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*Published in:*  
Tobacco Control

*DOI:*  
[10.1136/tc.10.3.258](https://doi.org/10.1136/tc.10.3.258)

2001

[Link to publication](#)

*Citation for published version (APA):*  
Lindström, M., & Östergren, P.-O. (2001). Intermittent and daily smokers: two different socioeconomic patterns, and diverging influence of social participation. *Tobacco Control*, 10(3), 258-266.  
<https://doi.org/10.1136/tc.10.3.258>

*Total number of authors:*  
2

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## Intermittent and daily smokers: two different socioeconomic patterns, and diverging influence of social participation

Martin Lindström, Per-Olof Östergren

### Abstract

**Objective**—To investigate socioeconomic differences in intermittent and daily smoking, and to assess the association between social participation and these two smoking behaviours.

### Design/setting/participants

**measurements**—A population of 11 837 individuals interviewed in 1992-94, aged 45-64 years, was investigated in this cross sectional study. A multivariate logistic regression model was used to assess socioeconomic differences in daily and intermittent smoking, adjusting for age, country of origin, previous/current diseases, and marital status. Finally, social participation as a measure of social capital was introduced in the multivariate model.

**Results**—When unskilled manual workers were compared to high level non-manual employees, odds ratios of 2.3 (95% confidence interval (CI) 1.7 to 3.0) for men and 1.9 (95% CI 1.4 to 2.5) for women were found in regard to daily smoking, but odd ratios of only 0.7 (95% CI 0.4 to 1.2) for men and 1.3 (95% CI 0.7 to 2.4) for women were found in regard to intermittent smoking. A decrease in the daily smoking odds ratios was found when social participation was introduced in the model, while the odds ratios regarding intermittent smoking were unaffected.

**Conclusions**—There were no socioeconomic differences in intermittent smoking and no association with social participation, a result that contrasts sharply with the patterns of daily smoking. These findings have important implications for the discussion concerning social capital and preventive measures.

(*Tobacco Control* 2001;10:258-266)

Keywords: intermittent smoking; daily smoking; socioeconomic status; social participation; social capital

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Received 9 August 2000 and  
in revised form  
20 March 2001. Accepted 24  
April 2001

Recent large scale surveys have called attention to the fact that a substantial proportion of all smokers nowadays are intermittent, non-daily smokers.<sup>1-3</sup> The proportion of intermittent smokers may even be rising.<sup>1-4</sup> The scientific literature on intermittent smokers is scarce, but intermittent smokers seem to be younger, and to have a higher educational and occupational status than daily smokers.<sup>1-4</sup> These sociodemographic differences between intermittent and daily smokers give reason to believe that there

may be different causal mechanisms behind these two phenomena. The sociodemographic pattern for intermittent smokers contrasts sharply with the general sociodemographic smoking pattern in Europe and the USA. In the 1950s there were no socioeconomic differences in smoking, and women smoked to a much lesser extent than men.<sup>5</sup> In the 1980s and 1990s, the decrease in smoking prevalence has also involved a change in this pattern in most western countries. Smoking is now associated with low socioeconomic status, and in many countries women are smokers to the same extent as men.<sup>6-9</sup>

There is a strong biological mechanism that explains nicotine dependence.<sup>10-13</sup> However, no biological model can account for the presence of socioeconomic differences in smoking. Psychological factors at the individual level have been shown to predict the inclination to initiate smoking cessation.<sup>14-15</sup> These individual characteristics are most likely affected by factors in the psychosocial environment. One study has suggested that psychosocial factors may protect very light smokers against nicotine dependence and higher tobacco consumption.<sup>16</sup> Participation in social and civic life is a central factor to the understanding of empowerment. Israel and colleagues have defined empowerment, in its most general sense, as the ability of people to gain understanding and control over personal, social, economic, and political forces in order to take action to improve their own life situations.<sup>17</sup> In contrast to reactive approaches that derive from a treatment or illness mode, the concept of empowerment is positive and proactive. Civic and social participation enables individuals and groups of individuals to assume responsibility and control concerning their own lives.<sup>18</sup> Social participation has been shown in several studies to be associated with smoking.<sup>19-20</sup> Social participation is one aspect of Putnam's social capital concept. Social capital concerns both the real and perceived possibilities for the citizens to participate, feel trust, have equal opportunities, and cooperate in society.<sup>21-23</sup> Low levels of social capital indicate low perceived and real possibilities to influence one's own life situation—for example, the smoking status and the general health status of the individual. Social capital has in the literature been defined and operationalised as social participation and social trust.<sup>24</sup> The aspect of social capital investigated in this study is social participation. However, no

Table 1 Prevalence (%) of smoking, socioeconomic, demographic, and social participation variables. The Malmö diet and cancer study 1992-94

