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Neighborhood linking social capital as a predictor of drug abuse: A Swedish national cohort study

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Abstract

Aims—This study examines the association between the incidence of drug abuse (DA) and linking (communal) social capital, a theoretical concept describing the amount of trust between individuals and societal institutions.

Methods—We present results from an 8-year population-based cohort study that followed all residents in Sweden, aged 15–44, from 2003 through 2010, for a total of 1,700,896 men and 1,642,798 women. Linking social capital was conceptualized as the proportion of people in a geographically defined neighborhood who voted in local government elections. Multilevel logistic regression was used to estimate odds ratios (ORs) and between-neighborhood variance.

Results—We found robust associations between linking social capital and DA in men and women. For men, the OR for DA in the crude model was 2.11 [95% confidence interval (CI) 2.02–2.21] for those living in neighborhoods with the lowest vs. highest level of social capital. After accounting for neighborhood level deprivation, the OR fell to 1.59 (1.51–1.68). The ORs remained significant after accounting for age, family income, marital status, country of birth, education level, and region of residence, and after further accounting for comorbidities and family history of comorbidities and family history of DA. For women, the OR decreased from 2.15 (2.03–2.27) in the crude model to 1.31 (1.22–1.40) in the final model, adjusted for multiple neighborhood-level, individual-level variables, and family history for DA.

Conclusions—Our study suggests that low linking social capital may have significant independent effects on DA.

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Contributors

JS and KS developed the initial concept for the study. JS designed the study and data collection tools and coordinated data collection, with advice from MW, KK and KS. XL and CS conducted the data analysis with advice from JS and KS. All authors contributed to interpretation and JS wrote the first draft of the manuscript. All authors contributed to and approved the final manuscript.

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Conflicts of interest declaration

None.

Keywords

Neighborhood; Linking social capital; Socioeconomic factors; Drug abuse

1. Introduction

Drug abuse (DA) has been a recognized public health concern for decades with the recognition that the development of DA is caused by a constellation of individual and neighborhood-level factors. One important aspect of research on the social context of DA has been on the relationship between neighborhood-level deprivation and individual-level DA.

In general, many studies have examined the contribution of neighborhood social deprivation effects on DA after “adjustment” for potential confounding factors including individual-level socioeconomic status (SES) (Boardman, Finch, Ellison, Williams, & Jackson, 2001; Hoffmann, 2002; Schroeder et al., 2001). However, a recent review found only a significant neighborhood effect on DA in 19.4% of 64 studies. In addition, 6.5% was significant in the opposite direction and 74.1% was not significant (Karraker-Jaffe, 2011). This is possibly due to methodological limitations, such as small and/or too homogeneous samples, cross-sectional designs, use of imprecise boundaries or large geographic areas, and single (vs. composite) indicators of area-level deprivation. Although linking social capital is the main focus in this study it is important to adjust for the social deprivation effect as a potential confounder.

Kawachi and Berkman (I Kawachi & Berkman, 2000) described social capital as a clean collective characteristic, an attribute of the neighborhood to which the individual belongs. It has been associated with democracy (Putnam, 1993, 2000), economic wealth (Holzmann & Jorgensen, 1999; Woolcock & Narayan, 2000), violent crime (Sampson, Raudenbush, & Earls, 1997), self-rated health (Kawachi, Kennedy, & Glass, 1999; Sundquist & Yang, 2007), coronary heart disease (Sundquist, Johansson, Yang, & Sundquist, 2006), mental health (Hamano et al., 2010; Lofors & Sundquist, 2007) and other health outcomes (Green et al., 2000; Hyypä & Mäki, 2001; Kawachi, Kennedy, & Lochner, 1997; Sundquist et al., 2006).

One aspect of social capital is linking social capital, a rather new theoretical concept introduced in 2004 (Szreter & Woolcock, 2004). It emphasizes the importance of social ties between individuals and political institutions in a society, including norms of trust across power and authority gradients in building and maintaining community health. As conceptualized this way, low linking social capital may be linked to people's health and wellbeing.

