

Sense of coherence and oral health in dentate adults: findings from the Finnish Health 2000 survey

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Abstract

Aim: To assess the relationship between sense of coherence (SOC) and oral health, and the role of oral health-related behaviours in this relationship.

Materials and Methods: This is a cross-sectional study of 5401 dentate adults who participated in the nationally representative Health 2000 Survey in Finland. The survey gathered information on SOC, demographic characteristics, education, income, pre-existing diabetes, daily smoking, dental attendance, toothbrushing frequency and sugar intake frequency. Oral health was assessed through clinical outcomes, such as number of teeth, number of decayed teeth and extent of periodontal pockets and perceived oral health.

Results: A strong SOC was related to having more teeth, fewer decayed teeth, lower extent of periodontal pockets and good perceived oral health after adjustment for confounders, such as demographic and socioeconomic factors (all $p \le 0.003$). These associations were attenuated but remained significant after further adjustment for potential mediators (oral health-related behaviours), except for the association of SOC with the extent of periodontal pockets, which was fully accounted for by pre-existing diabetes, oral health-related behaviours and dental plaque (p = 0.549).

Conclusion: SOC is positively associated with various aspects of adult oral health, in part because of the better oral health-related behaviours among people with a strong SOC.

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Sense of coherence (SOC) is "a global orientation that expresses the extent to which one has a pervasive, enduring although dynamic feeling of confidence

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that the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable; the resources are available to one to meet the demands posed by these stimuli; and these demands are challenges, worthy of investment and engagement" (Antonovsky 1987). SOC has been hypothesized to facilitate successful coping with stressors and the maintenance and improvement of health (Antonovsky 1996, Eriksson & Lindstrom 2006). Supporting this hypothesis, several studies (Poppius et al. 1999, Kivimäki et al. 2000, Suominen et al. 2001, Ing &

Reutter 2003, Poppius et al. 2003, Surtees et al. 2003, Kouvonen et al. 2008, 2010) have shown stronger SOC to be associated with more favourable levels in various health measures in adult life. However, whereas the contribution of SOC to oral health has been explored in children and adolescents with mixed results (Freire et al. 2001, 2002, Avo-Yusuf et al. 2008, 2009, Bonanato et al. 2009), the contribution of SOC to adult oral health has not been fully assessed. In adults, SOC was positively related to self-reported oral health-related behaviours (Savolainen et al. 2004, 2005b, Lindmark et al. 2005, Bernabé et al.

2009a, c) and perceived oral health measures (Savolainen et al. 2005a, 2009), but we are not aware of any previous studies that have assessed the contribution of SOC to clinical measures of adult oral health. Most of the above-mentioned studies in adult populations used data from the Finnish Health 2000 Survey (Savolainen et al. 2004, 2005b, Bernabé et al. 2009a, c).

One potential mechanism linking SOC to health is health-related behaviours (Antonovsky 1987). SOC may influence the aetiology of, and recovery from disease through effective coping, by avoiding behaviours that are directly detrimental to health such as smoking, excessive drinking, unhealthy diet or sedentary lifestyle and by adopting behaviours that can reduce the severity of illness, such as seeking treatment early or compliance to it (Antonovsky 1987, 1996). The behavioural pathway for SOC seems relevant to oral health as oral diseases have a strong behavioural component. Indeed, previous studies in adults found that SOC was associated with more favourable oral health-related behaviours (Savolainen et al. 2004. 2005b, 2009, Lindmark et al. 2005, Bernabé et al. 2009a).

Therefore, this study assesses the relationship between SOC and four different oral health outcomes and explores the role of oral health-related behaviours in this association in a nationally representative sample of Finnish dentate adults. It was hypothesized that SOC is related to oral health independently of demographic characteristics and socioeconomic position (SEP), and that oral health-related behaviours, such as dental attendance, toothbrushing frequency, sugar intake frequency and daily smoking, mediate the association between SOC and adult oral health.