	Men		Women		Total	
	n	%	n	%	n	%
<i>Smoking status</i>						
Regular/daily smoker	1346	25.0	1647	25.5	2993	25.3
Intermittent	299	5.6	296	4.6	595	5.0
Stopped smoking	2197	40.8	1746	27.1	3943	33.3
Never smoked	1538	28.6	2765	42.8	4303	36.4
(Missing)	(0)		(3)		(3)	
<i>Socioeconomic status</i>						
High level non-manual	528	9.8	358	5.6	886	7.5
Middle level non-manual	833	15.5	932	14.5	1765	14.9
Low level non-manual	598	11.1	1587	24.6	2185	18.5
Skilled manual	646	12.0	312	4.8	958	8.1
Unskilled manual	604	11.2	1258	19.5	1862	15.8
Self employed	794	14.8	349	5.4	1143	9.7
Pensioners	953	17.7	1269	19.7	2222	18.8
Unemployed	418	7.8	383	5.9	801	6.8
(Missing)	(6)		(9)		(15)	
<i>Age</i>						
45-49 years	808	15.0	976	15.1	1784	15.1
50-54 years	1574	29.3	1928	29.9	3502	29.6
55-59 years	1468	27.3	1699	26.3	3167	26.8
60-64 years	1530	28.4	1854	28.7	3384	28.6
(Missing)	(0)		(0)		(0)	
<i>Country of origin</i>						
Sweden	4653	86.5	5667	87.8	10320	87.2
Other country	725	13.5	787	12.2	1512	12.8
(Missing)	(2)		(3)		(5)	
<i>Self reported diseases*</i>						
No	4466	83.2	5311	82.6	9777	82.9
Yes	901	16.8	1118	17.4	2019	17.1
(Missing)	(13)		(28)		(41)	
<i>Marital status</i>						
Married	3860	71.8	4039	62.6	7899	66.8
Unmarried	603	11.2	569	8.8	1172	9.9
Divorced	803	14.9	1354	21.0	2157	18.2
Widow/widower	112	2.1	491	7.6	603	5.1
(Missing)	(2)		(4)		(6)	
<i>Social participation</i>						
High	3851	71.6	4635	71.8	8486	71.7
Low	1529	28.4	1822	28.2	3351	28.3
(Missing)	(0)		(0)		(0)	
<b>Total</b>	<b>5380</b>		<b>6457</b>		<b>11 837</b>	

\*Self reported previous or current diseases included myocardial infarction, stroke, intermittent claudication, diabetes mellitus, cancer, and asthma/chronic obstructive lung disease.

investigation on social participation or social capital, including intermittent smoking or the differentiation of social determinants between daily and intermittent smoking, has previously been conducted to our knowledge.

Our paper aims to characterise and compare daily and intermittent (non-daily) smokers to non-smokers according to sociodemographic characteristics. The aim is also to investigate whether socioeconomic differences in smoking can be observed for both daily and intermittent smokers, and whether the socioeconomic patterns observed for daily and intermittent smokers are associated with social participation as a measure of social capital.

## Material and methods

### STUDY POPULATION

The Malmö diet and cancer study (MDCS) is a prospective cohort study in Malmö, the third largest city of Sweden with approximately 250 000 inhabitants. Recruitment to the MDCS started in the spring of 1991 and the final participants were examined in the autumn of 1996. The MDCS source population consists of all men and women living in Malmö

born between 1926 and 1945 ( $n = 53\ 000$ ), and was extended to some older and younger age groups in 1995-96. The total participation rate in the MDCS was 40.6%.

The social participation variable was not included in the first version of the questionnaire used in 1991-92, and a third version of the questionnaire was used in 1994-96. The present study population consists of every person who participated in the MDCS during the two year period from March 1992 until August 1994, and were aged 45-64 years ( $n = 11\ 837$ ). This represents a quarter of the entire population aged 45-64 years in Malmö.

Subjects were recruited at random by postal invitation. Some respondents (25.2%) came to the examination spontaneously.<sup>25</sup> The baseline questionnaire was completed at home and checked for missing answers by the diet assistants at the second visit to the MDCS project office a few weeks later.

### DEFINITIONS

There were four possible alternative answers to the question "Do you smoke?": "Yes, I smoke daily" (*daily smoker*); "Yes, I smoke sometimes (not daily)" (*intermittent smoker*); "No, I have stopped smoking"; and "No, I have never smoked". *Non-smoker* status was defined as having stopped smoking or having never smoked (alternatives 3 and 4).

Classification of socioeconomic status (SES) was based on data about job title, working tasks, and position obtained in the questionnaire. The procedure was identical to the one used in the Swedish population census.<sup>26</sup> The employee groups include skilled and unskilled manual workers, non-manual employees in low and medium position, and high level non-manual employees in leading positions or with university degree.

The *self employed* group is very heterogeneous, comprising physicians, dentists, and large company employers on the one hand, and small shopkeepers, self employed carpenters, etc, on the other.

The *unemployed* were analysed as a separate group of individuals, composed of persons who are outside the active workforce but still available as a potential part of the workforce, thus excluding self retired individuals.

*Pensioners* were analysed as a separate category completely outside the workforce. The group of pensioners younger than 65 years consists largely of those people who have received disability pensions.

In regard to *country of origin*, all persons born in countries other than Sweden were merged into a single category. Thus, the two categories used in the analysis are "Sweden" or "other".

*Self reported diseases* might modify the inclination to stop smoking. Self reported previous or current diseases included myocardial infarction, stroke, intermittent claudication, diabetes mellitus, cancer or asthma/chronic obstructive lung disease.

*Marital status* included four categories: married, unmarried, divorced, and widow/widower.