The process of social and emotional literacy is a social and behavioral development of skills by which children learn vertical trust from parents, teachers, and other adults how to participate in a honest and trustful way in social life (Catalano, Kosterman, Hawkins, Newcomb, & Abbott, 1996). Attitudinal and behavioral defiance of basic rules of conduct is related to later drug use. Theories of social control emphasize that low bonding to school predicts later violence among youth (Catalano et al., 1996). A community that is

characterized of a lower level of linking social capital is according to this theoretical framework also more disorganized because such pathologic developmental social processes may contribute to a higher availability of drugs. The social development model is grounded in criminological theory that incorporates research on the etiology of different forms of antisocial behavior and is a general theory of human behavior that hypothesizes similar developmental processes leading to antisocial outcomes.

We hypothesized that linking social capital, that is a collective neighborhood characteristic, is associated with DA. We examined the association between linking social capital and DA after accounting for potential confounding factors, such as neighborhood-level deprivation, individual-level sociodemographics, comorbidities and family history of DA.

2. Methods

2.1. Study participants

This 8-year population-based cohort study included all residents in Sweden aged 15–44, i.e., a total of 1,700,896 men and 1,642,798 women. These individuals were followed from 2003 until death, emigration, or the end of the study (31 December 2010). Individuals born between 1960 and 1990 were included in the analysis. As our objective was to analyze the neighborhood impact on first recorded DA events, we excluded individuals who were not registered in Sweden in 2003. We also excluded individuals previously registered with DA.

2.2. Data sources

We used linked data from multiple Swedish nationwide registries. Data were linked using the unique 10-digit personal identification numbers assigned at birth or immigration to all Swedish residents. These personal identification numbers were replaced with serial numbers to ensure anonymity. The following sources were used to create our unique DA dataset: the Total Population Register, which contains annual data on socio-demographic characteristics, such as education and marital status; the Multi-Generation Register, which provides information on family relationships; the Swedish Hospital Discharge Register, which contains data on all hospitalizations (including those for DA) for all Swedish residents; the Swedish Prescribed Drug Register, which contains details of all prescriptions in Sweden picked up by patients between 2005 and 2010; the Outpatient Care Register, which contains information from all outpatient visits for the period 2001–2010; the Crime Register, which contains information on all crimes, including those related to DA, for 1998–2007; the Swedish Mortality Register, which contains information on causes of death; and the Longitudinal Integration Database for Health Insurance and Labor Market Studies (LISA), containing annual information on socio-economic factors for all individuals from 16 years of age.

2.3. Outcome variables

Our outcome variable was first recorded event of registration for DA during the study period. Individuals were deemed to have their first recorded event of DA if they fulfilled any of the criteria below. DA patients (1/31/2003–12/31/2010) diagnosed with DA before 2003 were excluded to enhance the likelihood of enrolling “true” incident cases.

Incident cases of DA were identified in the Swedish Hospital Discharge, Swedish Mortality, and Outpatient Care Registers using the following codes from the tenth revision of the International Classification of Disease: ICD-10 codes for mental and behavioral disorders due to psychoactive substance use (F10-F19), except for those due to alcohol (F10) or tobacco (F17).

Cases of DA in the Crime Register were identified by codes 5011 and 5012 which reflect crimes (drug holding) related to DA. Crimes relating only to alcohol abuse or the trafficking of illicit drugs were excluded.

Individuals who picked up more than four defined daily doses (DDD) of hypnotics or sedatives (Anatomical Therapeutic Chemical [ATC] Classification System codes N05C and N05BA) or opioids (ATC Classification System code N02A) over a 12-month period were identified using the Prescribed Drug Register. There is no established definition for pathological intake of hypnotics/sedatives or opioids. In order to minimize false positive cases of DA, we chose a relatively high cutoff and excluded individuals diagnosed with cancer (ICD 10 codes C00–C99, D00–D48) as they may have a high use of opioids.

The greatest numbers of individuals with DA were identified in the Crime Register, followed by the Outpatient Care Register, Hospital Discharge Register, and Prescribed Drug Register.

2.4. Neighborhood of residence

To examine the effect of the exposure (neighborhood level of linking social capital), all individuals were geocoded to their neighborhoods of residence. Small area market statistics (SAMS)—small administrative areas in Sweden whose average population is 2000 in Stockholm and 1000 in the rest of Sweden—were used to define neighborhoods. The boundaries of SAMS include similar types of housing construction, meaning that SAMS neighborhoods are comparatively homogeneous in terms of socioeconomic structure. Data on SAMS covering the whole of Sweden ($n = 9119$) were obtained from the Swedish government-owned statistics bureau, Statistics Sweden.

