Social Science & Medicine 130 (2015) 250–258

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Changes in access to structural social capital and its influence on self-rated health over time for middle-aged men and women: A longitudinal study from northern Sweden

Malin Eriksson*, Nawi Ng

Department of Public Health and Clinical Medicine, Epidemiology and Global Health, Umeå University, SE-901 87 Umeå, Sweden

ARTICLE INFO

Article history:
Available online 19 February 2015

Keywords:
Northern Sweden
Social capital
Self-rated health
Longitudinal study
Västerbotten Intervention Program
Gender

ABSTRACT

Until recently, most studies on social capital and health have been cross-sectional making it difficult to draw causal conclusions. This longitudinal study used data from 33,621 individuals (15,822 men and 17,799 women) from the Västerbotten Intervention Program, to analyse how changes in access to individual social capital influence self-rated health (SRH) over time. Two forms of structural social capital, i.e. informal socializing and social participation, were measured. Age, sex, education, marital status, smoking, snuff, physical activity, alcohol consumption, high blood pressure, and body mass index were analysed as potential confounders. The association between changes in access to structural social capital and SRH in the follow-up was adjusted for SRH at baseline, as well as for changes in the socio-demographic and health-risk variables over time. The results support that changes in access to structural social capital over time impact on SRH. Remaining with no/low level of informal socializing over time increased the odds ratio for poor SRH for both men and women (OR of 1.45; 95%CI = 1.22–1.73 among men and OR of 1.56; 95%CI = 1.33–1.84 among women). Remaining with no/low levels of social participation was also detrimental to SRH in men and women (OR 1.14; 95%CI = 1.03–1.26 among men and OR 1.18; 95% CI = 1.08–1.29 among women). A decrease in informal socializing over time was associated with poor SRH for women and men (OR of 1.35; 95%CI = 1.16–1.58 among men and OR of 1.57; 95%CI = 1.36–1.82 among women). A loss of social participation had a negative effect on SRH among men and women (OR of 1.16; 95%CI = 1.03–1.30 among men and OR of 1.15; 95%CI = 1.04–1.27 among women). Gaining access to social participation was harmful for SRH for women (OR 1.17; 95%CI = 1.05–1.31). Structural social capital has complex and gendered effects on SRH and interventions aiming to use social capital for health promotion purposes require an awareness of its gendered nature.

1. Introduction

The association between social capital and health has received considerable attention within public health and epidemiology. Social capital has been defined in many ways, but all agree that it concerns “social networks, the reciprocities that arise from them and the value of these for achieving (mutual) goals” (Schuller et al., 2000, p. 2., parentheses added). This still growing research field reflects a renewed interest in the social determinants of health and a shift in focus from individual risk factors to the broader social environment.

Most health researchers acknowledge that social capital is both a collective and an individual attribute (Kawachi et al., 2008; Eriksson, 2011; Moore et al., 2011). Within health research, the most utilized approach has been the collective approach (Kim et al., 2008; Murayama et al., 2012), which is often referred to as the “social cohesion approach”. Following the definition of Putnam (1993, 2000), this approach views social capital as a characteristic of whole communities in terms of social participation, trust, and reciprocity norms (Kawachi and Berkman, 2000; Szreter and Woolcock, 2004; Kawachi et al., 2008).

This study is based on an individual approach that is often referred to as the “social network approach” and is a less utilized approach to social capital within health research. This approach leans towards sociological definitions of social capital and views it as a valuable resource that is acquired through involvement in

* Corresponding author.
E-mail address: malin.eriksson@epiph.umu.se (M. Eriksson).

http://dx.doi.org/10.1016/j.socscimed.2015.02.029
0277-9536/

social networks (Bourdieu, 1986). Within this approach, social capital is believed to promote health by access to social support and material resources, through the social influence of role models, and by opportunities to learn new skills and develop a sense of belonging (Berkman and Glass, 2000; Berkman et al., 2000; Eriksson, 2011). In addition, social capital is viewed as unequally distributed between population sub-groups within a society (Bourdieu, 1986), why health inequalities might partly be understood by the unequal distribution of social capital.

Social capital contains both structural and cognitive components. Structural forms refer to the actual participation in various networks, and cognitive forms refer to perceptions about network involvement, i.e. there is distinctions between what people do and what people *feel* with regards to social relations (Krishna and Shrader, 2000; Harpham et al., 2002). In addition, a distinction between bonding and bridging social capital is made (Harpham et al., 2002). Bonding social capital refers to the strong attachments that form between people who are similar to each other, i.e. within-group relations, while bridging social capital implies weaker ties between people from different social backgrounds, i.e. "between" group relations (Harpham et al., 2002; Gittell and Vidal, 1998; Putnam, 2000). Cognitive social capital is often measured by perceived trust, safety, reciprocity, and support (Harpham et al., 2002). In this study, we measured two forms of structural social capital, i.e. *social participation* (involvement in formal associations, organizations, etc.) and *informal socializing* (interactions with family, friends, etc.).

There is strong evidence for a positive association between access to individual social capital and health. In their systematic review of the literature on the associations between social capital and physical health, Kim et al. (2008) conclude that the strongest associations are at the individual level. A recent meta-analysis of social capital and health (Gilbert et al., 2013) suggest a strong positive association between social capital and self-rated health at both the collective and individual levels, although the overall effects size estimate were higher at individual level. Further, cognitive forms of social capital have been found to increase the likelihood for good self-rated health (SRH) more than structural forms of social capital (Kim et al., 2008; Nyqvist et al., 2008; Yip et al., 2007; Eriksson et al., 2010). Positive associations between access to individual social capital and self-rated health have been found in studies from several countries such as Belgium (Verhaeghe et al., 2012), Canada (Moore et al., 2011), Finland (Hyyppä and Mäki, 2001, 2003; Nyqvist et al., 2008), Japan (Iwase et al., 2010; Murayama et al., 2013; Miyamoto et al., 2014), Russia (Rose, 2000), Sweden (Mohseni and Lindström, 2008; Eriksson et al., 2010), Taiwan (Song and Lin, 2009), the UK (Giordano et al., 2012; Verhaeghe and Tampubolon, 2012), and the US (Schultsz et al., 2008).

In addition, Muryama et al. (2012) in their review, highlight that social capital does not always generate beneficial effects on health; some forms might negatively affect health outcomes. And, while being beneficial for the health of one population sub-group, the same form of social capital might be harmful for others. Iwase et al. (2010) investigated the associations between bonding and bridging social capital and self-rated health in Japan and found a differential pattern by sex, in that women benefited more from bridging social capital compared to men. Also, when stratifying the analysis by age, they (Iwase et al., 2010) found a similar pattern among mid-aged and older, but the associations were less clear among the younger cohorts. Thus, in line with Gilbert et al. (2013) we believe that there is a further need to analyse how the association between social capital and health may vary for different populations subgroups based on e.g. gender, age and socioeconomic position.