Table 2 Crude odds ratios (OR) and 95% confidence intervals (CI) of daily and intermittent smoking in relation to demographic, socioeconomic and psychosocial variables: men. Malmö diet and cancer study 1992-94

	n	Daily smokers		Intermittent smokers	
		%	OR (95% CI)	%	OR (95% CI)
<i>Socioeconomic status</i>					
High level non-manual	528	18.4	1.0	6.4	1.0
Middle level non-manual	833	18.8	1.0 (0.8 to 1.4)	4.4	0.7 (0.4 to 1.1)
Low level non-manual	598	20.1	1.1 (0.8 to 1.5)	6.9	1.1 (0.7 to 1.7)
Skilled manual	646	24.9	1.5 (1.1 to 2.0)	5.6	0.9 (0.5 to 1.4)
Unskilled manual	604	33.8	2.3 (1.7 to 3.0)	4.8	0.7 (0.4 to 1.2)
(Missing)	(2171)				
<i>Vocationally active*</i>					
Employees	3209	23.0	1.0	5.5	1.0
Self employed	794	22.8	1.0 (0.8 to 1.2)	7.1	1.3 (0.95 to 1.8)
(Missing)	(1377)				
<i>Vocationally active and unemployed†</i>					
All employed	4003	23.0	1.0	5.8	1.0
Unemployed	418	34.4	1.8 (1.4 to 2.2)	5.0	0.9 (0.5 to 1.4)
(Missing)	(959)				
<i>Workforce v pensioners‡</i>					
Workforce	4421	24.1	1.0	5.7	1.0
Pensioners	953	29.4	1.3 (1.1 to 1.5)	4.7	0.8 (0.6 to 1.1)
(Missing)	(6)				
<i>Age</i>					
45-49 years	808	27.5	1.0	6.8	1.0
50-54 years	1574	25.9	0.9 (0.8 to 1.1)	6.2	0.9 (0.6 to 1.3)
55-59 years	1468	26.1	0.9 (0.8 to 1.1)	5.1	0.7 (0.5 to 1.1)
60-64 years	1530	21.8	0.7 (0.6 to 0.9)	4.7	0.7 (0.5 to 0.97)
(Missing)	(0)				
<i>Country of origin</i>					
Sweden	4653	24.7	1.0	5.3	1.0
Other country	725	27.0	1.1 (0.9 to 1.3)	7.0	1.3 (0.98 to 1.8)
(Missing)	(2)				
<i>Self reported diseases§</i>					
No	4466	25.5	1.0	5.5	1.0
Yes	901	22.8	0.9 (0.7 to 1.02)	6.0	1.1 (0.8 to 1.4)
(Missing)	(13)				
<i>Marital status</i>					
Married	3860	21,9	1.0	5.5	1.0
Unmarried	603	31,3	1.6 (1.3 to 2.0)	6.1	1.1 (0.8 to 1.6)
Divorced	803	34,9	1.9 (1.6 to 2.2)	5.9	1.1 (0.8 to 1.5)
Widow/widower	112	26,8	1.3 (0.9 to 2.0)	3.6	0.6 (0.2 to 1.8)
(Missing)	(2)				
<i>Social participation</i>					
High	3851	21.1	1.0	5.8	1.0
Low	1529	34.9	2.0 (1.8 to 2.3)	4.9	0.8 (0.6 to 1.1)
(Missing)	(6)				
Total	5380				

\*Employees (five groups) versus self employed.

†All employed (six groups including self employed) versus unemployed.

‡Workforce (five employee groups, self employed and unemployed) versus pensioners.

§Self reported previous or current diseases included myocardial infarction, stroke, intermittent claudication, diabetes mellitus, cancer, and asthma/chronic obstructive lung disease.

*Social participation* (during the past year) describes how actively the person takes part in the activities of formal and informal groups in society. Respondents were asked whether in the previous 12 months they had been involved in any of the following 13 activities: study circle/course at workplace, other study circle/course, union meeting, meeting of other organisations, theatre/cinema, arts exhibition, church, sports event, writing a letter to the editor of a newspaper/journal, demonstration, night club/entertainment, large gathering of relatives, and private party. It was measured as an index consisting of 13 items and dichotomised. If three alternatives or less were indicated, the social participation of that individual was classified as low.

The validity and reliability of the social participation index variable was tested in a previous study concerning the MDCS data

material, and the  $\kappa$  coefficient was 0.70, indicating an acceptable reliability. Furthermore, the construct validity analysed by Cronbach's  $\alpha$  was 0.61 for the social participation index variable. The analysis of construct validity indicated that the social participation index variable measured other aspects of the psychosocial environment than the social support variables.<sup>27</sup>

#### STATISTICS

Crude odds ratios and 95% confidence intervals (95% CI) were calculated in order to analyse associations between different demographic and socioeconomic variables, social participation, and daily and intermittent smoking. The multivariate analysis was performed in order to investigate the potential importance of various confounders and to analyse the importance of social participation on the