2.5. Predictor variable

Neighborhood linking social capital was conceptualized as the number of people in the neighborhood (SAMS) who voted in local government elections divided by the number of people in the neighborhood who were entitled to vote. Neighborhoods were divided into the following three groups based on the proportion of residents who voted: (Boardman et al., 2001) low, (Boydell, McKenzie, van Os, & Murray, 2002) intermediate, and (Callas, Pastides, & Hosmer, 1998) high. Group 1 comprised the 20% of neighborhoods with the lowest proportions of voters (< 74.0%); group 2 comprised the 60% of neighborhoods with intermediate proportions of voters (74.1–82.0%); and group 3 comprised the 20% of neighborhoods with the highest proportions of voters (>82.0%).

2.6. Neighborhood deprivation index (NSES)

We created a baseline (2002) neighborhood deprivation variable, neighborhood socioeconomic status (NSES), for each of the SAMS neighborhoods using data for all

residents in the neighborhood aged 25–64 years, i.e., the working-age population, which is assumed to have a stronger impact on the neighborhood than other population subgroups, such as children, students and retirees. The deprivation index was defined as: proportion of residents with low education (9 years or less), proportion of residents with low household incomes (less than half the median income), proportion of unemployed residents, and proportion of individuals receiving social assistance (Szreter & Woolcock, 2004). The index was kept as a continuous variable, ranging between –3.1 and 11.5, with the values for 50% of all neighborhoods lying between –0.9 and 0.6. A higher value indicated higher neighborhood deprivation.

2.7. Individual-level variables

Age—Age was categorized as 15–19, 20–24, 25–29, 30–34, 35–39, and 40–44 years.

Sex—Separate analyses were performed for women and men.

Education level—Individual level of education was divided into three groups: Compulsory school or less (9 years), Practical high school or some theoretical high school (10–11 years), and Theoretical high school and/or college (12 years).

Marital status—Married/cohabiting or never married/widowed/divorced.

Country of birth—Categorized as Sweden, Western countries (Western Europe, USA, Canada, Oceania), and Other countries.

Family income—Annual family income divided by the number of people in the family. The final variable was calculated as empirical quartiles from the distribution.

Region of residence—large cities (Stockholm, Gothenburg, Malmö), northern Sweden, and southern Sweden (excluding large cities).

Comorbidity was defined as the first or second main diagnosis in the Hospital Discharge Register as registered 5 years before the baseline (1997–2010) of 1) chronic obstructive pulmonary disease (COPD) (J40–J49), 2) alcoholism and alcohol-related liver disease (F10 and K70), 3) and psychiatric disorders (F00–F09, F17, F20–F99).

Family history of comorbidity and family history of drug abuse were defined as the first-degree relatives (fathers, mothers or siblings) diagnosed in the Hospital Discharge Register.

2.8. Statistical methods

Multilevel logistic regression was performed with individuals at the first level and neighborhoods at the second level (Larsen, Petersen, Budtz-Jørgensen, & Endahl, 2000; Snijders & Bosker, 1999). Logistic regression was considered to be a good approximation of Cox's proportional hazard model because of the large numbers, a relatively low incidence rate, risk ratios of moderate size, and a relatively short follow-up period (Callas et al., 1998). The fixed effects are presented as odds ratios (ORs) with 95% confidence intervals (CIs). The random effects were calculated as the variance between neighborhoods and the

explained variance. We performed separate analyses for women and men. We created six models: Model 0 was an empty or unconditional model; Model 1 included the social capital variable; Model 2 also included a deprivation index, neighborhood socioeconomic status (NSES); Model 3 included the neighborhood-level variables and age; Model 4 included the neighborhood-level variables, age, and the other individual-level sociodemographic variables; and Model 5 also included the comorbidity variables and family history of comorbidities and family history of DA. MLwiN software was used to perform the analyses (Rasbash et al., 2000).