Different forms of social capital might also be more or less accessible to individuals due to characteristics such as gender, age, and ethnicity. Studies have shown that access to all forms of social capital is positively associated with higher socioeconomic positions (Ziersch, 2005; Eriksson et al., 2010). Studies from Indonesia (Silvey and Elmhirst, 2003) and the UK (Campbell et al., 1999) have found that women tend to be more involved in local close-knit bonding networks than men (i.e. bonding social capital), but a study from northern Sweden (Eriksson et al., 2010) found that women were more involved in bridging social networks (i.e. formal associations) compared to men. Further, the access to social capital might differ due to age, since people's involvements in social networks are likely to decrease in later life (Nyqvist et al., 2012).

Despite strong associations between access to individual social capital and good SRH, most research so far has been cross-sectional making it difficult to confirm a causal relation between social capital and health. This has led to the call for more longitudinal studies (Kim et al., 2008). Recent longitudinal studies based on data from the British Household Panel Survey support a causal positive effect of individual social capital (especially trust) on SRH and physiological health (Giordano and Lindström, 2010, 2011; Giordano et al., 2012). Similarly, a recent prospective study from the Netherlands (Waverijn et al., 2014) found that greater individual social capital at baseline was significantly associated with a positive change in SRH at follow up (1–3 years later) among people with somatic chronic diseases. Giordano et al. (2012) found that "generalized trust" at time point $(t-1)$ was positively associated with SRH at time point (t). As they put it, a temporal relationship is the essential criterion to rule out causality, i.e. if an exposure (such as access to social capital) is influencing health outcome (such as SRH), then access to social capital must always precede good SRH. However, this logical assumption requires that the exposure is constant and does not change over time. This is problematic when it comes to social capital because there are reasons to believe that access to social capital does change over time. Similarly, access to social capital is likely to have both long-term as well as immediate effects on SRH. Rather than social capital at time $(t-1)$ influencing health at time (t), we also believe that changes in access to social capital between time point $(t-1)$ and (t) influence SRH at time (t). The need for examining not only changes in health but also changes in social capital over time and has been underlined by others (Waverijn et al., 2014) but too our knowledge, little is known on how access to individual social capital changes over time for men and women and how these changes may influence SRH.

The aims of this study are (i) to assess the level of individual structural social capital over time, and (ii) to investigate whether changes in access to social capital during a 10-year period influence SRH differently in men and women.

2. Materials and methods

This study used the longitudinal database from the Västerbotten Intervention Program (VIP), which is a community-based intervention program for reducing the risk of cardiovascular diseases in Västerbotten County, Sweden (Norberg et al., 2010). The VIP started in the mid-1980s and has been fully integrated into primary healthcare services in the county since 1990. Individuals who turn 40, 50, and 60 years are invited to a routine health examination at their respective healthcare centre. In addition to blood pressure measurement and blood sampling, the respondents are asked to fill in a self-administrated questionnaire covering socio-demographic information, health behaviours, and social networks. Respondents who participated in the baseline VIP in 1990–2003 and returned for the 10-year follow-up in 2000–2013 constituted the panel data in this study.

2.1. Social capital measurements

We measured two forms of structural social capital using questions shown in Table 1. *Informal socializing* was measured by the extent and intensity of interactions with family and friends. *Social participation* was measured by participation in organized activities, clubs, and organizations.

We recoded each of the three informal socializing questions into "medium or high" or "low or no" access. Respondents who answered with two or less people on each question were categorized as having "low or no" access. Accordingly, respondents who answered with three or more people on each question were categorized as having "medium or high" access. Responses from these three questions were later combined to create the informal socializing variable. Respondents were categorized as having no/very low informal socializing (those with low or no access on all three questions), a low level (high access only on one of the three questions), a medium level (high access on two of the three questions), or a high level (high access on all three questions).

We used two questions to construct the social participation variable. Respondents were categorized as having no social participation (those who had not participated in any leisure-time activities or volunteer organizations during the last year), a low level (those who participated 1–2 times in the last year), a medium level (those who participated 1–2 times per month in the last year), or a high level (those who participated at least 1–2 times per week).

We determined changes in informal socializing and social participation between baseline and the 10-year visit (Fig. 1). The following four types of change were observed: a) "remain at no/very low/low level"; b) "negatively changed" if changed from medium/high levels at baseline to no/very low/low levels after 10 years; c) "positively changed " if changed from no/very low/low levels at baseline to medium/high levels at 10 years; and d) "remain at medium/high level".

2.2. Self-rated health measurement

SRH as the outcome variable was based on the following question: *"How do you perceive your overall health during this last year?"* Responses were "very good", "rather good", "fair", "rather poor", and "poor". We dichotomized this variable into "good SRH" (the first two responses) and "poor SRH" (the last three responses).

2.3. Potential confounding variables

Several socio-demographic and health-risk variables were used to control for potential confounding. These included age, sex, education level, marital status, smoking, snuff consumption, physical activity, alcohol consumption, history of blood pressure medication, blood pressure, and body mass index (BMI).

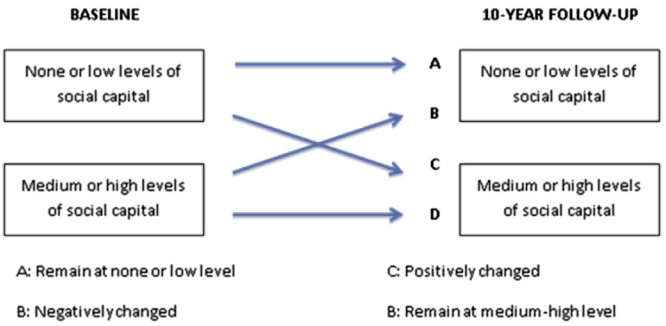

Fig. 1. An illustration of how changes in social capital were assessed between baseline and follow-up.

Education was categorized into basic education (9 years of compulsory education), medium education (12 years of education), or high education (university degree). Marital status was coded as married (including cohabiting) or not married.

Smoking was evaluated by asking "Do you currently smoke?". Respondents were categorized as never smokers, former smokers, or current smokers. Snuff consumption was assessed by asking, "Have you ever used snuff?". Individuals were categorized as never users, former users, or current users.

Physical activity was determined by questions about commuting, recreational time, and physical exercise. Responses from these questions were used to group the respondents as sedentary, moderately active, or physically active. More detailed information on how the physical activity level was assessed has been published elsewhere (Ng et al., 2011).

The risk of alcoholism was measured using the CAGE questionnaire. These questions assess the need to cut down on one's drinking, whether people are annoyed by one's drinking behaviour, feeling guilty about drinking, and the habit of drinking first thing in the morning (Ewing, 1984). Individuals who responded positively to at least two of these questions were categorized as having possible alcoholism.