Table 3 Crude odds ratios (OR) and 95% confidence intervals (CI) of daily and intermittent smoking in relation to demographic, socioeconomic and psychosocial variables: women. Malmö diet and cancer study 1992-94

	n	Daily smokers		Intermittent smokers	
		%	OR (95% CI)	%	OR (95% CI)
<i>Socioeconomic status</i>					
High level non-manual	358	20.1	1.0	4.2	1.0
Middle level non-manual	932	21.8	1.1 (0.8 to 1.5)	5.3	1.3 (0.7 to 2.3)
Low level non-manual	1587	24.3	1.3 (0.9 to 1.7)	4.6	1.1 (0.6 to 1.9)
Skilled manual	312	26.3	1.4 (0.99 to 2.0)	2.9	0.7 (0.3 to 1.6)
Unskilled manual (Missing)	1257 (2011)	30.0	1.7 (1.3 to 2.3)	5.2	1.2 (0.7 to 2.2)
<i>Vocationally active*</i>					
Employees	4446	25.3	1.0	4.7	1.0
Self employed (Missing)	349 (1662)	22.1	0.8 (0.6 to 1.1)	6.3	1.4 (0.9 to 2.1)
<i>Vocationally active and unemployed†</i>					
All employed	4795	25.1	1.0	4.9	1.0
Unemployed (Missing)	383 (1279)	27.7	1.2 (0.9 to 1.5)	3.7	0.7 (0.4 to 1.3)
<i>Workforce v pensioners‡</i>					
Workforce	5178	25.3	1.0	4.8	1.0
Pensioners (Missing)	1267 (12)	26.9	1.1 (0.95 to 1.3)	3.8	0.8 (0.6 to 1.1)
<i>Age</i>					
45-49 years	976	31.9	1.0	5.9	1.0
50-54 years	1928	29.5	0.9 (0.8 to 1.1)	5.7	0.9 (0.7 to 1.3)
55-59 years	1699	23.1	0.6 (0.5 to 0.8)	3.8	0.6 (0.4 to 0.9)
60-64 years (Missing)	1851 (3)	20.3	0.5 (0.46 to 0.7)	3.5	0.6 (0.4 to 0.8)
<i>Country of origin</i>					
Sweden	5666	25.4	1.0	4.7	1.0
Other country (Missing)	785 (6)	26.5	1.1 (0.9 to 1.3)	3.9	0.8 (0.6 to 1.2)
<i>Self reported diseases§</i>					
No	5311	25.0	1.0	4.6	1.0
Yes (Missing)	1116 (30)	27.5	1.1 (0.98 to 1.3)	4.5	0.97 (0.7 to 1.3)
<i>Marital status</i>					
Married	4038	20.6	1.0	4.0	1.0
Unmarried	569	28.6	1.5 (1.3 to 1.9)	4.2	1.0 (0.7 to 1.6)
Divorced	490	36.7	2.2 (1.9 to 2.5)	6.2	1.6 (1.2 to 2.1)
Widow/widower (Missing)	6450 (7)	31.4	1.8 (1.4 to 2.2)	4.5	1.1 (0.7 to 1.8)
<i>Social participation</i>					
High	4635	22.9	1.0	4.7	1.0
Low (Missing)	1819 (3)	32.1	1.6 (1.4 to 1.8)	4.4	1.1 (0.8 to 1.4)
Total	6457				

\*Employees (five groups) versus self employed.

†All employed (six groups including self employed) versus unemployed.

‡Workforce (five employee groups, self employed and unemployed) versus pensioners.

§Self reported previous or current diseases included myocardial infarction, stroke, intermittent claudication, diabetes mellitus, cancer, and asthma/chronic obstructive lung disease.

socioeconomic differences in daily and intermittent smoking, respectively. The daily and intermittent smokers were compared to non-smokers in all the multivariate analyses. The effects of the covariates were explored by logistic regression analysis concerning the association between social participation and the odds ratio of daily and intermittent smoking, respectively. The statistical analysis was performed using the SPSS software package.<sup>28</sup>

## Results

Table 1 shows that the men in our study were more often self employed, non-manual employees in higher positions, and skilled manual workers, and the women were more often non-manual employees in lower and middle positions and unskilled manual workers. These differences further support our

notion that men and women should be analysed separately. The proportion of persons born in countries other than Sweden were almost the same for men and women (13.5% and 12.2%, respectively).

The proportion of both daily and intermittent smokers was the same for both sexes. The proportion of persons who had never smoked was much larger among women (42.8%) than among men (28.6%) ( $p < 0.001$ ,  $t$  test). On the other hand, the proportion of individuals that had stopped smoking was much larger among men (40.8%) compared to women (27.1%) ( $p < 0.001$ ,  $t$  test). The sum proportion of non-smokers (according to our definition above) is thus approximately the same for men and women.

Tables 2 and 3 illustrate that there were significant socioeconomic differences in daily smoking among both men and women. For

Table 4 Age adjusted and multivariate odds ratios (OR) and 95% confidence intervals (CI) of daily and intermittent smoking compared to all non-smokers in socioeconomic groups: men. Malmö diet and cancer study 1992-94