The basic logistic model used is given by the formula:

$$y_{ij} = \exp. \left((f_{ij} + u_{0j}) / (1 + \exp. (f_{ij} + u_{0j})) + e_{0ij} Z_{0ij} \right)$$

where f_{ij} denotes the fixed part of the model, u_{0j} denotes the neighborhood random effect, and z_{0ij} denotes the estimated binomial standard variation and equals $[\pi_{ij}(1 - \pi_{ij})]$. The first-level variance is constrained to unity. These two terms ensure the correct specification of the binomial variance.

We next calculated the second-level (i.e. neighborhood-level) intercept variance. The proportion of the second-level variance explained by the different variables was calculated as:

$$V_{\text{Explained}} = (V_0 - V_1) / V_0 \times 100$$

where V_0 is the second-level variance in the initial model and V_1 the second-level variance in the other models.

The intra-class correlation (ICC) (i.e. the intra-neighborhood correlation) expresses the proportion of the total variance that is at the neighborhood level. It can be estimated by different procedures in multilevel logistic regression. We used the latent variable method (Snijders & Bosker, 1999):

$$ICC = \frac{V_n}{V_n + \pi^2/3}$$

where V_n represents the variance between neighborhoods and $\pi^2/3$ represents an approximation of the variance between individuals.

Possible cross-level interactions were tested. We did not test for random slopes or heterogeneity between the SAMS neighborhoods since there was little variance left in the final models. Parameters were estimated by second-order penalized quasi-likelihood. We systematically explored extra-binomial variation in all models and found no evidence of under- or over-dispersion.

2.8.1. Geographic Information Systems (GIS) analyses—Neighborhood linking social capital, NSES and DA in Malmö, the third largest city in Sweden, are displayed in maps as spatial patterns. The maps were constructed in ArcGIS (v.10).

3. Results

Of the 3,343,694 women and men in this 8-year cohort, 65,891 (2.0%) met our criteria for a first registration of DA between January 2003 and December 31, 2010. The population distribution and number of DA events by sociodemographic characteristics, as well as age-standardized DA-rates by level of linking social capital, are presented in Table 1.

Approximately three times as many men were registered with DA compared to women. Of those registered with DA, 91% were never married and 80% were born in Sweden. The DA rates were highest among those aged 15–19, followed by those aged 20–24. Of the 3,343,694 individuals aged 15–44, 28%, 54% and 18% lived in neighborhoods characterized by low, intermediate, and high linking social capital, respectively.

3.1. Fixed effects

Table 2 presents ORs with 95% CIs for the association between linking social capital and DA in men aged 15–44 years. There was a gradient between linking social capital and DA, with men living in neighborhoods with low linking social capital being more likely to be subsequently registered with DA compared with those living in neighborhoods with high linking social capital (OR = 2.11). The OR decreased to 1.62 after accounting for neighborhood deprivation and age. Men living in neighborhoods with intermediate linking social capital were also more likely to be registered with DA (OR = 1.21) than those in high linking social capital neighborhoods. After adjusting for multiple individual socioeconomic confounders (Model 4) and comorbidities and family history of comorbidities and family history of DA (Model 5), the ORs for DA for neighborhoods with low and intermediate linking social capital decreased to 1.38 and 1.17, respectively, but remained significant. There were also strong associations between most of the individual-level variables and DA. For example, men with low individual income, living alone, born in a non-Western country, and with low education level had higher odds of DA (OR = 1.52, 1.77, 1.93, and 2.66, respectively) after adjusting for all other individual socioeconomic factors and comorbidities (Table 2).

Table 3 shows ORs and 95% CIs for the association between linking social capital and DA in women. As with men, there was a clear and significant gradient between low linking social capital and DA in women. Female residents of neighborhoods with low and intermediate linking social had ORs for DA of 1.31 and 1.16, respectively, in the final model. Low income and low educational level were highly associated with DA (OR = 1.61 and 3.08, respectively).

3.2. Interactions

For women, there were no significant interactions between linking social capital and the individual-level variables as well as with neighborhood deprivation (data not shown). For men, we found two statistically significant interactions (Table 4): for the variables

neighborhood deprivation and individual education. For men living in high deprivation neighborhoods, the odds of DA decreased from OR = 1.71 to 1.20 when the level of social capital increased. In contrast, for men living in low deprivation neighborhoods, the odds of DA were rather similar in all types of neighborhoods. For men with a high educational level, the odds of DA were similar in all three types of neighborhoods whereas for men with a middle (OR = 2.57) and low level of education (OR = 3.34), the odds of DA decreased to 1.76 and 2.33, respectively, when the level of social capital increased. When including these interaction terms in the model, there were only minor changes in the ORs with the exception for low educational status where the odds ratio for DA increased (Supplementary Table 1).