Blood pressure was measured using a manual sphygmomanometer on the right mid-arm at the level of the heart after 5 min rest. The average systolic and diastolic blood pressures of two measurements were used. Respondents were classified as having high blood pressure if the average systolic blood pressure was ≥140 mm Hg or the diastolic blood pressure was ≥90 mm Hg or

Table 1
Survey questions used to derive social capital variables.

Questions	Response categories
Informal socializing	
How many people do you know and interact with that have the same interests as you?	Six categories: (1) None; (2) 1–2 people; (3) 3–5 people; (4) 6–10 people; (5) 11–15 people; and (6) More than 15 people
How many friends do you have that can come to your house anytime and feel at home? (They wouldn't care if the house was a mess or if you were eating dinner. Family and relatives do not apply here.)	Six categories: (1) None; (2) 1–2 people; (3) 3–5 people; (4) 6–10 people; (5) 11–15 people; and (6) More than 15 people
How many people are there, in your family or among your friends that you can speak your mind openly to without having to think about what you're saying?	Six categories: (1) None; (2) 1–2 people; (3) 3–5 people; (4) 6–10 people; (5) 11–15 people; and (6) More than 15 people
Social participation	
Have you during the last year participated in any leisure-time activity, volunteer organization, etc. with others (sports, study circle, theatre group, choir, political organization)?	Two categories: (1) Yes and (2) No If No, the respondent did not answer the next question.
How often do you participate in organizational activities, club activities, study circles, etc. with others?	Four categories: (1) 1–2 times per year; (2) 1–2 times per month; (3) 1–2 times per week; and (4) Every day

they had been taking blood pressure-lowering medication in the last 14 days (Chobanian et al., 2003).

BMI (kg/m^2) was measured in light clothing. Respondents were grouped as normal weight (BMI < 24.9), overweight (25 ≤ BMI < 30), or obese (BMI ≥ 30).

As for the social capital variables, we also created new variables to reflect changes in these confounding variables. All the potential confounding variables were dichotomized. Education was regrouped into basic education and medium–high education. Smoking and snus use were categorized into never smokers/snus-users and ever smokers/snus-users. Physical activity was regrouped into sedentary and non-sedentary (moderately and physically active). Body mass index was categorised as normal weight and overweight (BMI ≥ 25). A change in each of these variable is defined as changes from one to another category between baseline and 10-year follow-up, resulting in a new variable with four potential groups, i.e. of no risk factor in both baseline and follow-up, with risk factor in baseline but not in follow-up, no risk factor in baseline but with risk factor in follow-up, and with risk factor in both baseline and follow-up.

2.4. Data analysis

Differences in the distribution of socio-demographic and health-risk variables at baseline between men and women were analysed with Chi-square tests. The descriptive data were presented using available non-imputed original data, thus the total sample sizes for each variable do not add up to the total sample size.

We used multiple imputation to impute the missing values with different sets of plausible values, taking into account the uncertainly of the missing data (Sterne et al., 2009). We imputed the missing values for social capital variables, self-rated health, and the socio-demographic and health-risk covariates. As the distributions of these variables might differ in different sexes, age cohorts, and observation periods, we conducted the imputation separately for each of these sub-samples. The different imputed datasets were later combined into single dataset for the whole sample. We conducted ten imputations, each of the imputed data was later used in regression methods to fit our model, and the results were finally combined to obtain the overall estimated effects.

We conducted step-wise logistic regression to assess the independent association between access to social capital and poor SRH at baseline and the 10-year follow-up separately. We tested for interaction between sex and age group with changes in social capital level to assess if stratified analysis was justified. We modelled the association between changes in access to each dimension of structural social capital and SRH in the follow-up independently (Model 1 for informal socializing and Model 2 for social participation) after adjustment for SRH at baseline. In Model 3, we included both dimensions of structural social capital in the regression and adjusted for SRH at baseline. In Model 4, we adjusted Model 3 with changes in all of the socio-demographic and health-risk variables between baseline and 10-year follow-up.

A p-value less than 0.05 signified statistical significance. All statistical analyses were performed in Stata v.13 (StataCorp, 2013). We used the Stata's ice function for the multiple imputation (Royston, 2004).

3. Ethical considerations

The regional ethics committee in Umeå (Dnr 08-131M) approved the VIP database. The research and development unit of the Västerbotten County Council granted permission for data extraction in this study (date 2013-0115).

4. Results

4.1. Characteristics of the study population

During 1990–2013, 96,475 unique individuals aged 40, 50, and 60 years participated in the VIP study. In this paper, we extracted data from all individuals aged 40 and 50 who participated in the VIP in 1990–2003 (n = 46,426 individuals). We did not include individuals aged 60 years because they were not invited to the survey when they turned 70. The 46,426 individuals were invited again when they turned 50 and 60 years old. A total of 33,621 (15,822 men and 17,799 women) responded to the follow-up invitation, yielding a 10-year response rate of 72%. Of them, a total of 21,139 (63%) had complete data for all variables used in this analysis. The proportion of missing data ranged from less than 5% in most variables, 6% in smoking and snus use variables, 7% in social participation, and 19% in alcohol use. All together, 37% respondents had missing data on at least one variable, hence justified the use of multiply imputed data in the analysis.

Appendix 1 shows the baseline distribution of socio-demographics and health-risk variables in men and women. The majority of the respondents had medium education (55.1% in men and 47.7% in women), but more women reported high education than men (30.5% vs. 21.8%, respectively). Over 83% of the respondents were married. The proportions of current smokers were higher in women than men (25.6% vs. 21.9%, respectively). The proportion of men using snuff currently was six times higher than women (26.8% vs. 4.1%, respectively). Elevated blood pressure, overweight and obesity, and sedentary behaviour were more common in men than women. The proportion of men at risk of alcoholism was about four times greater than that of women.

Table 2
Levels of informal socializing, social participation, and self-rated health in the overall population at baseline and follow-up.

Characteristics	Men (N = 15,822)	Women (N = 17,799)
BASELINE	**N (%)**	**N (%)**
Informal socializing		
High level	11,042 (71.6)*	12,950 (74.9)
Medium level	2741 (17.8)	2661 (15.4)
Low level	1160 (7.5)	1136 (6.6)
No/Very low	476 (3.1)	555 (3.2)
Social participation		
High level	4708 (30.7)*	5691 (33.4)
Medium level	3652 (23.8)	3516 (20.6)
Low level	1796 (11.7)	1560 (9.1)
No	5161 (33.7)	6293 (36.9)
Self-rated health		
Good health	11,857 (76.0)*	12,877 (73.5)
Poor health	3742 (24.0)	4646 (26.5)
10-YEAR FOLLOWUP	**N (%)**	**N (%)**
Informal socializing		
High level	11,235 (72.1)*	13,026 (74.6)
Medium level	2697 (17.3)	2688 (15.4)
Low level	1112 (7.1)	1179 (6.8)
No/Very low	538 (3.5)	576 (3.3)
Social participation		
High level	3699 (24.1)*	5064 (29.7)
Medium level	3439 (22.4)	3166 (18.6)
Low level	1688 (11.0)	1426 (8.4)
No	6496 (42.4)	7379 (43.3)
Self-rated health		
Good health	11,815 (75.3)*	12,219 (69.4)
Poor health	3884 (24.7)	5395 (30.6)

Note: * ($p < 0.001$) denote significant difference in the informal socializing, social participation, and self-rated health between men and women.

