Abstract

IMPORTANCE While the association between economic connectedness and social mobility has now been documented, the potential linkage between community-level economic connectedness and population health outcomes remains unknown.

OBJECTIVE To examine the association between community social capital measures (defined as economic connectedness, social cohesion, and civic engagement) and population health outcomes (defined across prevalence of diabetes, hypertension, high cholesterol, kidney disease, and obesity).

DESIGN, SETTING, AND PARTICIPANTS This cross-sectional study included communities defined at the zip code tabulation area (ZCTA) level in all 50 US states. Data were collected from January 2021 to December 2022.

MAIN OUTCOMES AND MEASURES Multivariable regression analyses were used to examine the association between population health outcomes and social capital. Adjusted analyses controlled for area demographic variables and county fixed effects. Heterogeneities within the associations based on the racial and ethnic makeup of communities were also examined.

RESULTS In this cross-sectional study of 17,800 ZCTAs, across 50 US states, mean (SD) economic connectedness was 0.88 (0.32), indicating friendship sorting on income; the mean (SD) support ratio was 0.90 (0.10), indicating that 90% of ties were supported by a common friendship tie; and the mean (SD) volunteering rate was 0.08 (0.03), indicating that 8% of individuals within a given community were members of volunteering associations. Mean (SD) ZCTA diabetes prevalence was 10.8% (2.9); mean (SD) high blood pressure prevalence was 33.2% (6.2); mean (SD) high cholesterol prevalence was 32.7% (4.2); mean (SD) kidney disease prevalence was 3.0% (0.7), and mean (SD) obesity prevalence was 33.4% (5.6). Regression analyses found that a 1% increase in community economic connectedness was associated with significant decreases in prevalence of diabetes (−0.63%; 95% CI, −0.67% to −0.60%); hypertension (−0.31%; 95% CI, −0.33% to −0.29%); high cholesterol (−0.14%; 95% CI, −0.15% to −0.12%); kidney disease (−0.48%; 95% CI, −0.50% to −0.46%); and obesity (−0.28%; 95% CI, −0.29% to −0.27%). Second, a 1% increase in the community support ratio was associated with significant increases in prevalence of diabetes (0.21%; 95% CI, 0.16% to 0.26%); high blood pressure (0.16%; 95% CI, 0.13% to 0.19%); high cholesterol (0.16%; 95% CI, 0.13% to 0.19%); kidney disease (0.17%; 95% CI, 0.13% to 0.20%); and obesity (0.08%; 95% CI, 0.06% to 0.10%). Third, a 1% increase in the community volunteering rate was associated with significant increases in prevalence of high blood pressure (0.02%; 95% CI, 0.01% to 0.02%); high cholesterol (0.03%; 95% CI, 0.02% to 0.03%); and kidney disease (0.02%; 95% CI, 0.01% to 0.02%). Additional analyses found that the strength of these associations varied based on the majority racial and ethnic population composition of communities.

CONCLUSIONS AND RELEVANCE In this study, higher economic connectedness was significantly associated with better population health outcomes; however, higher community support ratios and volunteering were significantly associated with worse population health.

Key Points

Question Is community social capital associated with population health outcomes?

Findings This cross-sectional study of 17,800 zip code tabulation areas found that a 1% increase in community economic connectedness was associated with significant decreases in the prevalence of diabetes, hypertension, high cholesterol, kidney disease, and obesity; that a 1% increase in the community support ratio was associated with significant increases in the prevalence of diabetes, high blood pressure, high cholesterol, kidney disease, and obesity; and that a 1% increase in community volunteering was associated with significant increases in the prevalence of high blood pressure, high cholesterol, and kidney disease. The strength of these associations further varied based on the majority racial and ethnic population of communities.

Meaning In this study, social capital as captured by higher economic connectedness was significantly associated with better population health; social capital as captured by higher community support ratios and volunteering was significantly associated with worse population health.

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Abstract (continued)
volunteering rates were both significantly associated with worse population health. Associations also differed by majority racial and ethnic composition of communities.