Supplementary Table 2 shows for all individuals the distribution of population by family income and linking social capital.

We also performed a sensitivity analysis using the outpatient and hospital discharge data separately and the ORs were very similar to the main results in the present study (Supplementary Table 4).

3.3. Random effects

3.3.1. Linking social capital—The between-neighborhood variance (ICC) was over 1.96 times higher than the standard error in the crude model (Tables 2 and 3, Model 1), indicating that there were significant differences in linking social capital between neighborhoods. After inclusion of age (Model 3) and the other individual-level variables (Model 4), the between-neighborhood variance decreased, but remained significant. The explained variance increased after inclusion of the individual-level variables, reaching 71% for men and 75% for women in Model 5. This implies that the neighborhood- and individual-level variables partly explained the between-neighborhood variance in linking social capital.

3.3.1.1. Linking social capital and NSES in Malmö, Southern Sweden: Fig. 1 shows the geographic distribution of the population aged 15–44, levels of linking social capital, and age-standardized DA rates in Malmö. A separate multilevel regression analysis was conducted for the association between linking social capital and DA in residents of Malmö aged 15–44 years (Supplementary Table 3). The association between linking social capital and DA seemed to be stronger in Malmö than that for Sweden as a whole.

4. Discussion

In this 8-year cohort study, we found that as linking social capital decreased, the odds of DA increased. The average neighborhood effect on DA (fixed effect) remained significant after inclusion of the neighborhood-level deprivation index and the individual-level socioeconomic factors, comorbidity variables, and family history for DA. The between-neighborhood variance indicated significant differences in total DA between neighborhoods, which were partly explained by the neighborhood-level and individual-level variables (random effects).

Our finding of a strong association between linking social capital and DA are consistent with a population-based survey from Sweden showing that political/vertical trust in the Swedish

parliament was significantly and negatively associated with DA, defined as cannabis smoking (Lindström, 2008). In this study we used participation in local governmental elections as an indicator of vertical trust or linking social capital. Civic engagement in general has been shown to be associated with political engagement and political participation (Verba, Lehman Schlozman, & Brady, 1995). It is possible that people in neighborhoods characterized by low linking social capital are at risk of DA, because they may be less integrated with the norms and values of the society as a whole.

The decrease in OR, from 2.11 to 1.59 in men and from 2.15 to 1.65 in women, after adjusting for a composite neighborhood level deprivation index indicates that social deprivation may represent a confounder in the association between low linking social capital and DA. However, we cannot exclude the possibility of reverse causality.

Although the mechanisms underlying the association between linking social capital and DA remain to be established, neighborhood linking social capital may reflect how society is organized at the neighborhood level. As in the US and many other Western countries, local governments in Sweden have a great deal of power because they have the rights to apply taxes and are responsible for city planning, social services, schools, and health care. Local politicians must distribute key services to their local population, i.e. their voters. They must build community trust via repeated interaction with their citizens, and many of them have face-to-face contact with potential voters in the local neighborhood.

4.1. Strengths and limitations

This study makes a contribution to previous research because it is the first large-scale multilevel study to examine the association between linking social capital and DA, after accounting for neighborhood-level social deprivation and multiple individual-level socioeconomic factors and comorbidities. It is the largest study to date with a study population comprising 1,700,896 men and 1,642,798 women aged 15–44 years living in 9119 small neighborhoods, each with around 1000 residents (2000 for those in Stockholm). The use of small homogenous neighborhoods is an advantage compared to larger areas noted by a review of social capital (Whitley & McKenzie, 2005) possibly because the immediate neighborhood may contribute most to etiological pathways among individuals suffering from mental disorders (Boydell et al., 2002) including DA. In addition, our analyses were enhanced by the almost 100% complete socioeconomic, hospital admission, crime, and mortality data. Furthermore, by using a multilevel model we were able to: 1) separate the neighborhood effect on DA from the individual effect by taking into account the hierarchical structure of the data, and 2) take into consideration both fixed and random effects in the models.