4.2. Access to social capital and its association to SRH

Table 2 shows the level of access to structural social capital at baseline and at the 10-year follow-up. In both baseline and follow-up, there were slightly more women who reported high level of informal socializing and social participation. Access to informal socializing was quite stable over time. Access to social participation, however, decreased over time in the study population, with an increasing proportion of men and women reporting no social participation at follow up. The proportion of those who reported high level of social participation decreased from 30.7% to 24.1% and from 33.4% to 29.7% in men and women, respectively, between baseline and 10-year follow-up (Table 2). At the 10-year follow-up, 4.6% of the study population remained with no/very low level of informal socializing, 84.1% remained with medium/high level, 5.6% increased their informal socializing, and 5.7% decreased their informal socializing. The corresponding numbers for social participation were 34%, 36.2%, 11.6%, and 18.2% (data not shown). A total of 24% of men and 26.5% of women reported poor SRH in the baseline. The proportion of men who reported poor SRH increased slightly from 24% to 24.7% over 10-year period. The increase was larger among women, 26.5% reported poor self-rated health at baseline, compared to 30.6% at follow up (Table 2).

At baseline, men and women with no/very low level of informal socializing were more likely to report poor SRH than those with high levels of this form of social capital, with a clear dose–response relationship between individuals with different levels of social capital. The effect was less prominent for social participation. When assessed at the 10-year follow-up, the same pattern was for social participation, and the effect of informal socializing attenuated. Being unmarried, being hypertensive, being overweight or obese, having moderate level of physical activity or sedentary behaviour, and having risk of alcoholism were all consistently associated with higher odds of reporting poor SRH among men and women in both baseline and 10-year follow-up. Men and women who were current snuff users and only women who were current smokers had higher odds of reporting poor SRH than those who did not smoke or use snuff at baseline. However, these associations were not observed in the follow-up data (data not shown).

4.3. Changes in access to social capital and its association with SRH

We observed significant interaction effects between sex and changes in both forms of social capitals on self-rated health, shown by the statistically significant difference/non-overlapping 95% confidence intervals of the effect of changes in social capital level on poor self-rated health in men and women (as in Appendix 2). The similar interaction effects were not observed for different age cohorts. Hence, in subsequent analyses, we adjusted for age as potential confounder, and stratified all the analyses by sex.

We investigated the independent association between how changes in access to structural social capital were associated with poor SRH at the 10-year follow-up while controlling for baseline SRH (Models 1 and 2 in Table 3). Men and women who negatively changed (changing from medium/high levels to no/low levels) their levels of both forms of structural social capital had significantly higher ORs for reporting poor SRH compared to those who maintained medium/high access to structural social capital at the 10-year follow-up. The effects of remaining on no/very low or low level of informal socializing and social participation on reporting poor SRH were slightly stronger than for those who had decreased their informal socializing and social participation. An increase in informal socializing and social participation seemed to be unfavourable for reporting good SRH among men and women except for men who had increased access to informal socializing. In Model 3, we included both social capital variables in the regression, and the results did not change significantly though the effects attenuated.

When controlling for changes in other potential socio-demographic and health-risk variables (Model 4 in Table 3), including SRH at baseline, the effect of a decrease in informal socializing on reporting poor SRH remained significant for both men and women. A loss or decrease in social participation increased the risk of reporting poor SRH by about 16% in both men and women. Gaining access to social participation increased the odds of reporting poor SRH only among women with ORs of 1.17 (95% CI = 1.05–1.31). Remaining with no/low level of informal socializing had a negative effect on SRH in the study population in men and women (OR of 1.45, 95%CI = 1.22–1.73 in men and OR of 1.56, 95% CI = 1.33–1.84 in women). Though the effects were weaker, the same detrimental effects were observed among women and men who remained with no/low level of social participation.

Table 3
Regression analysis of the association between changes in access to social capital over 10 years and poor SRH at follow-up.

Determinants	Men (N = 15,822)	Women (N = 17,799)
	OR (95% CI)	OR (95% CI)
MODEL 1		
Informal socializing		
Remain medium/high	1	1
Positively changed	1.07 (0.91–1.26)	1.22 (1.05–1.42)
Negatively changed	1.45 (1.24–1.69)	1.74 (1.51–2.00)
Remain no or low	1.55 (1.31–1.83)	1.83 (1.56–2.14)
MODEL 2		
Social participation		
Remain medium/high	1	1
Positively changed	1.21 (1.06–1.39)	1.23 (1.1–1.38)
Negatively changed	1.25 (1.12–1.40)	1.24 (1.12–1.37)
Remain no or low	1.35 (1.23–1.48)	1.40 (1.29–1.52)
MODEL 3		
Informal socializing		
Remain medium/high	1	1
Positively changed	1.03 (0.87–1.21)	1.18 (1.01–1.37)
Negatively changed	1.39 (1.19–1.62)	1.66 (1.45–1.92)
Remain no or low	1.45 (1.23–1.72)	1.71 (1.46–2.01)
Social participation		
Remain medium/high	1	1
Positively changed	1.20 (1.04–1.37)	1.20 (1.08–1.34)
Negatively changed	1.23 (1.10–1.37)	1.21 (1.09–1.33)
Remain no or low	1.29 (1.17–1.42)	1.31 (1.21–1.43)
MODEL 4		
Informal socializing		
Remain medium/high	1	1
Positively changed	1.03 (0.87–1.21)	1.12 (0.96–1.31)
Negatively changed	1.35 (1.16–1.58)	1.57 (1.36–1.82)
Remain no or low	1.45 (1.22–1.73)	1.56 (1.33–1.84)
Social participation		
Remain medium/high	1	1
Positively changed	1.13 (0.99–1.30)	1.17 (1.05–1.31)
Negatively changed	1.16 (1.03–1.30)	1.15 (1.04–1.27)
Remain no or low	1.14 (1.03–1.26)	1.18 (1.08–1.29)

Note: The numbers represent odds ratios and their 95% confidence intervals derived from 10 imputations.
Model 1: Informal socializing, adjusted for baseline self-rated health and age at follow-up.
Model 2: Social participation, adjusted for baseline self-rated health and age at follow-up.
Model 3: Informal socializing and social participation, adjusted for baseline self-rated health and age at follow-up.
Model 4: Informal socializing and social participation, adjusted for baseline self-rated health, age at follow-up and changes in all of the potential confounders, including education level, marital status, smoking, snuff use, high blood pressure, overweight, physical activity level, and alcohol risk.