Introduction

Longstanding trends indicate a high, and in many cases growing, prevalence of adverse health conditions, such as diabetes, hypertension, high cholesterol, kidney disease and obesity, in the US adult population.1-6 These trends are concerning, as these health conditions have been linked to increased mortality,7 reduced quality of life,8,9 and increased health care costs.6,10 Prior work has further indicated that these and other health outcomes derive in large part from social determinants of health.11 Social determinants of health are defined as the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks.11 One important component of these social determinants of health is social capital.

Broadly defined, social capital refers to the resources that individuals can access via their membership in a network, group, or community. This includes resources that are accessible via direct (individual) relationships as well as resources available to all the individuals that belong to a given group and/or community.12,13 A large and growing literature has sought to examine the potential linkage between social capital and health outcomes. In particular, prior work has examined the association between social capital and self-reported health,14 health behaviors,15-17 mortality,14,18-21 cardiovascular disease,22 obesity,23-25 and diabetes.26-28 The results from this literature indicate broadly mixed findings pertaining to the existence of an association between social capital and health, and it points toward this relationship being nuanced, with findings being intimately driven by each study’s conceptualization and measurement of social capital.14

Currently, 2 limitations of many prior studies on this topic concern the reliance on self-reported survey data for the construction of social capital scores and indices and the use of geographically local data (eg, from a single county) that imposes limitations on the generalizability of findings. In this study we use recent national data on social capital to assess the association between community social capital and population health outcomes. This social capital data, first examined by Chetty et al,29,30 is primarily based on revealed (rather than self-reported) social ties that are inferred from individual’s social media connections. Another benefit of these data are that they allow for a more nuanced examination of social capital by providing measures across 3 broad social capital domains: economic connectedness (a cross-income group bridging type of social capital), community support ratio (a within-group social cohesion and clustering measure of social capital), and community volunteering (a social capital measure derived from community-level civic engagement). Based on recent findings, the first of these has been shown to be associated with economic mobility,29,30 while the latter 2 appear better indicators of local clustering and immobility. These differences are important to note, as they may affect the potentially nuanced association between social capital and health outcomes that we examine within this study. Specifically, this study sets out to examine the hypothesis that increased social capital is associated with improved health outcomes at the community level. As prior work has noted that the association between social capital and health outcomes may vary across different subpopulations,31 we also examine these associations stratified by the racial and ethnic composition of local communities.
Methods

Study Samples
We combined data from several sources to construct our study sample. We sourced zip code tabulation area (ZCTA) population health variables from the CDC PLACES databases,1 social capital measures (also at the ZCTA level) from the Opportunity Insights Social Capital Atlas database,32 and racial and ethnic composition of neighborhoods from the Agency for Healthcare Research and Quality (AHRQ) health disparities database.33

Per the Common Rule, this study is exempt based on its utilization of publicly available data that has been deidentified for the purpose of analyses. This study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.

Study Variables

Social Capital Measures
Our social capital measures are based on recently operationalized definitions by Chetty et al.29,30 which define and categorize social capital across 3 separate domains. The first of these captures a neighborhood’s (defined at the ZCTA level) economic connectedness (a form of cross-group “bridging” capital) as the extent to which low-income (ie, below median income) individuals are socially connected (based on social media network connections data) with high-income (ie, above median income) individuals.29 Mathematically, the ZCTA-level measure of economic connectedness (EC) is defined as

\[
EC_z = \frac{\sum_{i \in L \cap z} f_{Q,i} \cdot w_Q \cdot N_{L_z}}{w_Q},
\]

where \(f_{Q,i}\) indicates the share of low-income individual’s \(i\) in the high-income (above median income) group; \(w_Q\) is a normalization factor capturing the share of individuals in the sample who belong to income group \(Q\); and \(N_{L_z}\) is the number of low-income individuals that are in ZCTA \(z\). In the presence of homophily (that is, when individuals preferentially sort into relationships with people who are similar to them), then this measure will take on values between 0 and 1, indicating that a higher share of low-income individual’s friends also belong to the low-income group.29