	Daily smoking			Intermittent smoking		
	Adjusted* OR, 95% CI	Adjusted† OR, 95% CI	Adjusted‡ OR, 95% CI	Adjusted* OR, 95% CI	Adjusted† OR, 95% CI	Adjusted‡ OR, 95% CI
<i>Socioeconomic status</i>						
High level non-manual	1.0	1.0	1.0	1.0	1.0	1.0
Middle level non-manual	1.0 (0.8 to 1.3)	1.0 (0.8 to 1.4)	1.0 (0.8 to 1.3)	0.7 (0.4 to 1.1)	0.7 (0.4 to 1.1)	0.7 (0.4 to 1.1)
Low level non-manual	1.1 (0.8 to 1.5)	1.1 (0.9 to 1.6)	1.1 (0.8 to 1.4)	1.1 (0.7 to 1.7)	1.1 (0.7 to 1.7)	1.1 (0.7 to 1.8)
Skilled manual	1.5 (1.1 to 2.0)	1.5 (1.1 to 2.0)	1.3 (1.00 to 1.8)	0.9 (0.5 to 1.4)	0.8 (0.5 to 1.3)	0.8 (0.5 to 1.4)
Unskilled manual	2.3 (1.7 to 3.0)	2.3 (1.7 to 3.0)	1.9 (1.4 to 2.5)	0.7 (0.4 to 1.2)	0.7 (0.4 to 1.2)	0.7 (0.4 to 1.2)
<i>Vocationally active§</i>						
Employees	1.0	1.0	1.0	1.0	1.0	1.0
Self employed	1.0 (0.8 to 1.2)	1.0 (0.8 to 1.2)	1.0 (0.8 to 1.2)	1.3 (0.95 to 1.8)	1.3 (0.96 to 1.8)	1.3 (0.95 to 1.8)
<i>Vocationally active and unemployed¶</i>						
All employed	1.0	1.0	1.0	1.0	1.0	1.0
Unemployed	1.8 (1.4 to 2.2)	1.8 (1.4 to 2.2)	1.6 (1.3 to 2.0)	0.9 (0.5 to 1.4)	0.8 (0.5 to 1.3)	0.8 (0.5 to 1.4)
<i>Workforce v pensioners**</i>						
Workforce	1.0	1.0	1.0	1.0	1.0	1.0
Pensioners	1.6 (1.3 to 1.8)	1.6 (1.3 to 1.8)	1.3 (1.1 to 1.6)	0.9 (0.7 to 1.3)	0.9 (0.6 to 1.3)	0.9 (0.6 to 1.3)

\*Adjustment for age.

†Adjustment made for age, ethnicity, self reported diseases, and marital status.

‡Adjustment made for age, ethnicity, self reported disease, marital status, and social participation.

§Employees (five groups) versus self employed.

¶All employed (six groups including self employed) versus unemployed.

\*\*Workforce (five employee groups, self employed and unemployed) versus pensioners.

both sexes, the SES groups skilled and unskilled manual workers showed significantly higher odds ratios for daily smoking, compared to the non-manual high level reference group. The unemployed men had significantly higher odds ratios for daily smoking compared to the whole employed group. The male pensioners also had higher odds ratios for daily smoking compared to the whole workforce. On the other hand, no significant socioeconomic differences in intermittent smoking were seen, either for men or for women. Unmarried and divorced men had significantly higher odds ratios for daily smoking than married men. The same patterns of higher odds ratios for daily smoking were seen for unmarried and divorced women, and widows. In contrast, the odds ratio for being an intermittent smoker was only significantly higher among women

who were divorced. Men with low social participation had an odds ratio of 2.0 (95% CI 1.8 to 2.3) for being a daily smoker, while the corresponding odds ratio for being an intermittent smoker was non-significant (0.8, 95% CI 0.6 to 1.1). Among women, individuals with low social participation had an odds ratio of 1.6 (95% CI 1.4 to 1.8) for daily smoking. In contrast, women with low social participation only had a non-significant odds ratio of 1.1 (95% CI 0.8 to 1.4) for intermittent smoking.

Tables 4 and 5 show that the SES patterns among daily smokers and the lack of SES patterns among intermittent smokers compared to non-smokers did not change when age, country of origin, self reported diseases, and marital status were included in the multivariate logistic regression models, neither for men nor

Table 5 Age adjusted and multivariate odds ratios (OR) and 95% confidence intervals (CI) of daily and intermittent smoking compared to all non-smokers in socioeconomic groups: women. Malmö diet and cancer study 1992-94

	Daily smoking			Intermittent smoking		
	Adjusted* OR, 95% CI	Adjusted† OR, 95% CI	Adjusted‡ OR, 95% CI	Adjusted* OR, 95% CI	Adjusted† OR, 95% CI	Adjusted‡ OR, 95% CI
<i>Socioeconomic status</i>						
High level non-manual	1.0	1.0	1.0	1.0	1.0	1.0
Middle level non-manual	1.1 (0.8 to 1.5)	1.2 (0.9 to 1.6)	1.1 (0.8 to 1.6)	1.3 (0.7 to 2.3)	1.3 (0.7 to 2.4)	1.3 (0.7 to 2.4)
Low level non-manual	1.3 (1.01 to 1.8)	1.4 (1.01 to 1.8)	1.3 (0.96 to 1.7)	1.1 (0.6 to 2.0)	1.1 (0.6 to 2.0)	1.1 (0.6 to 2.0)
Skilled manual	1.5 (1.02 to 2.1)	1.5 (1.02 to 2.1)	1.4 (0.9 to 2.0)	0.7 (0.3 to 1.6)	0.7 (0.3 to 1.6)	0.7 (0.3 to 1.6)
Unskilled manual	1.8 (1.4 to 2.4)	1.9 (1.4 to 2.5)	1.6 (1.2 to 2.2)	1.3 (0.7 to 2.3)	1.3 (0.7 to 2.4)	1.3 (0.7 to 2.4)
<i>Vocationally active§</i>						
Employees	1.0	1.0	1.0	1.0	1.0	1.0
Self employed	0.8 (0.6 to 1.1)	0.8 (0.6 to 1.1)	0.8 (0.6 to 1.1)	1.3 (0.8 to 2.1)	1.3 (0.9 to 2.1)	1.3 (0.9 to 2.1)
<i>Vocationally active and unemployed¶</i>						
All employed	1.0	1.0	1.0	1.0	1.0	1.0
Unemployed	1.2 (0.98 to 1.6)	1.2 (0.95 to 1.5)	1.2 (0.9 to 1.5)	0.8 (0.5 to 1.4)	0.8 (0.5 to 1.4)	0.8 (0.5 to 1.4)
<i>Workforce v pensioners**</i>						
Workforce	1.0	1.0	1.0	1.0	1.0	1.0
Pensioners	1.5 (1.3 to 1.7)	1.4 (1.2 to 1.7)	1.3 (1.1 to 1.5)	1.0 (0.7 to 1.4)	1.0 (0.7 to 1.4)	1.0 (0.7 to 1.4)