Materials and Methods Study population

Data are from the Health 2000 Survey, the latest national survey carried out in Finland. The two-stage stratified cluster sample was representative of the Finnish national population and included 8028 subjects aged 30 years or over. Subjects were interviewed at home (Phase 1), where they were also given a questionnaire to be returned at the clinical health examination (Phase 2). A total of 7419 subjects (93% of the 7977 subjects alive on the first day of Phase 1) attended at least one phase of the study and 6335 subjects (79%) had clinical oral health examinations. Of the latter group, 5401 (85%) were dentate and had information on the variables selected for analysis. Therefore, they formed the analytic sample for this study (Aromaa & Koskinen 2004, Suominen-Taipale et al. 2008).

The Health 2000 Survey was approved by the Ethics Committee for Epidemiology and Public Health in the Hospital District of Helsinki and Uusimaa in Finland. During the interview, the respondents received an information leaflet and their written informed consent was obtained.

SOC scale

Participants' SOC was assessed using a slightly abbreviated version of the Finnish SOC-13 scale (Savolainen et al. 2004, 2005a, b, 2009, Bernabé et al. 2009a, b, c). The item "Does it happen that you have feelings inside you would rather not feel?" belonging to the comprehensibility component was not included in the final questionnaire of the Health 2000 Survey. Participants answered using seven-point semantic differential scales with two opposite anchoring phrases (1 = very often and 7 = very)seldom or never). Negatively worded items were reverse-scored so that a high score indicated a strong SOC. Items were averaged to calculate the SOC score of each subject, which ranged between one and seven points. When calculating SOC score, subjects with missing values for more than three SOC items were treated as missing. If a subject had three or less SOC items with missing values, they were replaced by the mean value of the remaining SOC items for that subject (Savolainen et al. 2004, 2005a, b, 2009, Bernabé et al. 2009a, c). In this sample, Cronbach's α for the whole scale was 0.85 (Bernabé et al. 2009b).

Oral health outcomes

Four oral health outcomes were evaluated: perceived oral health, as well as clinical measures of number of teeth, number of decayed teeth and extent of periodontal pockets. During interviews, subjects reported their perceived oral health status using a five-point scale (poor, rather poor, moderate, rather good and good), which was later dichotomized for analysis as poor (poor/rather poor/moderate) *versus* good (rather good/good). Clinical examinations

were carried out at 80 field examination sites, usually local health centres or premises provided by municipalities. Five dentists did the clinical examinations using a headlamp, mouth mirror, fibre optic light and a WHO periodontal probe, with subjects seated on a portable dental treatment unit. All teeth, including third molars and tooth remnants were counted to determine the number of teeth. Dental caries was recorded by tooth. A tooth was recorded as decayed if there was evidence of a caries lesion clearly extending into dentine on any coronal or root surface. The number of decayed teeth per subject was calculated if the condition of all their teeth had been clinically determined. Periodontal pocket depth was measured on four sites per tooth, excluding wisdom teeth. All teeth with pocket depths of 4 mm or more at any site were recorded as having periodontal pockets. This count was converted into a percentage to take into account those teeth in a subject that could not be periodontally examined. The percentage agreement in the parallel measurements on 269 subjects. where field examiners were individually compared with the reference examiner under field circumstances, was 93% (K: 0.87) for dental status by tooth and 77%(κ : 0.41) for periodontal pockets by tooth. ĸ-values for intra-examiner reliability on 111 subjects were 0.95 for dental status by tooth and 0.83 for periodontal pockets by tooth (Suominen-Taipale et al. 2008).