Finally, our outcome variables and exposure variable were collected from two different sources. In contrast, many previous studies used questionnaires that aggregated individuals' perceptions of social capital and assessed rates of studied outcomes simultaneously. Such an approach may sometimes create self-source bias in the assessment of the predictor as well as the outcome variable.

This study also has some important limitations. We operationalized linking social capital as neighborhood voting rates as a proxy for a multidimensional concept. The nature of social capital creates several possibilities for its measurement. A consensus has not yet been established as to which measurement is the most accurate. However, we argue that measuring social capital in multiple different ways can broaden its multidimensional conceptualization. Furthermore, some residual confounding most likely exists in the measurement of a number of socioeconomic conditions; for example, years of education does not equate to quality of education (Kaufman, Cooper, & McGee, 1997).

In summary, these findings from a large national cohort study suggest that low linking social capital may have important independent effects on DA. Further studies are needed to replicate these findings and understand potential causal links. If confirmed, community actions in the form of investments in linking social capital may be a feasible way to prevent people from beginning to use drugs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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HIGHLIGHTS

- Linking social capital exerts an independent effect on risk of drug abuse.
- These results remained after taking potential confounders into account.
- The key findings are important for clinicians and decision-makers.

Fig. 1.

The geographic distribution of the population aged 15–44 years, levels of linking social capital, and age-standardized DA rates in Malmö.

Table 1

Distribution of population, number of drug abuse (DA) events, and age-standardized rates (per 100) by linking social capital.

	Population		DA event		Linking social capital		
	No.	(%)	No.	%	Low	Moderate	High
Total population (%)	3,343,694				922,683 (28%)	1,824,329 (54%)	596,682 (18%)
Total DA events			65,891		2,9	1,7	1,3
Neighborhood deprivation							
Low	723,437	21,6	9870	15,0	1,4	1,5	1,3
Moderate	2,016,888	60,3	36,523	55,4	2,3	1,7	1,3
High	603,369	18,0	19,498	29,6	3,4	2,2	2,1
Gender							
Men	1,700,896	50,9	47,891	72,7	4,2	2,4	1,8
Women	1,642,798	49,1	18,000	27,3	1,5	1,0	0,7
Age (years)							
15–19	520,516	15,6	24,739	37,5	7,0	4,3	3,3
20–24	498,052	14,9	13,186	20,0	3,4	2,3	2,0
25–29	546,328	16,3	8060	12,2	2,1	1,2	0,9
30–34	584,776	17,5	6560	10,0	1,8	1,0	0,6
35–39	633,990	19,0	7177	10,9	1,9	1,0	0,6
40–44	560,032	16,7	6169	9,4	1,8	1,0	0,6
Family income (quartiles)							
Low income	836,372	25,0	27,020	41,0	4,0	3,0	2,5
Middle–low income	835,986	25,0	16,555	25,1	3,0	2,1	1,8
Middle–high income	835,587	25,0	11,572	17,6	2,4	1,5	1,3
High income	835,749	25,0	10,744	16,3	1,8	1,1	1,0
Marital status							
Married/cohabiting	881,235	26,4	6077	9,2	1,8	1,2	1,4
Never married, widowed, or divorced	2,462,459	73,6	59,814	90,8	3,2	1,9	1,5
Immigrant status							
Sweden	2,864,582	85,7	52,516	79,7	2,7	1,6	1,2
Western countries	180,158	5,4	3807	5,8	3,1	2,2	1,4
Other countries	298,954	8,9	9568	14,5	3,8	2,9	2,5
Educational attainment							
9 years	821,110	24,6	37,347	56,7	5,0	3,6	2,8
10–11 years	775,113	23,2	13,010	19,7	2,1	1,4	1,3
12 years	1,747,471	52,3	15,534	23,6	0,7	0,5	0,4
Urban/rural status							
Large cities	1,745,432	52,2	37,126	56,3	3,2	1,9	1,4
Medium-sized cities	1,092,350	32,7	19,842	30,1	2,7	1,6	1,2
Small town or rural area	505,912	15,1	8923	13,5	2,1	1,6	1,2
Hospitalization for chronic lower respiratory disease							

