Is state level social capital related to oral health in the US?

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Background

Why Social Capital?

Over the past two decades, the concept of social capital has been the focus of considerable attention and debate. Although a contested concept, social capital has been convincingly linked to population health and well-being[1,2]. Strengthening social capital may buffer the negative effects of economic disadvantage and reduce health inequalities[1,3]. Evidence in relation to oral health is emerging but still limited[3].

Definition

Robert Putnam, an important proponent of the social capital concept, defined social capital as *"... social networks and the associated norms of reciprocity and trustworthiness that arise from them"* [4].

Dimensions

Social capital has cognitive and structural dimensions. Cognitive social capital includes norms, values, perceptions, attitudes and beliefs, while structural social capital refers to forms of social organisation, such as the size of social networks, civic engagement, and the functioning of institutions[1,3].

Pathways from social capital to oral health

The hypothesised pathways linking social capital and oral health are a) behavioural, b) psychosocial, c) via access to oral health services, and d) via policy development[2,3] (Fig. 1).
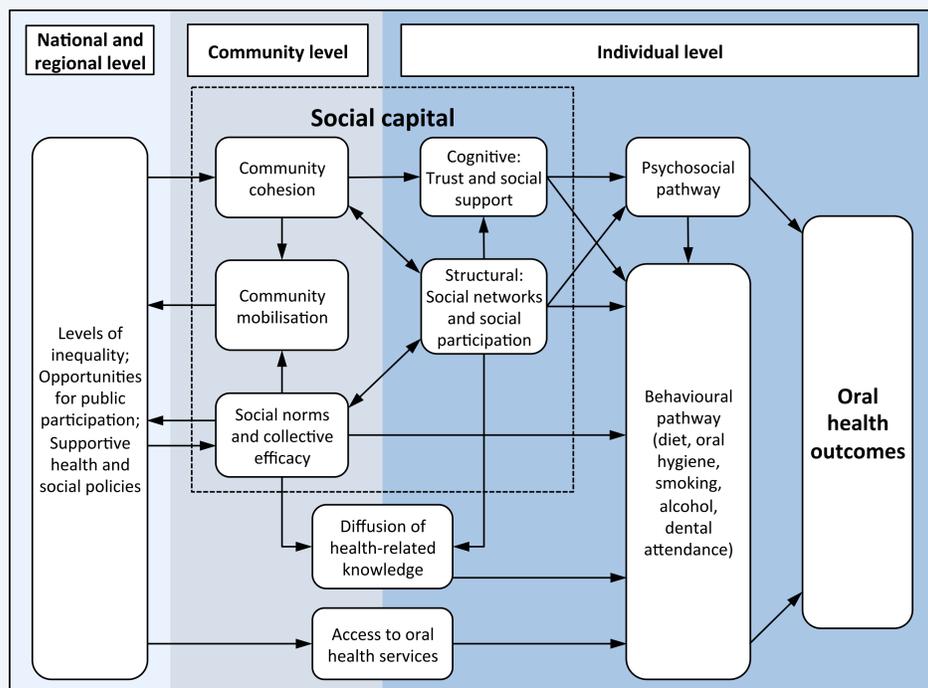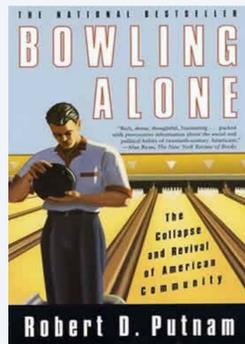

Figure 1   Conceptual framework of how social capital may affect oral health (Source: Rouxel et al., 2015).

Aim

To test whether Putnam's state-level Comprehensive Social Capital Index is associated with clinical oral health outcomes in a nationally representative sample of the adult US population.

Methods

Study Design

Secondary analysis of data from the US National Health and Nutrition Examination Survey (NHANES). For this study, Putnam's Comprehensive Social Capital Index at US state level was linked into the NHANES dataset by the CDC National Center for Health Statistics (NCHS) Research Data Center (RDC).

Study population

Analyses were restricted to dentate respondents older than 19 years for whom information was complete. Analysis samples comprised 11,121 participants for number of decayed teeth and number of sound and filled teeth, and 9,009 participants for periodontal attachment loss. Each sample contained data from 28 US states.

Outcome variables

Number of decayed teeth, the number of sound and filled teeth, and periodontal attachment loss (percentage of periodontal sites for which the loss of attachment was 4mm or greater).

Exposure

State-level social capital was measured using Putnam's "Comprehensive Social Capital Index", presented in "Bowling Alone" (Putnam 2000). The index has 14 variables pertaining to the following domains: community organisational life, engagement in public affairs, community volunteerism, informal sociability and trust.

Covariates

The final models adjusted for age, sex, ethnicity, household income, educational attainment, smoking status and dental visits.

Statistical analyses

Multilevel modelling was used to estimate the variability in the above outcomes between US states, and associations with the Social Capital Index. All analyses were carried out through the RDC remote system, and the software package SAS. We estimated two-level random intercept models with individuals as level 1 units and US states as level 2 units.