\*Adjustment for age.

†Adjustment made for age, ethnicity, self reported diseases, and marital status.

‡Adjustment made for age, ethnicity, self reported disease, marital status, and social participation.

§Employees (five groups) versus self employed.

¶All employed (six groups including self employed) versus unemployed.

\*\*Workforce (five employee groups, self employed and unemployed) versus pensioners.

Table 6 Logistic regression analysis of association between social participation and the odds ratio of daily and intermittent smoking, respectively, compared to all non-smokers and presented as crude odds ratio (OR), adjusted OR, and confidence intervals (95% CI): men. The Malmö diet and cancer study 1992-94.

	Crude OR	Model I	Model II	Model III	Model IV	Model V
<i>Daily smokers</i>						
Social participation*	2.0 (1.8 to 2.3)	2.1 (1.8 to 2.4)	2.1 (1.8 to 2.4)	2.1 (1.8 to 2.4)	2.1 (1.8 to 2.4)	1.9 (1.6 to 2.2)
Age†		0.9 (0.8 to 0.9)	0.9 (0.8 to 0.9)	0.9 (0.8 to 0.9)	0.9 (0.8 to 1.0)	0.9 (0.8 to 0.9)
Country of origin‡			1.0 (0.8 to 1.2)	1.0 (0.8 to 1.2)	1.0 (0.8 to 1.2)	0.9 (0.8 to 1.1)
Self reported diseases§				0.8 (0.7 to 1.0)	0.8 (0.7 to 1.0)	0.8 (0.7 to 0.9)
Marital status¶					1.3 (1.2 to 1.4)	1.3 (1.2 to 1.4)
Socioeconomic status**						1.1 (1.1 to 1.1)
<i>Intermittent smokers</i>						
Social participation*	0.8 (0.6 to 1.1)	0.9 (0.7 to 1.1)	0.8 (0.6 to 1.1)	0.8 (0.6 to 1.1)	0.8 (0.6 to 1.1)	0.8 (0.6 to 1.1)
Age†		0.9 (0.8 to 1.0)	0.9 (0.8 to 1.0)	0.9 (0.8 to 1.0)	0.9 (0.8 to 1.0)	0.9 (0.8 to 1.0)
Country of origin‡			1.4 (1.0 to 1.9)	1.4 (1.0 to 1.9)	1.4 (1.0 to 1.9)	1.4 (1.0 to 1.9)
Self reported diseases§				1.2 (0.9 to 1.6)	1.2 (0.9 to 1.6)	1.2 (0.9 to 1.6)
Marital status¶					1.0 (0.9 to 1.2)	1.0 (0.9 to 1.1)
Socioeconomic status**						1.0 (0.9 to 1.1)

\*Low versus high.

†Per 5 year interval.

‡Born in country other than Sweden versus born in Sweden.

§Disease versus no disease.

¶Four marital status groups.

\*\*Eight socioeconomic groups.

for women. Finally, when social participation was included in the models, the association between SES and daily smoking was considerably weakened because one third of the excess risk disappeared among the unskilled manual workers for both sexes. The odds ratios were reduced among men from 2.3 (95% CI 1.7 to 3.0) to 1.9 (95% CI 1.4 to 2.5) for the unskilled manual workers. Social participation also reduced the female odds ratios from 1.9 (95% CI 1.4 to 2.5) to 1.6 (95% CI 1.2 to 2.2) for the unskilled manual workers. On the other hand, social participation had no association with intermittent smoking.

Since social participation was introduced in the final step in the regression analyses, it seemed important to analyse how much of the association between this variable and regular and intermittent smoking, respectively, that could be ascribed to the other variables in the model. Tables 6 and 7 show that age, country of origin, and self reported diseases had almost no effects on either the significant relation between social participation and daily smoking or the lack of significant association between social participation and intermittent smoking.

Marital status had some effect on the relation between social participation and daily smoking among both men and women.

Nicotine consumption in the form of oral snuff is a common habit in Sweden.<sup>29</sup> The prevalence of snuff intake (yes/no) in the population of this study was 7.9% among men and 0.5% among women. When snuff consumption was included in the multivariate analysis (not shown in the tables), it had no effect on the odds ratios obtained.

When the respondents that came to the MDCS spontaneously were analysed separately, all the statistical patterns reported above remained unchanged (not shown in the tables).