	<u>Population</u>		<u>DA event</u>		<u>Linking social capital</u>		
	No.	(%)	No.	%	Low	Moderate	High
No	3,327,336	99,5	65,033	98,7	2,9	1,7	1,3
Yes	16,358	0,5	858	1,3	6,4	5,1	3,1
Hospitalization for alcoholism and related liver disease							
No	3,300,670	98,7	57,524	87,3	2,6	1,5	1,1
Yes	43,024	1,3	8367	12,7	21,4	18,6	16,9
Hospitalization for psychiatric disorders							
No	3,235,361	96,8	51,308	77,9	2,4	1,4	1,0
Yes	108,333	3,2	14,583	22,1	14,6	13,0	11,7
Family history of hospitalization for chronic lower respiratory disease							
No	3,166,649	94,7	61,523	93,4	2,8	1,7	1,3
Yes	177,045	5,3	4368	6,6	4,4	2,6	2,0
Family history of hospitalization for alcoholism and related liver disease							
No	3,162,321	94,6	57,659	87,5	2,7	1,6	1,2
Yes	181,373	5,4	8232	12,5	5,9	4,0	2,9
Family history of hospitalization for psychiatric disorders							
No	3,001,444	89,8	54,248	82,3	2,7	1,6	1,2
Yes	342,250	10,2	11,643	17,7	4,7	3,1	2,2
Family history of drug abuse							
No	3,183,506	95,2	52,991	80,4	2,5	1,5	1,1
Yes	160,188	4,8	12,900	19,6	8,4	5,9	4,8

Table 2

Odds ratios (OR) and 95% confidence intervals (CI) for DA in men; results of multi-level logistic regression models.

	Model 1		Model 2		Model 3		Model 4		Model 5	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Linking social capital (ref. high linking social capital)										
Intermediate	1,27	1,22 1,32	1,19	1,14 1,24	1,21	1,16 1,27	1,20	1,15 1,25	1,17	1,12 1,22
Low	2,11	2,02 2,21	1,59	1,51 1,68	1,62	1,54 1,71	1,48	1,41 1,56	1,38	1,32 1,45
Neighborhood deprivation (ref. low deprivation)										
Moderate			1,10	1,06 1,14	1,09	1,04 1,13	1,08	1,05 1,12	1,00	0,96 1,03
High			1,70	1,61 1,79	1,67	1,58 1,76	1,25	1,21 1,29	1,23	1,17 1,30
Age					0,92	0,92 0,92	0,95	0,95 0,95	0,94	0,94 0,94
Family income (ref. high income)										
Middle-high income							1,08	1,05 1,12	1,05	1,01 1,08
Middle-low income							1,25	1,21 1,29	1,20	1,16 1,24
Low income							1,72	1,68 1,77	1,52	1,47 1,56
Marital status (ref. married/co-habiting)										
Never Married, widowed, divorced							2,05	1,97 2,13	1,77	1,70 1,84
Immigrants (ref. Sweden)										
Western countries							1,17	1,12 1,22	1,39	1,33 1,44
Others							1,61	1,57 1,66	1,93	1,87 1,99
Education attainment (ref. 12 years)										
9 years							3,32	3,24 3,41	2,66	2,59 2,73
10–11 years							2,30	2,23 2,37	2,02	1,96 2,09
Urban/rural status (ref. large cities)										
Medium-sized cities							0,82	0,79 0,84	0,81	0,79 0,84
Small town or rural area							0,78	0,75 0,81	0,78	0,75 0,81
Family history and comorbidities										
Hospitalization for chronic lower respiratory disease (ref. no)									1,65	1,47 1,85
Hospitalization for alcoholism and related liver disease (ref. no)									5,01	4,83 5,20
Hospitalization for psychiatric disorders (ref. no)									4,90	4,75 5,06
Family history of hospitalization for chronic lower respiratory disease (ref. no)									1,14	1,09 1,19

	Model 1			Model 2			Model 3			Model 4			Model 5		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Family history of hospitalization for alcoholism and related liver disease (ref. no)													1,31	1,27	1,36
Family history of hospitalization for psychiatric disorders (ref. no)													1,09	1,05	1,12
Family history of drug abuse (ref. no)													3,13	3,05	3,22
Variance (S.E.)	0,176 (0,006)			0,142 (0,006)			0,154 (0,006)			0,114 (0,005)			0,087 (0,005)		
Explained variance (%)	41			53			49			62			71		
Intra class correlation	0,051			0,041			0,045			0,033			0,026		

Table 3

Odds ratios (OR) and 95% confidence intervals (CI) for DA in women; Results of multi-level logistic regression models.