Confounders and mediators

Covariates for the association between SOC and oral health included potential confounders, such as demographic characteristics and SEP indicators, and potential mediators, such as oral healthrelated behaviours, diabetes and dental plaque. Demographic characteristics were sex, age, marital status and urbanization. Years of education and household income per consumption unit (hereafter referred to as income) were used as indicators of SEP. Participants reported the number of years of their full-time education. Monthly household income per consumption units (in Finnish Marks) was obtained from tax authorities. Consumption units were calculated using equivalence scale of the Organization for Economic Co-operation and Development, which assigns a weight of one to the first household member, 0.7 to each additional adult

and 0.5 to each child under 18 years old (OECD 1982).

In terms of oral health-related behaviours, participants reported their pattern of dental attendance on a three-point scale (never, only for emergencies, regularly for check-ups), their toothbrushing frequency on a five-point scale (never, less often than every day, once a day, twice a day, more often than twice a day) and their frequency of intake of six different sweets and snacks (sugar in tea or coffee; other drinks with sugar added; toffee, liquorice or dried fruit: sweets, hard pastilles or candy without xylitol; chocolate or filled biscuits; and chewing gum without xylitol) on five-point scales (three times a day or more often, once or twice a day, two to five times a week, more rarely, never). Sugar intake frequency was considered as daily if at least one of the six items was consumed once a day or more often. For smoking status, daily smokers were defined as those who reported smoking at least 100 times in their lifetime, regularly for at least 1 year and most recently the day of the survey or the previous day. For analysis, oral health-related behaviours were dichotomized as follows: dental attendance as only for emergencies/never versus regularly for check-ups (Savolainen et al. 2004, 2009), toothbrushing frequency as once a day or less often versus twice a day or more often (Savolainen et al. 2004, 2009), sugar intake frequency as less often than daily versus on a daily basis (Bernabé et al. 2009a, c) and daily smoking as no versus yes (WHO 1998). Preexisting diabetes was determined based on information provided during the health interview. Participants were asked whether a doctor had ever diagnosed them with diabetes (no/yes). Dental plaque was assessed using a modified version of the method described by Silness & Löe (1964). Three tooth surfaces were clinically examined: the buccal surface of the most posterior tooth on the upper right sextant, the lingual surface of the most posterior tooth on the lower left sextant and the buccal surface of the lower left canine. Dental plaque was classified into three categories (no visible plaque, visible plaque in gingival margins, visible plaque also elsewhere) and the highest one was recorded.

Statistical analysis

Survey design and analysis weights were taken into account during analyses.

The association of SOC with each oral health outcome was assessed in three steps using appropriate regression models for each outcome: linear regression was used for the number of teeth, number of decayed teeth and extent of periodontal pockets and binary logistic regression was used for perceived oral health. We used linear regression models instead of count regression models, such as Poisson or negative binomial regression, because they make data analysis and interpretation simple and straightforward. When tried, comparable conclusions were also obtained with the latter types of regression models.

The association of SOC with each oral health outcome was assessed adjusting for demographic characteristics (sex, age, marital status and urbanization) in Model 1; for demographic characteristics and SEP indicators (years of education and income) in Model 2; and additionally for relevant mediators in Model 3. Relevant mediators were dental attendance, toothbrushing frequency, sugar intake frequency and daily smoking for the number of teeth and perceived oral health (Model 3A); dental attendance, toothbrushing frequency and sugar intake frequency for number of decayed teeth (Model 3B); and dental attendance, toothbrushing frequency and daily smoking, diabetes and dental plaque for extent of periodontal pockets (Model 3C). At this stage, statistical interactions (cross-products) between SOC and confounders (demographic characteristics and SEP indicators) were examined by assessing their significance when added to Model 3 one at a time. Explanatory variables included in an interaction term were meancentred to reduce collinearity between the main effects and the cross-product (Jaccard 2001, Jaccard & Turrisi 2003). To examine the direction and trend of the significant interactions, the association between the confounder and the oral health outcome was presented at three different points in the SOC score distribution, namely moderate (meancentred), weak (1 SD below the meancentred) and strong (1 SD above the mean-centred) SOC score (Jaccard 2001, Jaccard & Turrisi 2003).