Second, a neighborhood’s social cohesion was captured based on the degree to which friendship networks are clustered into groups and whether friendships tend to be supported by mutual social connections.29 This notion of “bonding” capital is measured using a neighborhood’s support ratio. The support ratio designates the rate at which pairs of socially connected individuals (within a community) also have other friends in common.29 Mathematically, this measure is defined as

\[
\text{SupportRatio}_z = \frac{|\{(ij): i,j \in z, A_{ij} = 1, [(A^2)_{ij}] > 0\}|}{|\{(ij): i,j \in z, A_{ij} = 1\}|},
\]

where linkages are denoted by the adjacency matrix \(A \in \{0,1\}^{n \times n}\) (where \(A_{ij} = 1\) indicates a link between individuals \(i\) and \(j\) and \(A_{ij} = 0\) indicates the absence of such a link), and \(A^2\) denotes the subset of friendships between individuals within ZCTA \(z\). Intuitively, a support ratio of 0.5 would indicate that 50% of friendship ties within a given community are supported by at least 1 common friendship tie.

Lastly, social capital is also measured using neighborhood level civic engagement. This measure is defined as the share of neighborhood social media users who are members of at least 1 volunteering or activism group.29 As such, a volunteering rate of 0.1 would indicate that 10% of individuals within the community are members of at least 1 volunteering or activism group.
In summary, our first measure captures aspects of social capital that prior work has shown to be associated with economic mobility, while the other 2 measures capture features of social capital that are more nuanced, in that they may capture characteristics such as immobility, clustering, and bonding. These data were sourced from the Social Capital Atlas, which used proprietary Facebook data to construct each of the noted social capital measures for each US ZCTA. For additional details on the construction and validation process for these data, please see Chetty et al.

**Population Health Outcome Measures**
We used a total of 5 measures regarding population health outcomes. These were prevalence of diabetes, hypertension, high cholesterol, kidney disease, and obesity. These measures were sourced from the 2021 CDC PLACES databases and are based on (validated) model-based ZCTA estimates of crude prevalence measures for the adult (age >18 years) US population.

**Racial and Ethnic Majority Designation**
The racial and ethnic composition of each community was examined to identify majority populations. A ZCTA where a given racial and ethnic group represented 50% or more of the population was designated as a community where that racial and ethnic group represented the majority population. These designations were defined across majority Hispanic, non-Hispanic Black, non-Hispanic White, and other (defined across American Indian and Alaska Native, Asian, multiracial, Native Hawaiian and Pacific Islander, and other race) race and ethnicity communities. The racial and ethnic composition measures used for these categorizations were sourced from the US Census Bureau’s American Community Survey data and were obtained from AHRQ, and these race and ethnicity aggregate measures were based on self-reported data.

**Additional Variables**
Additional variable measures consist of ZCTA-level median household income; the share of the population that is unemployed; the share of the population that is younger than 18 years; the share of the population that aged 65 years or older; and the share of the population that is female. These data are based on data from the US Census Bureau’s American Community Survey data and were obtained from the AHRQ social determinants of health database. Lastly, ZCTA-level population counts were sourced from Opportunity Insight.

**Statistical Analysis**
We examined the association between our 3 social capital measures and our population health outcomes. This was done using regression models in which the population health outcomes and social capital measures are in logarithm (log) form. As such, point estimates from the resulting regressions are interpreted as elasticities. Elasticity is a concept from economics that captures the responsiveness of the outcome variable to another variable (e.g., one of our social capital measures). Elasticities can be compared across different variables to identify relative sensitivity of the outcome measure to each of the dependent variables. In terms of interpretation, an elasticity of 0.5 implies that a 1% increase of the dependent variable would result in an 0.5% increase of the outcome variable (this relationship is said to be inelastic as the outcome changes by less than the dependent measure in relative terms; if the opposite is true, the relationship is classified as an elastic relationship).

All regression models additionally control for ZCTA-level median household income, share unemployed, share younger than 18 years, share 65 years or older, share female, and county fixed effects. As such, our estimated associations are identified based on within-county (across ZCTA) variation.

As part of our secondary analysis, we examined whether the associations between social capital and population health outcomes varied across communities with different majority racial and ethnic populations. These associations are examined within stratified analyses, where the stratification is
performed across the racial and ethnic majority population of each community. All other aspects of these stratified analyses are the same as the main analyses (described previously), and as such, our estimated associations are again identified based on within-county (across ZCTA) variation within our data.