5. Discussion

Our results provide evidence on how changes in access to structural social capital could be associated with SRH. Changes in informal socializing and social participation over a 10-year period associated significantly with SRH among middle-aged men and women, even after controlling for several socio-demographic and health-risk variables. However, these effects of the social capital changes on SRH are complex and differ for men and women.

Remaining with no/low level or decreasing informal socializing over a 10-year period significantly increased the OR for poor SRH for men and women. The same detrimental effects of a decrease in social participation, though weaker, were also observed among men and women. Remaining with no/low social participation showed detrimental effect among women and men. Interestingly, a positive change, i.e. an increase in social participation, was harmful for SRH among women.

5.1. Is the access to structural social capital influenced by gender and does it change over time?

A slightly higher proportion of women reported high-level of informal socializing at both baseline and follow-up (Table 2) compared to men. Our findings confirm results from other studies showing that women have more extensive social relations compared to men (Fuhrer and Stansfeld, 2002). Hall (1999) found that women devoted more time visiting friends compared to men in his investigation of social capital in Britain. Kawachi and Berkman (2001) refer to studies showing that women more than men tend to maintain intimate emotional relationship and mobilize social support. However, it is worth noting that our results indicate differences in the size and extent of informal socializing, but say nothing about the quality and satisfaction of such socializing.

A higher proportion of women reported high levels of social participation compared to men, and this discrepancy was significantly greater at the 10-year follow-up (Table 2). This was also found in our previous cross-sectional study from northern Sweden (Eriksson et al., 2010), and women's generally higher involvement in civic associations was also noted by Putnam (2000). Data from Statistics Sweden (SCB, 2003) on associational life do not show any significant differences in the extent of civic engagement between men and women, but a clear gender pattern emerges in the types of associations' men and women are involved in. Swedish women are over-represented in humanitarian associations such as parent–teacher associations and organizations for the disabled, while Swedish men are over-represented in lifestyle associations related to, for example, sports and automobiles (SCB, 2003). The same pattern was observed in Britain, with men tending to be more active in sports and recreation, while women tended to be more active in associations related to health and social services (Lowndes, 2000). Similarly, Son and Lin (2008) found that civic action was gendered in that women were more likely to be involved in "expressive" and voluntary civic actions than men. Thus, women's higher social participation might possibly be understood by gendered expectations of women to be engaged in civil society. Interestingly, our results show that the gender difference in social participation is higher at follow-up despite the overall pattern of decreased levels of social participation at follow-up. This might possible be explained by older women's reduced responsibilities for children living at home, allowing them more time for civic engagements.

Our results show that social participation decreased over time among men and women (Table 2). These findings are consistent with other studies that have shown how opportunities for social participation and voluntary association membership as well as friendship networks decrease with age. Statistics Sweden (SCB, 2003) shows how associational membership in Sweden peaks around 50 years of age but then gradually levels off. McDonald and Mair (2010) investigated social capital over the life course in the US and found that the levels of daily interactions were highest among the youngest age groups but steadily declined after the age of 40 years. Opportunities for social participation and engagement might also decrease in older age due to impairments in health and functional capacity (Leinonen et al., 2002). We found that the levels of informal socializing did not decrease significantly over time in our study population aged 40- and 50-year in the baseline when followed up 10-year later. However, we believe that a decrease in the levels of informal socializing might be seen in a population aged 60 and over, due to decreased labour market involvement at the age of 60, which might limit opportunities for informal socializing with colleagues and friends. The importance of labour related networks may in turn be more significant for men compared to women.

5.2. How do changes in access to structural social capital influence SRH for men and women?

Our results confirm the negative effect of either decreasing or remaining at no/low levels of informal socializing over time on SRH. The effects were stronger among women. This somewhat contradicts results from earlier studies, which found weaker associations between social connections (Kaplan et al., 1988) or bonding social capital (Iwase et al., 2010) and ill health for women compared to men. However, one possible explanation for our finding might be that socializing with a partner (as opposed to friends) might be more important for men, which may compensate for the health effects of informal socializing with friends in older age. A study from the UK on how gender effects patterns of social relations and their impact on health found that men more than women reported higher levels of support from their closest person; often a women and their spouse (Fuhrer and Stansfeld, 2002).

Remaining at no/low levels of social participation had a negative effect on SRH for men and women. A reduction in social participation had the same negative effect on poor SRH for men and women. Giordano and Lindström (2010) similarly found that social participation was significantly associated with SRH over time in their longitudinal study based on data from the British Household Survey. However, they found that remaining at high social participation over a six-year period was only associated with *improved* SRH and not with impaired SRH. Our study further suggests that there might also benegative health effects of decreased social participation over time.

An important finding is that for women, an increase in social participation over a 10-year period increased the OR for poor SRH to the same extent as a negative change or remaining at no/low levels of social participation (Model 4 in Table 3). These results add to previous studies that have suggested that not all forms of social capital have a positive effect on health for everyone. Mitchell and LaGory (2002) found that bonding social capital was associated with mental distress in their study from a southern US city. Kawachi and Berkman (2001) reviewed the literature on social ties and mental health and found that the supporting effects of social connections are not equally shared but are influenced by gendered expectations on women to be the primary supporters of others. Similarly, a study on urban–rural networks during the 1997–1999 Indonesian economic crisis found that women's involvement in bonding social networks had protective effects for *families* during the time of crises but had higher costs than benefits for the women themselves. This was due to gendered expectations that women should care for other family members (Silvey and Elmhirst, 2003). Thus, social connections might increase stress and illness for the

ones who are expected to be the main provider of support to others. The demands on being the main provider of social support might be especially prominent among women aged 40–50 years. This is the period in life (at least in Sweden) when many women still have children living at home and at the same time are most active in the labour market, and this might lead to an overload of demands and increased stress. As discussed above, women's social participation tends to differ from men's. Thus, it is reasonable to believe that during this particular period in life women's social participation is strongly connected to children's activities as a result of higher expectations on women to be involved in civil society and children's activities. The "double burden" of labour and domestic responsibilities is probably most prominent for the middle-aged group of women because "women in Sweden carry out most of the unpaid domestic work in all stages of life, irrespectively of civil status or the presence of children at home" (Harrysson, 2013, p. 18).

5.3. Methodological considerations

A major strength of this study is its longitudinal design covering changes in access to social capital over a 10-year period in a large population (N = 33,621). This allowed us to conduct sex-stratified analyses in understanding how changes in access to social capital over time are associated with SRH in men and women. The VIP dataset, which is one of the global largest cohort datasets on cardiovascular disease prevention, consists of rich socio-demographic and health-risk variables that are controlled as potential confounders in our study. The high response rate in the VIP (up to 70% in recent years) (Norberg et al., 2010) and considerably small 10-year attrition (about 28% "only") compared to other longitudinal studies poses less risk of selection bias.