For the models in relation to perceived oral health, the assumption of linearity in the logit for the continuous explanatory variables (years of education, income and SOC score) was assessed by categorizing each explanatory variable into quartiles, replacing the continuous explanatory variables with their categorical equivalents and then fitting them into the logistic regression model for perceived oral health. Following this, the estimated coefficients were plotted against the midpoints of the quartiles to visually inspect the shape of the association (Hosmer & Lemeshow 2000). The relationships across quartiles were approximately linear. Therefore, years of education, income and SOC score were used as continuous variables in the analyses.

Results

Data from 5401 dentate adults (2538 men and 2863 women) were analysed. Their mean age was 49.6 years (range: 30–99 years). Description of the sample according to demographic characteristics, SEP indicators, the SOC score, oral health-related behaviours and oral health outcomes is shown in Table 1. The mean number of teeth per person was 23.0 (range: 1–32), the mean number of decayed teeth was 0.8 (range: 0–24) and mean extent of periodontal pockets was 21% (range: 0–100). Thirty-four percent reported poor perceived oral health.

The association of SOC with each oral health outcome was assessed in sequential models (Table 2). In Model 1, the SOC score was positively related to the number of teeth and negatively related to the number of decayed teeth, extent of periodontal pockets and poor perceived oral health after adjustment for sex, age, marital status and urbanization. In Model 2, these associations were attenuated but remained significant after further adjustment for years of education and income. For every point increase in SOC score, the number of teeth increased by 0.46, the number of decayed teeth decreased by 0.19 and the extent of periodontal pockets decreased by 1.47%. Moreover, subjects were 1.32 times less likely to report poor perceived oral health for every additional point in SOC score. In Models 3A-3C, additional adjustment for potential mediators further attenuated the association of SOC with the number of teeth, number of decayed teeth and perceived oral health, but these associations still remained significant. However, the association between SOC and extent of periodontal pockets was fully attenuated after adjustment for all potential mediators (diabetes, dental attendance, tooth-

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Table 1 Sample distribution of Finnish dentate adults, by demographic factors, socioeconomic position indicators, sense of coherence (SOC) score, oral health-related behaviours and oral health outcomes

Variables	n	% or Mean (SD)
Sex		
Men	2538	49%
Women	2863	51%
Age (years)	5401	49.6 (12.8)
Marital status		· · · · ·
Not cohabiting	1485	27%
Cohabiting	3898	73%
Urbanization		
Rural	1235	23%
Semi-urban	736	14%
Urban	3430	63%
Years of education	5347	11.9 (3.9)
Income (\times 1000 Finnish Marks)	5401	14.7 (42.5)
SOC score (range 1–7)	5098	5.5 (0.8)
Dental attendance		
Only for emergencies/never	2129	41%
Regularly for check-ups	3053	59%
Toothbrushing frequency		
Once a day or less often	1956	38%
Twice a day or more often	3220	62%
Sugar intake frequency		
Less often than daily	2546	48%
On a daily basis	2767	52%
Daily smoking		
No	4173	77%
Yes	1206	23%
Diabetes		
No	5147	96%
Yes	232	4%
Dental plaque		
No plaque	1934	36%
At the gingival margin	2632	50%
Plaque elsewhere	728	14%
Number of teeth	5401	23.0 (7.8)
Number of decayed teeth	5389	0.8 (2.0)
Extent of periodontal pockets	5255	21.1 (27.8)
Perceived oral health		
Good	3519	66%
Poor	1843	34%

brushing, daily smoking and dental plaque).

There were no significant interactions between demographic factors (sex, age, marital status and urbanization) and SOC (p > 0.104 for all the 20 interactions tested). As for SEP indicators (eight interactions tested), only the interaction between years of education and SOC was significant in the models for number of teeth (p = 0.046) and perceived oral health (p = 0.007). The positive association between years of education and number of teeth decreased gradually across the three levels of SOC (weak, moderate and strong) while the inverse association between years of education and poor perceived oral health increased gradually in individuals with a weak, moderate and strong SOC (Table 3).