Analyses were performed using Stata MP version 17 (StataCorp). Statistical significance was assigned at the 95% level, and hypothesis tests were 2-sided.

Results

Descriptive Statistics for Social Capital and Community Health Measures

The sample consisted of 17 800 ZCTA observations, across 50 US states. Table 1 provides summary descriptives for our analysis sample. Looking at our social capital measures, we note evidence of homophily within the sample, with mean (SD) economic connectedness of 0.88 (0.32). Our economic connectedness measure was between 0 and 1, indicating that low-income individuals were disproportionately more likely to be friends with other low-income individuals. We see that 90% of friendship ties within a given community were supported by a common friend (based on the mean [SD] support ratio of 0.90 [0.10]) and that 8% of individuals within a given community were members of volunteering associations (mean [SD] volunteering rate, 0.08 [0.03]). For the population health measures, we found a mean (SD) diabetes prevalence of 10.8% (2.9); a mean (SD) high blood pressure prevalence of 33.2% (6.2); a mean (SD) high cholesterol prevalence of 32.7% (4.2); a mean (SD) kidney disease prevalence of 3.0% (0.7); and a mean (SD) obesity prevalence of 33.4% (5.6).

Association Between Social Capital and Community Health

Table 2 shows statistically significant and clinically meaningful associations between our social capital and health outcome measures. Looking across columns 1 to 5, we found that a 1% increase of community economic connectedness was associated with a 0.64% (95% CI, 0.60%-0.67%; P < .001) decrease in diabetes prevalence; a 0.31% (95% CI, 0.29%-0.33%; P < .001) decrease in high blood pressure prevalence; a 0.14% (95% CI, 0.12%-0.16%; P < .001) decrease in high cholesterol prevalence; a 0.48% (95% CI, 0.46%-0.50%; P < .001) prevalence of kidney disease decrease; and a 0.28% (95% CI, 0.27%-0.29%; P < .001) decrease in obesity prevalence. As such, higher economic connectedness was associated with better population health.

Table 1. Summary Statistics for Social Capital and Population Health Measures Across Full and Stratified Samples, With Stratification by Racial and Ethnic ZCTA Majority Population

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>ZCTA, mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full sample (N = 17 800)</td>
</tr>
<tr>
<td>Social capital measures</td>
<td></td>
</tr>
<tr>
<td>Economic connectedness</td>
<td>0.88 (0.32)</td>
</tr>
<tr>
<td>Support ratio</td>
<td>0.90 (0.10)</td>
</tr>
<tr>
<td>Volunteering rate</td>
<td>0.08 (0.03)</td>
</tr>
<tr>
<td>Population health measures</td>
<td></td>
</tr>
<tr>
<td>Diabetes prevalence</td>
<td>10.82 (2.9)</td>
</tr>
<tr>
<td>High BP prevalence</td>
<td>33.23 (6.15)</td>
</tr>
<tr>
<td>High cholesterol prevalence</td>
<td>32.7 (4.19)</td>
</tr>
<tr>
<td>Kidney disease prevalence</td>
<td>2.99 (.66)</td>
</tr>
<tr>
<td>Obesity prevalence</td>
<td>33.36 (5.61)</td>
</tr>
</tbody>
</table>

Abbreviations: BP, blood pressure; ZCTA, zip code tabulation area.
Pertaining to the association between social cohesion and our health outcomes, we note a significant and positive association—that is, higher community social cohesion was associated with poorer health. In particular, we found that a 1% increase of community support ratio was associated with a 0.21% (95% CI, 0.16%-0.26%; \( P < .001 \)) increase in diabetes prevalence; a 0.16% (95% CI, 0.13%-0.19%; \( P < .001 \)) increase in high blood pressure prevalence; a 0.16% (95% CI, 0.13%-0.19%; \( P < .001 \)) increase in high cholesterol prevalence; a 0.17% (95% CI, 0.13%-0.20%; \( P < .001 \)) increase in prevalence of kidney disease; and a 0.08% (95% CI, 0.06%-0.10%; \( P < .001 \)) increase in obesity prevalence.