Selection bias can occur if the reasons for not participating in the health screening are associated with the exposures or outcomes of interest in the study. Despite the high response rate and low attrition rate observed in this study, the findings need to be appraised carefully. Those who did not come for the 10-year follow-up tended to be slightly younger, highly educated, not married, and slightly higher proportions of those with health risks such as smoking, snuff use, hypertension, being overweight, being sedentary, having higher risk of alcoholism, and reporting poorer health. One possible reason for their non-participation in the follow-up is that they might have been seeking healthcare before the follow-up survey due to their poorer risk-factor profiles. We cannot confirm this hypothesis, however, because we do not have access to outpatient registers in Sweden. When comparing their responses to the baseline social capital questions, however, we found very few differences between those who were followed-up and those who were lost to follow-up. For example, 73.3% and 68.6% reported high access to informal socializing, respectively, and 3.2% and 4.8% reported no or very low access to informal socializing. For social participation, 32.1% vs. 29.4% reported high social participation and 35.4% vs. 39.3% reported no social participation, respectively (data not shown).

We have relatively large amount of missing data in one of the variables studied (i.e. 19% missing data in the alcohol risk variable and less than 5% in most of the other variables). The use of multiple imputations is more efficient than other analytical methods for dealing with missing values and ensures sufficient randomness and uncertainty being taken into account in the calculation of standard errors for the parameters of interest (Royston, 2004; Sterne et al., 2009).

Another limitation is that the variables used to measure structural social capital were not primarily designed to assess social capital. Thus, as with many other studies, we constructed our social capital measures based on already available data, which limited the scope of what aspects of social capital could be assessed (Harpham et al., 2002). We had no available data on cognitive dimensions of social capital such as trust, safety, and reciprocity, and we were unable to distinguish between bonding, bridging, and linking social capital. However, we think that our measures of two different forms of structural social capital – informal socializing and social participation – adequately reflect the conceptual idea of structural social capital as defined by others as the "*extent and intensity of associational links or activity*" and "*what people do in terms of social relations*" (Harpham et al., 2002, p. 106). Furthermore, while previous research has found the strongest associations between cognitive social capital and SRH, our study contributes with further knowledge on the impact of structural social capital on SRH.

The use of self-reported measures for both social capital and health raises the potential of measurement error in this study. As outlined by others (Poortinga, 2006) there is a risk that self-rated health and self-reported social capital refer to the same thing, i.e. both could be an expression of general well-being. However, our results showing that the association between social capital and self-rated health goes in both directions (an increase or a decrease in social capital over time were both associated with higher OR for poor self-rated health) indicate that this was not the case. Further, others (Benyamini et al., 2000) have indicated that there might be gender differences in self-rated health in that women have a wider inclusiveness in their self-evaluation of health compared to men. If this is the case, one could expect more women than men to include aspects of social capital in their self-rated health, and thus the risk for overestimating the effects would be greater for women than men. However, our results found associations between changes in social capital and self-rated health for both men and women. The overall validity and predictive power of self-rated health has been established in many studies. Idler and Benyamini in their seminal article reviewed the predictive power of self-rated health as independent predictor of mortality in twenty-seven community studies (Idler and Benyamini, 1997). Subramanian et al. addressed the concern of measurement error using self-reported health measures by analysing data from 69 countries participated in the 2002 World Health Survey, and identified no significant underestimation of poor health among population in different education groups. They argue on the feasibility of using self-reported health measures in epidemiological studies, especially in resource scarce settings (Subramanian et al., 2010).

In this study, we did not focus on understanding the mechanisms on how health-risk variables could affect the association between changes in access to social capital and self-rated health. We have used the information on health-risk changes over time as covariates in the regression analysis. In their paper, Mohnen et al. described that not many researches (only three they were aware of) have focused on understanding the effects of lifestyle behaviours as mediating factors of social capital on health. Their study points out the indirect effect of neighbourhood social capital on health through physical activity, but no mediating effects of moderate alcohol intake, nutrition, and sleep habits were identified (Mohnen et al., 2012). Nieminen et al. also identified the mediating effect of leisure-time physical activity on individual social capital and self-rated health and wellbeing (Nieminen et al., 2013). Further research on the mediating role of health-risk behaviours on the association between social capital and health are warranted, and more advanced analytical methods such as structural equation modelling can shed light to understand this issue.

5.4. Conclusions

Our longitudinal study suggests that structural social capital has complex and gendered effects on SRH. Policies and interventions

aiming to use the concept of social capital in health promotion strategies require an awareness of the gendered nature of social capital. General attempts to increase social participation might be health promoting for men while at the same time stress enhancing for some groups of middle-aged women. Similarly, the health effects of informal socializing might be influenced by gendered expectations of women to be the main provider of support in close social relationships as well as by differences between men and women regarding perceptions and definitions of close relationships.

Acknowledgements

This work was undertaken within the Umeå Centre for Global Health Research at Umeå University, with support from FORTE, the Swedish Research Council for Health, Working Life and Welfare (grant no. 2006-1512). Nawi Ng is also supported by the project "Paths to Healthy and Active Ageing" funded by the Swedish Research Council for Health, Working Life and Welfare, Dnr: 2013-2056. The authors would also like to acknowledge Västerbotten County Council for managing the VIP database.

Appendix 1. Baseline characteristics of men and women in the study population

Characteristics	Men (N = 15,822)	Women (N = 17,799)
	N (%)	N (%)
Highest education level		
Basic education	3625 (23.2)*	3837 (21.8)
Medium education	8623 (55.1)	8416 (47.7)
High education	3407 (21.8)	5376 (30.5)
Marital status		
Married	12,935 (82.8)*	15,022 (85.2)
Not married	2682 (17.2)	2615 (14.8)
Smoking status		
Never smokers	6936 (44.6)*	7930 (45.2)
Former smokers	5212 (33.5)	5132 (29.2)
Current smokers	3400 (21.9)	4496 (25.6)
Snuff user		
Never used	8611 (55.8)*	16,129 (93.1)
Former users	2679 (17.4)	499 (2.9)
Current users	4137 (26.8)	705 (4.1)
Blood pressure		
Normal	11,457 (73.2)*	13,753 (78.3)
Hypertensive	4186 (26.8)	3816 (21.7)
Body mass index		
Normal weight	6692 (42.6)*	10,534 (59.6)
Overweight	7408 (47.2)	5250 (29.7)
Obese	1603 (10.2)	1903 (10.8)
Physical activity level		
Physically active	3775 (24.1)*	2352 (13.4)
Moderately active	9512 (60.8)	12,862 (73.1)
Sedentary	2359 (15.1)	2391 (13.6)
Alcohol risk		
Normal risk	12,013 (87.9)*	14,175 (96.9)
Risk of alcoholism	1656 (12.1)	457 (3.1)

Note: * signifies a significant difference ($p < 0.001$) in the socio-demographic and risk behaviours between men and women.