Discussion

Our findings support an association between a strong SOC and better oral health, independently of the demographic characteristics and current SEP of individuals. This association was robust across all four oral health outcomes assessed; individuals with a strong SOC had more teeth, fewer decayed teeth, less periodontal pockets and better perceived oral health. This finding is important as we assessed both clinical and subjective outcomes that cover oral health and disease measures.

The magnitude of the association between SOC and the four oral health outcomes was such that the number of teeth increased by about 0.50 teeth, the number of decayed teeth decreased by about 0.20 teeth and the extent of perio-

dontal pockets decreased by about 1.5% for each higher point in the SOC score across the seven-point range. In addition, the odds of reporting good perceived oral health increased by about 30% per one-point increase in the SOC score. Given that these figures represent variations in clinical and perceived oral health statuses attributable to differences in SOC while keeping constant other important determinants of oral health such as demographic factors and SEP, the present findings may have a considerable dental public health importance. These findings suggest that SOC may be beneficial to an individuals' overall oral health status irrespective of their level of economic resources, even when individuals were financially well endowed.

We explored the mediating role of oral health-related behaviours in the relationship between SOC and different oral health outcomes. The fact that the associations of SOC with perceived oral health, number of teeth and untreated caries were attenuated, but did not disappear in the fully adjusted models indicates that other factors may also underlie these associations. On the other hand, the association between SOC and the extent of periodontal pockets was accounted for by pre-existing diabetes, oral health-related behaviours and dental plaque, with daily smoking being the main mediator (data not shown). Our results strongly support the importance of the behavioural pathway for the effect of SOC on periodontal health, while the attenuation of the coefficients indicates a potential but not equally strong role in the respective relationships with number of teeth and number of decayed teeth. The general theory of SOC proposes that it may promote health through three different pathways: first, by regulating emotional tension generated by confrontation with stressors; second, through the selection of health-promoting behaviours; and third, by direct physiological consequences via the central pathways of the neuro-immune and endocrine sys-1987, tems (Antonovsky 1996). Researchers in the medical field have shown that SOC correlates with emotional states (Antonovsky & Sagy 1986, Kivimaki et al. 2002) and health biomarkers (Lindfors et al. 2005, Nasermoaddeli et al. 2006, Garvin et al. 2009). However, further research is needed to determine the importance of each of those mechanisms in relation to a specific health outcome, such as oral health.

Table 2 Regression models for the association between sense of coherence (SOC) score and different oral health outcomes in Finnish dentate adults

Model*	Estimate	(95% CI)	<i>p</i> -value
Number of teeth ^{\dagger} (<i>n</i>	= 4833)		
Model 1	0.68	(0.44, 0.92)	< 0.001
Model 2	0.46	(0.23, 0.68)	< 0.001
Model 3A	0.29	(0.08, 0.51)	0.007
Number of decayed	teeth [†] ($n = 4825$)		
Model 1	-0.22	(-0.30, -0.14)	< 0.001
Model 2	-0.19	(-0.27, -0.11)	< 0.001
Model 3B	-0.13	(-0.21, -0.06)	< 0.001
Extent of periodonta	l pockets [†] ($n = 4703$)		
Model 1	- 1.78	(-2.73, -0.83)	< 0.001
Model 2	-1.47	(-2.43, -0.50)	0.003
Model 3C	-0.28	(-1.19, 0.63)	0.549
Poor perceived oral	health [‡] ($n = 4821$)		
Model 1	0.73	(0.67, 0.79)	< 0.001
Model 2	0.76	(0.70, 0.83)	< 0.001
Model 3A	0.80	(0.73, 0.87)	< 0.001