Similar associations were noted regarding the civic engagement measure, with higher civic engagement being associated with higher rates of poor health for 3 of our 5 population health measures—high blood pressure, high cholesterol, and kidney disease prevalence. A 1% increase of volunteering was associated with a 0.02% (95% CI, 0.01%-0.02%; \( P < .001 \)) increase in high blood pressure prevalence; a 0.03% (95% CI, 0.02%-0.03%; \( P < .001 \)) increase in high cholesterol prevalence; and an 0.02% (95% CI, 0.01%-0.02%; \( P < .001 \)) increase in prevalence of kidney disease.

Association Between Social Capital and Community Health, Stratified by Majority Racial and Ethnic Population

Tables 3, 4, and 5 and eTable 1 in Supplement 1 report the stratified estimation results based on majority racial and ethnic population. Table 3 reports the results for the non-Hispanic White majority communities. These results are qualitatively very similar to our full sample results within Table 2. Bridging social capital (as captured by economic connectedness) was negatively associated with all 5 of the population health prevalence measures. The elasticity estimates here ranged from −0.63% (95% CI, −0.67% to −0.60%); \( P < .001 \) to −0.18% (95% CI, −0.21% to −0.16%; \( P < .001 \)) depending on the population health measure. For bonding social capital (as captured by the support ratio) and civic engagement measures, higher values were associated with lower rates of poor health for each of the population health indicators. A 1% increase of volunteering was associated with a 0.02% (95% CI, 0.01%-0.02%; \( P < .001 \)) increase in high blood pressure prevalence; a 0.03% (95% CI, 0.02%-0.03%; \( P < .001 \)) increase in high cholesterol prevalence; and an 0.02% (95% CI, 0.01%-0.02%; \( P < .001 \)) increase in prevalence of kidney disease.
engagement (as captured by volunteering), both were positively associated with all 5 population health prevalence measures. The elasticity estimates for the support ratio ranged from 0.23% (95% CI, 0.17% to 0.28%; \( P < .001 \)) to 0.09% (95% CI, 0.07% to 0.11%; \( P < .001 \)); and those for volunteering ranged from 0.03% (95% CI, 0.02% to 0.04%; \( P < .001 \)) and 0.01% (95% CI, 0.01% to 0.01%; \( P < .001 \)).

Tables 4 and 5 as well as eTable 1 in Supplement 1, which report results for majority non-Hispanic Black, Hispanic, and other racial/ethnic groups, indicate broadly similar associations; however, there are 2 notable differences. First, for the results within Tables 4 and 5 and eTable 1 in Supplement 1, the magnitudes of the associations were in most cases smaller; and second, only economic connectedness was consistently significant across the various population health outcomes (with the 1 exception of the high cholesterol prevalence outcome).

Discussion

This study provides 2 main findings. First, we provide evidence indicating that communities with higher economic connectedness were associated with better population health outcomes; and that those with greater community support ratios and community volunteering were associated with higher prevalence of poor health outcomes. Second, we show results indicating that the associations between social capital and health outcomes vary based on the majority racial/ethnic population makeup of communities.

Pertaining to the first set of results, the observation that different measures of social capital are differentially associated with health outcomes is intuitive if placed in relation to prior studies. Chetty et al\(^29\) show that economic connectedness is strongly associated with economic mobility. Our findings show that the aspects of social capital that may be affected by economic mobility may also positively influence population health outcomes. The negative association between our social