## Discussion

We found clear socioeconomic differences in daily smoking among both men and women. However, no significant socioeconomic differences in intermittent smoking were observed. After adjustment for potential confounders the inclusion of social participation in the final model of the multivariate analysis had a decreasing effect on the odds ratios and the socioeconomic differences in

Table 7 Logistic regression analysis of association between social participation and the odds ratio of daily and intermittent smoking, respectively, compared to all non-smokers and presented as crude odds ratio (OR), adjusted OR, and confidence intervals (95% CI): women. The Malmö diet and cancer study 1992-94.

	Crude OR	Model I	Model II	Model III	Model IV	Model V
<i>Daily smokers</i>						
Social participation*	1.6 (1.4 to 1.8)	1.7 (1.5 to 2.0)	1.7 (1.5 to 2.0)	1.7 (1.5 to 1.9)	1.7 (1.5 to 1.9)	1.5 (1.3 to 1.8)
Age†		0.8 (0.7 to 0.8)	0.8 (0.7 to 0.8)	0.8 (0.7 to 0.8)	0.8 (0.7 to 0.8)	0.7 (0.7 to 0.8)
Country of origin‡			1.0 (0.8 to 1.1)	1.0 (0.8 to 1.1)	0.9 (0.8 to 1.1)	0.9 (0.7 to 1.0)
Self reported diseases§				1.2 (1.0 to 1.4)	1.1 (1.0 to 1.3)	1.1 (1.0 to 1.3)
Marital status¶					1.4 (1.3 to 1.4)	1.4 (1.3 to 1.4)
Socioeconomic status**						1.1 (1.0 to 1.1)
<i>Intermittent smokers</i>						
Social participation*	0.9 (0.7 to 1.2)	1.0 (0.8 to 1.3)	1.0 (0.8 to 1.3)	1.0 (0.8 to 1.3)	1.0 (0.8 to 1.3)	1.0 (0.8 to 1.3)
Age†		0.8 (0.7 to 0.9)	0.8 (0.7 to 0.9)	0.8 (0.7 to 0.9)	0.8 (0.7 to 0.9)	0.8 (0.7 to 0.9)
Country of origin‡			0.8 (0.6 to 1.2)	0.8 (0.6 to 1.2)	0.8 (0.6 to 1.2)	0.8 (0.6 to 1.2)
Self reported diseases§				1.0 (0.8 to 1.4)	1.0 (0.8 to 1.4)	1.0 (0.8 to 1.4)
Marital status¶					1.2 (1.0 to 1.3)	1.2 (1.0 to 1.3)
Socioeconomic status**						1.0 (0.9 to 1.1)

\*Low versus high.

†Per 5 year interval.

‡Born in country other than Sweden versus born in Sweden.

§Disease versus no disease.

¶Four marital status groups.

\*\*Eight socioeconomic groups.

daily smoking. In contrast, social participation showed no association with intermittent smoking.

The present results could be influenced by selection bias, misclassification, and confounding.

A comparison with another investigation conducted in the city of Malmö during the same time period with a higher participation rate (74% participation rate in the comparable age brackets) showed a good correspondence concerning SES, smoking, and social participation. On the other hand, people born abroad are under represented in the MDCS population.<sup>20</sup> However, this is because approximately 2000 individuals of foreign origin were excluded from the whole study as a result of insufficient language skills (of all those interviewed from 1991 to 1996). Some studies have shown that non-participants differ from study participants in terms of smoking habits.<sup>30-31</sup> The smoking prevalence in these studies has been shown to be somewhat higher among non-participants. If individuals with low social participation also have a tendency of non-participation, this could lead to a situation where smokers with low social participation (that is, "exposed" cases) are over represented among non-participants. However, this would lead to an underestimation of the true association between smoking and social participation. Moreover, we do not find any plausible reason for assuming that the tendency of non-participation would be lower for intermittent smokers compared with daily smokers. Accordingly, the difference between these two groups in our study are probably not biased by selection to any important extent.

The validity of items assessing smoking has previously been analysed several times. The results have consistently shown that self reported tobacco smoking is a valid and reliable way to measure smoking habits in a population.<sup>32-37</sup> Differential misclassification is not likely to have been present. Non-differential misclassification seems to be a problem of less importance in this study, since non-differential misclassification tends to attenuate true differences, and the main results of this study show clear socioeconomic differences in daily smoking. The reliability and validity of the social participation variable showed a good or acceptable validity and reliability with no differences between the various SES groups found in a previous paper.<sup>27</sup> The validity and reliability of the social participation variable was assessed using the cut-off ( $\leq 3$  items,  $\geq 4$  items) to distinguish between low and high social participation, and this cut-off has also been used in Sweden since the 1960s.<sup>38</sup>

Age, sex, country of origin, self reported diseases, and marital status could be confounders of the associations between the psychosocial variables and smoking cessation. Adjusting for these variables, however, only marginally affected the estimates.

The 8% prevalence of snuff use among men may be regarded as low compared to the prevalence sometimes reported for Sweden.

However, other unpublished data from Scania in southern Sweden reveal the same prevalence of snuff use in this part of Sweden.

The cross sectional study design may be considered a weakness, because this design makes it impossible to follow the smoking history of the individuals. Some intermittent smokers may in fact be former daily smokers on their way to smoking cessation. However, this possibility does not contradict the main conclusions of this study. An objection against the aggregation of former and never smokers may also be raised. However, many former smokers stopped smoking many years ago, and the prevalence of low social participation was the same in these two groups.