*Model 1: adjusted for demographic characteristics (sex, age, marital status and urbanization). Model 2: adjusted for demographic characteristics and SEP indicators (years of education and income). Model 3A: adjusted for demographic characteristics, SEP indicators and oral health-related behaviours (dental attendance, toothbrushing frequency, sugar intake frequency and daily smoking). Model 3B: adjusted for demographic characteristics, SEP indicators and oral health-related behaviours (dental attendance, toothbrushing frequency and sugar intake frequency). Model 3C: adjusted for demographic characteristics, SEP indicators, diabetes, dental plaque and oral healthrelated behaviours (dental attendance, toothbrushing frequency and daily smoking).

[†]Linear regression was fitted. Regression coefficients reported represent changes in the outcome measure per one-point increase in SOC score (across the seven-point range of the SOC scale). [‡]Logistic regression was fitted and odds ratios were reported.

Table 3 Adjusted estimates for the association of years of education with the number of teeth and poor perceived oral health in Finnish dentate adults with different sense of coherence (SOC) levels

SOC level*	Estimate [§]	(95% CI)	Test for interaction
Number of teeth [†] $(n = 4)$	1833)		
Weak SOC	0.44	(0.37, 0.50)	0.046
Moderate SOC	0.40	(0.35, 0.45)	
Strong SOC	0.37	(0.30, 0.43)	
Poor perceived oral hea	$1 th^{\ddagger} (n = 4821)$		
Weak SOC	0.99	(0.96, 1.02)	0.007
Moderate SOC	0.97	(0.95, 0.99)	
Strong SOC	0.95	(0.92, 0.97)	

*Weak and strong SOC levels were calculated as 1 SD below and above the mean-centred SOC score (moderate SOC level) respectively.

[†]Linear regression was fitted. Regression coefficients reported represent changes in the outcome measure per one-point increase in SOC score (across the seven-point range of the SOC scale). [‡]Logistic regression was fitted and odds ratios were reported.

[§]Adjusted for sex, age, marital status, urbanization, years of education, income, dental attendance, toothbrushing frequency, sugar intake frequency, daily smoking, SOC score and the interaction between years of education and SOC score.

[¶]Test for interaction between years of education and SOC score.

There was little evidence for an interactive effect between SOC and sociodemographic factors. SOC modified the association of education with oral health measures (number of teeth and perceived oral health) but not with oral disease measures (decayed teeth and periodontal pockets). Unexpectedly, SOC had opposite roles because it buffered the positive association between education and number of teeth but magnified the negative association between education and poor perceived oral health (a "reverse buffering effect"). The reasons for these findings remain unclear. Previous studies on these issues are not conclusive, with some claiming that SOC may have a buffering effect (Pop-

pius et al. 1999, 2003, Richardson & Ratner 2005) while others remain sceptical (Flannery & Flannery 1990, Ing & Reutter 2003). In addition, two previous studies found that SOC had a "reverse buffering effect" (Feldt 1997, Nielsen et al. 2008). A common explanation for non-significant moderating effects is the exacerbation of measurement errors and restricted variance in the variables included in the interaction term (Baron & Kenny 1986, Richardson & Ratner 2005). However, this would not explain the opposite roles of SOC found in this study. An alternative explanation is that these findings are not actual interactive effects. This is supported by the fact that 26 out of the 28 interactions tested were not significant while the only two significant interactions were small and close to the null hypothesis. Given the number of tests (28 in total), one to two statistically significant interactions at p < 0.05 would have been expected by chance. Indeed, after correcting for multiple testing the two interactions did not anymore reach statistical significance (Bonferroni corrected p > 0.19), suggesting that they are unlikely to be clinically meaningful. This interpretation is further supported by the failure to replicate the moderating role of SOC across both SEP indicators and different oral health outcomes, and the existence of some effects that were in an unexpected direction (reverse-buffering).