Appendix 2. Assessment of interaction effects of sex and age with changes in access to social capital in logistic regression model

Variables	OR (95% CI)
Baseline self-rated health	
Good health	1
Poor health	4.03 (3.82–4.26)
Sex	
Male	1
Female	1.51 (1.37–1.67)
Age	
50 year old	1
60 year old	1.21 (1.10–1.33)
Main effect of changes in social capital level (for men and individuals 50-year old)	
Changes in access to informal socializing social capital	
Remain medium/high	1
Positively changed	0.97 (0.79–1.19)
Negatively changed	1.37 (1.13–1.64)
Remain no, very low, or low	1.53 (1.24–1.89)
Changes in access to social participation social capital	
Remain medium/high	1
Positively changed	1.21 (1.03–1.42)
Negatively changed	1.24 (1.08–1.42)
Remain no, very low, or low	1.24 (1.10–1.40)
Joint effect of changes in informal socializing (for women and individuals 60-year old)	
Access to social capital × female sex	
Positively changed – female	1.62 (1.32–1.99)
Negatively changed – female	2.44 (2.00–2.99)
Remain no, very low, or low – female	2.56 (2.05–3.19)
Access to social capital × 60 year age (joint effects)	
Positively changed – 60 year old	1.29 (1.05–1.60)
Negatively changed – 60 year old	1.58 (1.29–1.95)
Remain no, very low, or low – 60 year old	1.62 (1.29–2.03)
Joint effect of changes in social participation (for women and individuals 60-year old)	
Access to social capital × female sex (joint effects)	
Positively changed – female	2.02 (1.48–2.76)
Negatively changed – female	2.22 (1.67–2.94)
Remain no, very low, or low – female	2.07 (1.53–2.80)
Access to social capital × 60 year age (joint effects)	
Positively changed – 60 year old	1.61 (1.19–2.17)
Negatively changed – 60 year old	1.44 (1.09–1.90)
Remain no, very low, or low – 60 year old	1.31 (0.97–1.77)

Note: The logistic regression model used self-rated health in follow-up as outcome, and was adjusted for baseline self-rated health and changes in all of the potential confounders, including education level, marital status, smoking, snuff use, high blood pressure, overweight, physical activity level, and alcohol risk.

References

Benyamini, Y., Leventhal, E., Leventhal, H., 2000. Gender differences in processing information for making self-assessments of health. Psychosom. Med. 62, 354–364.

Berkman, L.F., Glass, T., 2000. Social integration, social networks, social support, and health. In: Berkman, L.F., Kawachi, I. (Eds.), Social Epidemiology. Oxford University Press, New York, pp. 137–173.

Berkman, L.F., Glass, T., Brissette, I., Seeman, T.E., 2000. From social integration to health: Durkheim in the new millennium. Soc. Sci. Med. 51, 843–857.

Bourdieu, P., 1986. The forms of capital. In: Richardson, J.G. (Ed.), Handbook of Theory and Research for the Sociology of Education. Greenwood Press, Westport, Connecticut, pp. 241–258.

Campbell, C., Wood, R., Kelly, M., 1999. Social Capital and Health. Health Education Authority, London.

Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Green, L.A., Izzo Jr., J.L., et al., 2003. The seventh report of the joint National committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. JAMA 289, 2560–2572.

Eriksson, M., 2011. Social capital and health – implications for health promotion. Glob. Health Action 4, 5611.

Eriksson, M., Dahlgren, L., Janlert, U., Weinehall, L., Emmelin, M., 2010. Social capital,

