985). The other major criticism of the research to date is that no studies have adequately dealt with the potential problem that community cohesion is endogenous (Kawachi, 2006). For example, some people are likely to choose the communities they live in based on their preferences for social interactions with neighbors. To the extent that such preferences are also correlated with health, we have an endogeneity problem. Solving the endogeneity problem will require study designs in which the exposure (social capital) can be manipulated through either natural experiments (instruments) or randomization (e.g., cluster community trials) (Oakes, 2004) (see also chapter 7 fur further discussion of these issues).

### *8.8.4. Examining Social Capital in Diverse Populations*

While many existing studies have sampled populations across a wide range of ages, the investigation of specific effects among elderly populations (e.g., persons over age 65) and among children and adolescents (for which behaviors may be more malleable; Dietz & Gortmaker, 2001) has been sparse (Drukker, Kaplan, Feron, & van Os, 2003; Drukker, Buka, Kaplan, McKenzie,& van Os, 2005; Wen et al., 2005).

Populations in developing countries further represent an uncharted territory of investigation of the physical health effects of social capital, for which the associations might potentially differ due to vastly different political economies, sociocultural contexts, and patterns of disease than in developed nations.

### *8.8.5. Mechanisms Linking Social Capital to Physical Health*

Although few studies have sought to directly assess the mechanisms linking social capital to health, a variety of hypothesized pathways have been proposed by which cohesion may affect health, including the diffusion of knowledge about health promotion, maintenance of healthy behavioral norms through informal social control, promotion of access to local services and amenities, and psychosocial processes which provide affective support and mutual respect (Kawachi & Berkman, 2000). These mechanisms could broadly be categorized into local behaviorally-mediated mechanisms, and more upstream policy-mediated mechanisms.

On the behavioral front, drawing on the diffusion of innovations theory (Rogers, 2003), we may posit that residents of high social capital neighborhoods or regions in which healthy behaviors (e.g., engagement in exercise and avoidance of foods high in saturated fats) are practiced among some residents may be more likely to adopt these behaviors through diffusion of knowledge about the behaviors.

At larger geographical scales (e.g., the county, state, or regional level), social capital might also conceivably affect physical health through policy-related mechanisms. In his seminal work *Making Democracy Work* (Putnam, 1993) the political scientist Robert Putnam lends empirical credence to the notion that prosperous democracies are tied to the presence of civic engagement and social capital. Within the health context, it has been hypothesized that more cohesive societies are more apt to cooperate in the provision of health-promoting public goods for its residents, such as health care (see also Introduction and chapter 7). Social cohesion at other scales might have contextual effects on individual levels of social capital through attitudinal/cognitive mechanisms. For instance, transparency and the absence of corruption increase public confidence in governmental institutions, which in turn may raise levels of interpersonal trust (Brehm & Rahn, 1997; Levi, 1996).

A number of behavioral risk factors have been established for chronic diseases such as cardiovascular diseases (coronary heart disease and stroke), selected cancers (e.g., colon cancer, lung cancer, breast cancer), and diabetes. Several of these risk factors (e.g., dietary intakes, smoking, and physical inactivity) have themselves been linked to community cohesion (see chapter 10 by Lindström). Psychosocial factors (e.g., depression, anxiety) may also affect disease risk, either through direct pathways (e.g., through psycho-neuro-immune effects) or indirect pathways (e.g., mediated by behavioral changes), and are putative risk factors for heart disease (Kubzansky & Kawachi, 2000; Kuper, Marmot, & Hemingway, 2002), and to a lesser extent, for cancers and infectious diseases (Cohen, Alper, Doyle, Treanor, & Turner,

2006; Kroenke et al., 2005; Leonard, 2000). Of course, social cohesion can also plausibly contribute to *greater* transmission of infectious diseases through higher person-to-person contact (Holtgrave & Crosby, 2003).

## 8.9. Conclusions

The past decade has borne witness to a flourishing epidemiologic and public health interest in the investigation of the effects of social capital on physical health outcomes. This inquiry has broadened from an emphasis on overall mortality and self-rated health to include more specific disease diagnoses. Our review of the literature to date suggests several points of convergence – for example, the more consistent associations between social cohesion and health in unequal societies with weak safety nets compared to egalitarian countries with a strong tradition of public goods provision; the stronger associations between health and trust (as an indicator of cohesion) compared to associational membership; and stronger associations for the same indicator at the individual compared to collective level. At the same time, our review also points to several gaps that the next generation of research needs to address, in particular, stronger study designs that address questions of causality, and deepen our understanding of causal mechanisms.

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