Although the present findings support earlier results linking a strong SOC with better adult general health (Poppius et al. 1999, 2003, Kivimäki et al. 2000, Suominen et al. 2001, Ing & Reutter 2003, Surtees et al. 2003, Kouvonen et al. 2008, 2010) and perceived oral health (Savolainen et al. 2005a, 2009), the interpretations should be considered in relation to the limitations of the study. First, the data were cross-sectional, therefore precluding inferences about causal directions between SOC and oral health. Second, due to a clerical error SOC was assessed using a slightly modified version that included 12 out of the 13 items of the original short SOC scale. Despite being different in only one item from the original scale, it is possible that this modified instrument may have measured a phenomenon that is similar but not identical to Antonovsky's SOC construct. Although this could have influenced the results, numerous previous studies have used this abbreviated SOC scale among Finnish adults (Savolainen et al. 2004, 2005a, b, 2009,

Bernabé et al. 2009a, c) and the scale was recently found to also have a reasonable structural validity (Bernabé et al. 2009b). In addition, a previous 4-year prospective study found similar results for the association between SOC and health when using the SOC-13 or even a shorter six-item version (Kivimäki et al. 2000). Third, the levels of inter-examiner agreement for periodontal pockets were lower than those for tooth condition, which implies that the former variable was more prone to measurement bias. This is not a unique characteristic of this survey, but rather a standard feature across epidemiological surveys, reflecting the difficulty to examine and precisely measure periodontal pockets under field circumstances. In this study, inter-examiner agreement for periodontal pockets was regarded as moderate according to the established criteria (Landis & Koch 1977). More importantly, the association between SOC and the extent of periodontal pockets was strong and of similar magnitude to those found for the other clinical outcomes used in this study. Fourth, several community- and individual-level variables considered important in explaining oral health inequalities were not available. Because SOC is related to other important psychosocial determinants of health (Sullivan 1993, Wolff & Ratner 1999, Kivimaki et al. 2002, Holmberg et al. 2004, Konttinen et al. 2008) and the latter are associated with oral health (Sheiham & Nicolau 2005, Sisson 2007), we cannot rule out the possibility that the association between SOC and oral health found in this study could be explained by residual confounding due to unmeasured factors. However, the association between SOC and oral health was observed after controlling for established risk factors for dental caries and periodontal disease and was consistent across different measures of oral health.

Concluding Remarks

This study shows that SOC is an important disposition for the development and maintenance of people's oral health. SOC was positively associated with various aspects of adult oral health such that adults with a strong SOC had more teeth, fewer decayed teeth, less periodontal pockets and better perceived oral health. The link between SOC and

adult oral health was only partly explained by the more favourable oral health-related behaviours among people with a strong SOC. Subject to replication in different populations, the present findings imply that policies and interventions to promote oral health should take into consideration the psychosocial characteristics encompassed by the SOC construct. To date, there are no evidence-based standard interventions to strengthen adult SOC at a population level. However, according to the salutogenesis theory. SOC is shaped by three types of life experiences during the first decades of life, namely consistency, underload-overload balance and participation in socially valued decisionmaking (Antonovsky 1987, 1996). Therefore, it may be possible to strengthen SOC by early life interventions, with the former recently shown in a school programme where changes in SOC were accompanied by improvements in toothbrushing behaviour (Ayo-Yusuf et al. 2008, 2009). However, we still need to fully understand the context in which a strong SOC is developed in order to be able to extend this discussion to public health policy and practice.

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Clinical Relevance

Scientific rationale for the study: Although previous research has found that a strong SOC is associated with better health status, the link between SOC and adult oral health remains largely unexplored.

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Principal findings: A strong SOC was associated with clinically assessed oral health, as indicated by having more teeth, fewer decayed teeth and less periodontal pockets, as well as with good perceived oral health. These associations were par-

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tially explained by oral health-related behaviours.

Practical implications: Policies and interventions to promote oral health may benefit from taking into account the characteristics that define SOC.

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