gender, and educational level - impact on self-rated health. Open Public Health J. 3, 1–12.
Ewing, J.A., 1984. Detecting alcoholism. The CAGE questionnaire. JAMA 12, 1905–1907.
Fuhrer, R., Stansfeld, A., 2002. How gender affects patterns of social relations and their impact on health: a comparison of one or multiple sources of support from "close persons". Soc. Sci. Med. 54, 811–825.
Gilbert, K.L., Quinn, S.C., Goodman, R.M., Butler, J., Wallace, J., 2013. A meta-analysis of social capital and health: a case for needed research. J. Health Psychol. 18, 1385–1399.
Giordano, N.G., Björk, J., Lindström, M., 2012. Social capital and self-rated health – a study of temporal (causal) relationships. Soc. Sci. Med. 75, 340–348.
Giordano, N.G., Lindström, M., 2010. The impact of changes in different aspects of social capital and material conditions on self-rated health over time: a longitudinal cohort study. Soc. Sci. Med. 70, 700–710.
Giordano, N.G., Lindström, M., 2011. Social capital and change in psychological health over time. Soc. Sci. Med. 72, 1219–1227.
Gittell, R., Vidal, A., 1998. Community organizing. Building social capital as a development strategy. Sage Publications, Thousands Oaks, California.
Hall, P., 1999. Social capital in Britain. Br. J. Polit. Sci. 29, 417–461.
Harpham, T., Grant, E., Thomas, E., 2002. Measuring social capital within health surveys: key issues. Health Policy Plan. 17, 106–111.
Harrysson, L., 2013. An Equal Share, That's My Medicine (Doctoral dissertation). Umeå University, Umeå.
Hyyppä, M.T., Mäki, J., 2001. Individual-level relationships between social capital and self-rated Health in a bilingual community. Prev. Med. 32, 148–155.
Hyyppä, M.T., Mäki, J., 2003. Social participation and health in a community rich in stock of social capital. Health Educ. Res. 18, 770–779.
Idler, E.L., Benyamini, Y., 1997. Self-rated health and mortality: a review of twenty-seven community studies. J. Health Soc. Behav. 38, 21–37.
Iwase, T., Suzuki, E., Fujiwara, T., Takao, S., Doi, H., Ichiro, K., 2010. Do bonding and bridging social capital have differential effects on self-rated health? A community based study in Japan. J. Epidemiol. Community Health 66, 557–562.
Kaplan, G.A., Salonen, J.T., Cohen, R.D., 1988. Social connections and mortality from all causes and from cardiovascular disease: prospective evidence from Eastern Finland. Am. J. Epidemiol. 128, 370–380.
Kawachi, I., Berkman, L., 2000. Social cohesion, social capital, and health. In: Berkman, L.F., Kawachi, I. (Eds.), Social Epidemiology. Oxford University Press, New York, pp. 174–190.
Kawachi, I., Berkman, L., 2001. Social ties and mental health. J. Urban Health Bull. N. Y. Acad. Med. 78, 458–467.
Kawachi, I., Subramanian, S.V., Kim, D., 2008. Social capital and health: a decade of progress and beyond. In: Kawachi, I., Subramanian, S.V., Kim, D. (Eds.), Social Capital and Health. Springer, New York, pp. 1–26.
Kim, D., Subramanian, S.V., Kawachi, I., 2008. Social capital and physical health: a systematic review of the literature. In: Kawachi, I., Subramanian, S.V., Kim, D. (Eds.), Social Capital and Health. Springer, New York, pp. 139–190.
Krishna, A., Shrader, E., 2000. Cross-cultural Measures of Social Capital: A Tool and Results from India and Panama. Social Capital Initiative, Working paper No. 21. The World Bank, Washington DC.
Leinonen, R., Heikkinen, E., Jylhä, M., 2002. Changes in health, functional performance and activity changes in self-rated health. A 10-year follow-up study in older people. Arch. Gerontol. Geriatr. 35, 79–92.
Lowndes, V., 2000. Women and social capital: a comment on Hall's 'Social capital in Britain'. Br. J. Polit. Sci. 30, 533–537.
McDonald, S., Mair, C.A., 2010. Social capital across the life course: age and gendered patterns of network resources. Sociol Forum 25, 335–359.
Miyamoto, K., Iwakuma, M., Nakayama, T., 2014. Social capital and health: implication form health promotion by lay citizens in Japan. Glob. Health Promot. 1757–9759.
Mitchell, C.U., LaGory, M., 2002. Social capital and mental distress in an impoverished community. City Community 1, 199–222.
Mohseni, M., Lindström, M., 2008. Social capital, trust and self-rated health: a population-based study in southern Sweden. Scand. J. Public Health 36, 28–34.
Mohnen, S.M., Volker, B., Flap, H., Groenewegen, P.P., 2012. Health-related behavior as a mechanism behind the relationship between neighborhood social capital and individual health–a multilevel analysis. BMC Public Health 12, 116.
Moore, S., Bockenholt, U., Daniel, M., Frohlich, K., Kestens, Y., Richard, L., 2011. Social capital and core network ties: a validation study of individual-level social capital measures and their association with extra- and intra-neighborhood ties, and self-rated health. Health Place 17, 536–544.
Murayama, H., Fujiwara, Y., Kawachi, I., 2012. Social capital and health: a review of prospective multilevel studies. J. Epidemiol. 22, 179–187.
Murayama, H., Nishi, M., Matsuo, E., Nofji, Y., Shimizu, Y., Taniguchi, Y., Fujiwara, Y., Shinkai, S., 2013. Do bonding and bridging social capital affect self-rated health, depressive mood and cognitive decline in older Japanese? A prospective cohort study. Soc. Sci. Med. 98, 247–252.
Ng, N., Soderman, K., Norberg, M., Ohman, A., 2011. Increasing physical activity, but persisting social gaps among middle-aged people: trends in Northern Sweden from 1990 to 2007. Glob. Health Action 4, 6347.
Nieminen, T., Prattala, R., Martelin, T., Harkanen, T., Hyyppa, M.T., Alanen, E., et al., 2013. Social capital, health behaviours and health: a population-based associational study. BMC Public Health 13, 613.
Norberg, M., Wall, S., Boman, K., Weinehall, L., 2010. The Västerbotten Intervention Programme: background, design and implications. Glob. Health Action 3, 4643.
Nyqvist, F., Finnäs, F., Jakobsson, G., Koskinen, S., 2008. The effect of social capital on health: the case of two language groups in Finland. Health Place 14, 347–360.
Nyqvist, F., Nygård, M., Jakobsson, G., 2012. Social participation, interpersonal trust, and health: a study of 65- and 75-year-olds in western Finland. Scand. J. Public Health 40, 431–438.
Poortinga, W., 2006. Social capital: an individual or collective resource for health? Soc. Sci. Med. 62, 292–302.
Putnam, R.D., 1993. Making Democracy Work: Civic Traditions in Modern Italy. Princeton University Press, Princeton, New Jersey.
Putnam, R.D., 2000. Bowling Alone: The Collapse and Revival of American Community. Simon & Schuster, New York.
Rose, R., 2000. How much does social capital add to individual health? a survey study of Russians. Soc. Sci. Med. 51, 1421–1435.
Royston, P., 2004. Multiple imputation of missing values. Stata J. 4, 227–241.
SCB, 2003. Associational Life in Sweden. General welfare, social capital, training in democracy. Statistics Sweden, Stockholm. Available at: http://www.scb.se/statistik/LE/LE0101/2003M00/LE101SA0301.pdf.
Schuller, T., Baron, S., Field, J., 2000. Social capital: a review and critique. In: Baron, S., Field, J., Schuller, T. (Eds.), Social Capital: Critical Perspectives. Oxford University Press, New York, pp. 1–38.
Schultsz, J., O'Brien, A.M., Tadesse, B., 2008. Social capital and self-rated health: results from the US 2006 social capital survey of one community. Soc. Sci. Med. 67, 606–617.
Silvey, R., Elmhirst, R., 2003. Engendering social capital: women workers and rural-urban networks in Indonesia's crisis. World Dev. 31, 865–879.
Son, J., Lin, N., 2008. Social capital and civic action: a network-based approach. Soc. Sci. Med. 37, 330–349.
Song, L., Lin, N., 2009. Social capital and health inequality: evidence from Taiwan. J. Health Soc. Behav. 50, 149–163.
StataCorp., 2013. Stata Statistical Software: Release 13. StataCorp LP, College Station, TX.
Sterne, J.A., White, I.R., Carlin, J.B., Spratt, M., Royston, P., Kenward, M.G., et al., 2009. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. BMJ 338, b2393.
Subramanian, S.V., Huijts, T., Avendano, M., 2010. Self-reported health assessments in the 2002 World Health Survey: how do they correlate with education? Bull. World Health Organ. 88, 131–138.
Szreter, S., Woolcock, M., 2004. Health by association? Social capital, social theory, and the political economy of public health. Int. J. Epidemiol. 33, 650–667.
Verhaeghe, P.-P., Pattyn, E., Bracke, P., Verhaege, M., Van De Putte, B., 2012. The association between network social capital and self-rated health: pouring old wine in new bottles? Health Place 18, 358–365.
Verhaeghe, P.-P., Tampubolon, G., 2012. Individual social capital, neighborhood deprivation, and self-rated health in England. Soc. Sci. Med. 75, 349–357.
Waverijn, G., Wolfe, M.K., Mohnen, S., Rijken, M., Spreeuwenberg, P., Groenewegen, P., 2014. A prospective analysis of the effect of neighborhood and individual social capital on changes in self-rated health of people with chronic illness. BMC Public Health 14, 675.
Yip, W., Subramanian, S.V., Mitchell, A.D., Lee, D.T.S., Wang, J., Kawachi, I., 2007. Does social capital enhance health and well-being? Evidence from rural China. Soc. Sci. Med. 64, 35–49.
Ziersch, A.M., 2005. Health implications of access to social capital: findings from an Australian study. Soc. Sci. Med. 61, 2119–2213.