Results

Descriptive analyses

The state-level social capital index (SCI) ranged from -1.17 to 1.32. In US states with higher levels of social capital, people had, on average, less untreated caries and lower levels of periodontal disease. There was no statistically significant association with the number of sound and filled teeth (Fig. 2-4).

Table 1   Means and standard errors (unadjusted)

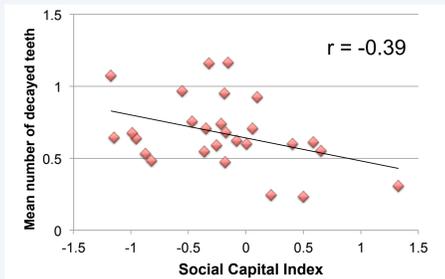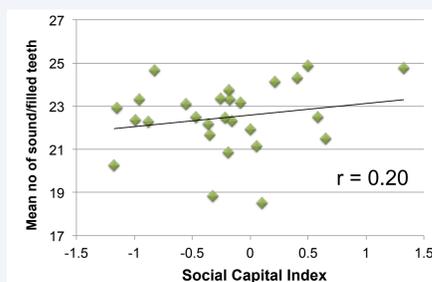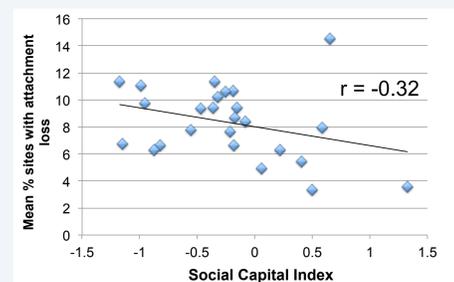|	No of decayed teeth	No of sound/ filled teeth	Periodontal attachment loss (%)
Overall sample mean	0.77 (0.04)	21.31 (0.35)	9.76 (0.59)
State with lowest SCI	1.07 (0.10)	20.26 (0.50)	11.33 (1.28)
State with highest SCI	0.31 (0.12)	24.77 (0.28)	3.58 (0.13)

Figure 2

Figure 3

Figure 4

Figures 2-4   Mean number of decayed teeth, mean number of sound/filled teeth and mean periodontal attachment loss, by state-level social capital. Each data point refers to a US state.

Results of multilevel models

Results of multilevel models are shown in Table 1. Before any adjustments (variance component models), 1.1% of the overall variability in the number of decayed teeth was due to differences attributed to the state level. For sound/filled teeth this was 4.6%, and for periodontal attachment loss it was 2.0%. Associations between social capital and number of decayed teeth, as well as with periodontal attachment loss, were small but remained statistically significant after allowing for individual-level covariates, and were slightly attenuated after additionally adjusting for oral health related behaviours.

We also tested whether associations with number of decayed teeth and periodontal attachment loss were explained by state-level Gini coefficient and mean household income. We found no independent associations between these measures and any of the oral health outcomes.

Table 2   Results of of random intercept models predicting number of decayed teeth, number of sound and filled teeth, and periodontal attachment loss

	Estimate (Standard error)					
	Number of decayed teeth		Number of sound/filled teeth		Periodontal attachment loss	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Social capital index	-0.14 (0.05)*	-0.11 (0.05)*	0.60 (0.38)	0.47 (0.35)	-1.52 (0.68)*	-1.26 (0.66)†
State-level variance	0.012 (0.006)*	0.008 (0.004)*	1.14 (0.36)***	0.94 (0.30)***	0.027 (0.011)**	0.025 (0.011)**
Residual variance	3.423 (0.05)***	3.343 (0.05)***	41.05 (0.55)***	39.56 (0.53)***	2.875 (0.043)***	2.809 (0.042)***
VPC (%)	0.3	0.2	2.7	2.3	0.9	0.9

*** p < 0.001   ** p < 0.01   *p < 0.05   †p < 0.01

Model 1: Adjusted for age, sex, income, education, and ethnicity   Model 2: Additionally adjusted for dental visits and smoking status

Discussion and conclusion

Key findings

This was the first study to examine associations between US state-level social capital and oral health. People living in states where social capital was higher had on average less untreated caries and fewer sites with periodontal attachment loss. The number of sound/filled teeth was not related to state-level social capital. The results lent only weak support to the theory that health behaviours are on the pathway between state-level social capital and oral health.

Limitations

This study was based on cross-sectional, observational data, therefore no causal inferences can be made. States with higher social capital might differ in other ways that would explain the above associations (residual confounding).

Conclusion

State-level social capital appears to be associated with small advantages in people's oral health.

References

1   Islam MK, Merlo J, Kawachi I, Lindstrom M, Gerdtham UG. 2006. Social capital and health: does egalitarianism matter? A literature review. Int J Equity Health 5:3

2   Kawachi I, Berkman LF (2000). Social Cohesion, Social Capital, and Health. In: Social Epidemiology. LF Berkman and I Kawachi editors. New York: Oxford University Press, pp. 174-190.

3   Rouxel PL, Heilmann A, Aida J, Tsakos G, Watt RG. 2015. Social capital: theory, evidence, and implications for oral health. Community Dent Oral Epidemiol 43(2):97-105.

4   Putnam RD. 2000. Bowling Alone. The collapse and revival of American community. New York: Simon and Schuster.