<table>
<thead>
<tr>
<th>Social capital measure</th>
<th>Change (95% CI), %a</th>
<th>In diabetes prevalence</th>
<th>In high blood pressure prevalence</th>
<th>In high cholesterol prevalence</th>
<th>In kidney disease prevalence</th>
<th>In obesity prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridging capital: ln economic connectedness</td>
<td>−0.27 (−0.38 to −0.15)</td>
<td>−0.12 (−0.19 to −0.05)</td>
<td>−0.05 (−0.11 to 0.00)</td>
<td>−0.24 (−0.34 to −0.14)</td>
<td>−0.11 (−0.15 to −0.06)</td>
<td></td>
</tr>
<tr>
<td>Bonding capital: ln support ratio</td>
<td>0.12 (−0.19 to 0.43)</td>
<td>0.10 (−0.11 to 0.30)</td>
<td>0.06 (−0.07 to 0.19)</td>
<td>0.06 (−0.22 to 0.34)</td>
<td>0.04 (−0.08 to 0.17)</td>
<td></td>
</tr>
<tr>
<td>Civic engagement: ln volunteering</td>
<td>0.01 (−0.02 to 0.04)</td>
<td>−0.01 (−0.03 to 0.01)</td>
<td>0.01 (−0.01 to 0.02)</td>
<td>0.04 (0.01 to 0.07)</td>
<td>−0.02 (−0.04 to −0.01)</td>
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<tr>
<td>Observations, No.</td>
<td>652</td>
<td>652</td>
<td>652</td>
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<tr>
<td>( R^2 )</td>
<td>0.84</td>
<td>0.85</td>
<td>0.88</td>
<td>0.86</td>
<td>0.92</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: ln, natural logarithm.

a Robust 95% CIs are reported within parentheses. Controls include zip code tabulation area population, median household income, share unemployed, share younger than 18 years, share aged 65 years or older, and share female. County fixed effects were included within all specifications. Given the log-log model specifications, estimates are interpreted as elasticities.

<table>
<thead>
<tr>
<th>Social capital measure</th>
<th>Change (95% CI), %a</th>
<th>In diabetes prevalence</th>
<th>In high blood pressure prevalence</th>
<th>In high cholesterol prevalence</th>
<th>In kidney disease prevalence</th>
<th>In obesity prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridging capital: ln economic connectedness</td>
<td>−0.30 (−0.39 to −0.22)</td>
<td>−0.12 (−0.18 to −0.06)</td>
<td>−0.02 (−0.07 to 0.02)</td>
<td>−0.24 (−0.33 to −0.16)</td>
<td>−0.15 (−0.19 to −0.12)</td>
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<tr>
<td>Bonding capital: ln support ratio</td>
<td>0.03 (−0.05 to 0.12)</td>
<td>−0.00 (−0.07 to 0.06)</td>
<td>0.04 (−0.01 to 0.09)</td>
<td>0.02 (−0.06 to 0.10)</td>
<td>0.02 (−0.02 to 0.05)</td>
<td></td>
</tr>
<tr>
<td>Civic engagement: ln volunteering</td>
<td>−0.02 (−0.04 to 0.01)</td>
<td>0.03 (0.01 to 0.05)</td>
<td>0.01 (−0.00 to 0.03)</td>
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<tr>
<td>( R^2 )</td>
<td>0.88</td>
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<td>0.85</td>
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</table>

Abbreviation: ln, natural logarithm.

a Robust 95% CIs are reported within parentheses. Controls include zip code tabulation area population, median household income, share unemployed, share younger than 18 years, share aged 65 years or older, and share female. County fixed effects were included within all specifications. Given the log-log model specifications, estimates are interpreted as elasticities.
support measure (which captures social cohesion/clustering) and our volunteering measure (which captures civic engagement) are also important to note. These measures are more challenging to interpret as they may be capturing multiple aspects of social capital, such as immobility (rather than mobility), which might adversely affect health, as well as community level clustering and bonding, which may represent the degree to which community members support and help one another, an aspect of social capital that we would expect to have a health-improving effect. Our results here suggest that the former (negative immobility), rather than the latter (positive social support), appears to be the larger of these two effects within our sample. These findings highlight the need to further identify and decouple the potential channels that connect social capital with population health outcomes within future work.

Our second set of results shows that the association between social capital in the form of economic connectedness and population health outcomes are less inelastic for communities that have a majority non-Hispanic White population than other racial/ethnic communities. Additionally, our stratified analyses suggest that the finding that social cohesion (captured by the support ratio) and civic engagement (given by volunteering) were broadly associated with worse health outcomes appears to be driven by associations observed within non-Hispanic White communities. For Hispanic, non-Hispanic Black, or other majority population communities, these associations were either not significant, or if significant, had smaller estimated magnitude (i.e., highly inelastic estimates). It is important to note that these results do not imply that policies aimed at improving social capital within minoritized racial/ethnic communities may be less potent, all else held equal. Rather, these findings seem to suggest that because all else is not equal when comparing non-Hispanic White communities with minoritized racial/ethnic communities (as can be seen, for example, in Table 1), the marginal effect of improved social capital may differ.