	Model 1			Model 2			Model 3			Model 4			Model 5		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Linking social capital (ref. high linking social capital)															
Intermediate	1.41	1.34	1.49	1.27	1.20	1.35	1.26	1.19	1.33	1.21	1.15	1.28	1.16	1.09	1.22
Low	2.15	2.03	2.27	1.65	1.54	1.77	1.60	1.50	1.72	1.48	1.38	1.58	1.31	1.22	1.40
Neighborhood deprivation (ref. low deprivation)															
Moderate				1.21	1.15	1.27	1.19	1.13	1.25	1.18	1.12	1.24	1.01	0.96	1.07
High				1.61	1.50	1.72	1.55	1.44	1.66	1.77	1.68	1.86	1.13	1.06	1.22
Age							0.96	0.96	0.96	1.00	0.99	1.00	0.98	0.98	0.99
Family income (ref. high income)															
Middle-high income										1.18	1.12	1.24	1.11	1.05	1.17
Middle-low income										1.77	1.68	1.86	1.52	1.44	1.60
Low income										2.15	2.05	2.25	1.61	1.54	1.70
Marital status (ref. married/co-habiting)															
Never Married, widowed, divorced										1.52	1.45	1.60	1.32	1.26	1.39
Immigrants (ref. Sweden)															
Western countries										0.72	0.67	0.77	0.86	0.80	0.93
Others										0.67	0.63	0.71	0.85	0.81	0.90
Education attainment (ref. 12 years)															
9 years										4.67	4.49	4.86	3.08	2.96	3.21
10–11 years										2.53	2.42	2.64	2.01	1.91	2.10
Urban/rural status (ref. large cities)															
Medium-sized cities										0.90	0.86	0.93	0.90	0.86	0.93
Small town or rural area										0.84	0.80	0.88	0.84	0.80	0.88
Family history and comorbidities															
Hospitalization for chronic lower respiratory disease (ref. no)													1.97	1.77	2.20
Hospitalization for alcohol (ref. no)													5.62	5.34	5.91
Hospitalization for psychiatric disorders (ref. no)													9.71	9.37	10.06
Family history of hospitalization for chronic lower respiratory disease (ref. no)													1.19	1.12	1.26

	Model 1			Model 2			Model 3			Model 4			Model 5		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Family history of hospitalization for alcoholism and related liver disease (ref. no)													1.36	1.29	1.43
Family history of hospitalization for psychiatric disorders (ref. no)													1.09	1.04	1.14
Family history of drug abuse (ref. no)													2.48	2.37	2.59
Variance (S.E.)	0.112 (0.008)			0.097 (0.008)			0.101 (0.008)			0.069 (0.007)			0.052 (0.007)		
Explained variance (%)	45			52			50			66			75		
Intra class correlation	0.033			0.029			0.030			0.021			0.016		

Table 4

Interaction between linking social capital and individual-level characteristics for DA in men, results of multilevel analysis.

	Linking social capital								
	Low			Intermediate			High		
	OR	95% CI		OR	95% CI		OR	95% CI	
Neighborhood deprivation									
Low	1.07	0.89	1.28	1.16	1.10	1.24	Ref.		
Moderate	1.35	1.28	1.43	1.16	1.11	1.22	0.97	0.91	1.04
High	1.71	1.63	1.81	1.34	1.24	1.45	1.20	0.85	1.68
Education attainment									
9 years	3.34	3.10	3.59	2.82	2.64	3.00	2.33	2.18	2.49
10–11 years	2.57	2.38	2.77	2.13	1.98	2.28	1.76	1.61	1.93
12 years	1.21	1.13	1.31	1.06	0.99	1.13	Ref.		

Adjusted for neighborhood deprivation, age, family income, marital status, immigrants, educational level, urban/rural status, family history, and comorbidities.