Given these findings, our study contributes to 2 strands of previous research. First, we contribute to the literature that has sought to specifically examine the linkage between social capital at the community level and health outcomes. Second, we contribute to the broader literature that has documented the presence of significant health disparities across racial and ethnic populations. Our addition to this literature is the finding that the association between community-level social capital and population health outcomes varies across communities with different racial/ethnic majority populations.

**Limitations**

Our study is subject to several study limitations that are important to note. First, results are based on estimates from an observational study design, and as such, results should be interpreted as indicative of associations rather than as causal effects. Second, estimates are based on an ecological analysis in which associations were identified using community-level data, rather than with individual-level data. Third, our social capital measures were based on social media data from individuals aged between 25 and 44 years, and as such, our analyses assume that this group's social capital measures are representative of the broader population. Fourth, our health outcomes data are based on model estimates, and as such, the quality of these data depend on the appropriateness of the underlying model. Here, we note that prior work has provided validation of these small area estimates and also note use of these data in number of recent ecological studies.

Furthermore, we note that our classification of communities (ZCTAs) into 1 of our 4 racial/ethnic majority groups is dependent on the threshold used to designate a majority population. Within our main results, we present results based on a threshold of 50%; however, within additional analyses (provided in eAppendix and eTables 2-9 in Supplement 1), we found that results remain qualitatively similar for alternative thresholds of 60% or 70%. This suggests that the results do not appear to be driven by our choice of threshold.
Conclusions

In this cross-sectional study of the association between community social capital and population health outcomes, our results indicate that communities with higher economic connectedness had better population health outcomes and that the opposite was true for communities with high community support ratios and volunteering rates. These findings suggest that communities where individuals cluster together within homogenous groups may not benefit health, but that stimulating connections across such groups in terms of socioeconomic standing can help increase community population health in substantial ways. In addition, our study also found that associations between social capital and health outcomes varied based on the majority racial/ethnic population makeup of communities, with the association between social capital and population health outcomes being considerably stronger for communities that have a majority non-Hispanic White population than other racial/ethnic communities. Further work is needed to map the associations between social capital and population health outcomes in greater detail as well as to help explain documented associations across communities that differ based on their racial/ethnic population makeup.
REFERENCES


SUPPLEMENT 1.
eTable 1. Population health regressions on social capital measures stratified by majority race/ethnicity populations: other majority subsample

eAppendix. Robustness checks using alternative community thresholds

eTable 2. Population health regressions on social capital measures stratified by majority race/ethnicity populations with majority race/ethnicity threshold set at 60%: NHW majority subsample

eTable 3. Population health regressions on social capital measures stratified by majority race/ethnicity populations with majority race/ethnicity threshold set at 60%: NHB majority subsample

eTable 4. Population health regressions on social capital measures stratified by majority race/ethnicity populations with majority race/ethnicity threshold set at 60%: Hispanic majority subsample

eTable 5. Population health regressions on social capital measures stratified by majority race/ethnicity populations with majority race/ethnicity threshold set at 60%: other majority subsample

eTable 6. Population health regressions on social capital measures stratified by majority race/ethnicity populations with majority race/ethnicity threshold set at 70%: NHW majority subsample

eTable 7. Population health regressions on social capital measures stratified by majority race/ethnicity populations with majority race/ethnicity threshold set at 70%: NHB majority subsample

eTable 8. Population health regressions on social capital measures stratified by majority race/ethnicity populations with majority race/ethnicity threshold set at 70%: Hispanic majority subsample

eTable 9. Population health regressions on social capital measures stratified by majority race/ethnicity populations with majority race/ethnicity threshold set at 70%: other majority subsample

SUPPLEMENT 2.
Data Sharing Statement