Social participation has been shown in other studies to be associated with smoking and smoking cessation.<sup>19-20</sup> In this study, social participation was associated with daily smoking. Exposure to low social participation partly explained a part of the socioeconomic gradient in daily smoking. Social participation measures the individual's participation in several social activities within the life of modern society. Health related behaviours like smoking are a result of the interaction between a person and his or her environment. A person's relation to his or her environment can be viewed as a dynamic process, since environmental changes require continuous adaptation by the individual. The successful adaptation to changes in the environment requires both individual resources (for example, education and material resources) and social relations (for example, social support and social network). Daily smoking and its maintenance might function as a coping mechanism when the individual has low social participation. In contrast, intermittent smoking appears to be a different health behaviour phenomenon. Intermittent smoking was not associated with low socioeconomic status or low social participation.

The absence of socioeconomic differences in intermittent smoking is in accordance with previous findings that intermittent smokers have higher educational and occupational status than daily smokers.<sup>1-4</sup> Previous studies have also reported that intermittent smokers often are free of nicotine dependence.<sup>39-40</sup> This study has also shown their particular smoking behaviour to be unrelated to low social participation, while daily smoking and low social participation are significantly associated. This observation supports the notion that low social participation may act as a psychosocial barrier against smoking cessation among daily smokers. Furthermore, unpublished data from the public health survey in Malmö 1994, concerning a representative sample of men and women aged 20–80 years and with a 71% participation rate, reveal that a much lower proportion of intermittent smokers (32.3%) compared to daily smokers (67.7%) have a desire to stop smoking; this also suggests that intermittent smoking is a different health related behaviour phenomenon, and not just a transitional stage between daily smoking and



non-smoking. This “desire to stop smoking” item was not included in the MDCS questionnaire.

There are at least two possible explanations for the differences between intermittent and daily smokers in socioeconomic patterns and influence of social participation observed in this study. Firstly, as already mentioned, some smokers are biologically nicotine dependent and others are not. Nicotine dependence is a biological and not a socioeconomic or psychosocial characteristic. The nicotine dependent smokers are mostly daily smokers. The process of smoking cessation and its maintenance may be more difficult for nicotine dependent smokers in a less supportive environment—that is, an environment with a low level of social participation and social capital.

The second plausible explanation concerns the initiation of the smoking behaviour. Many smokers start being intermittent smokers during adolescence.<sup>41</sup> A supportive environment with a high level of social participation prevents the progress from the state of intermittent smoking to the state of daily smoking. However, this explanation is impossible to confirm in this study, since the MDCS material does not contain any information concerning the levels of social participation at different stages in the life course of the participants. However, this notion seems to be supported by the fact that intermittent smokers do not differ from non-smokers in the level of social participation, while the odds ratio of low social participation is significantly higher among daily smokers compared to the non-smokers. The nicotine dependence could thus be an effect of the smoking habits that are determined by socioeconomic and psychosocial factors closely related to social participation and social capital.

These two tentative explanations are not mutually contradictory, but represent two possible hypotheses. However, because of the cross sectional design of this study, it is not possible to test any of these hypotheses. This would require a longitudinal study design.

The definition of social participation in this study is in accordance with Putnam’s definition of social participation, which forms a part of his definition of social capital.<sup>21–23</sup> The prevalences of the various sub-items of the social participation index variable differ somewhat. However, the socioeconomic gradients for the different items are very similar—that is, higher levels of different aspects of social participation are found in higher non-manual employees than in lower socioeconomic groups, with the exception of union meetings. Furthermore, the bivariate correlations between the items were in almost all the cases lower than 0.2, with the exception of the bivariate correlation between theatre/cinema and arts exhibition ( $r = 0.39$ ), study circle at workplace and union meeting ( $r = 0.25$ ), and theatre/cinema and private party ( $r = 0.25$ ). It thus seems that the social participation index variable measures different types of participatory activities in society.<sup>42</sup> The findings of this study thus suggest an influence of social capital

#### What this paper adds

The scarce scientific literature on intermittent smokers indicates that intermittent smokers are younger and have higher educational and occupational status than daily (regular) smokers. These sociodemographic differences give reason to believe that there may be different causal mechanisms behind these two phenomena. The importance of social participation and social network has not been previously investigated in relation to intermittent smoking. The aim of this study was to investigate whether there were socioeconomic differences in intermittent and daily smoking, respectively, in a middle aged population, and to assess the association between social participation and these two smoking behaviours.

There were no socioeconomic differences in intermittent smoking and no association with social participation, a result that contrasts sharply with the clear socioeconomic differences and strong association with low social participation for daily smokers. These results indicate that there may be different causal mechanisms that explain intermittent smoking as opposed to daily smoking, and that the lack of sufficient levels of social participation and empowerment may be a barrier against smoking cessation among daily smokers but not among intermittent smokers.

in the link between socioeconomic status and daily smoking, but not intermittent smoking.

An important task is therefore to increase the understanding of which aspects of social capital are protective against daily smoking—for example, those generated by family and kinship compared with those from formal organisations such as unions, political parties, and study circles.<sup>43</sup> Measures to improve social capital have been suggested as a means to improve health related behaviours that are not sufficiently influenced by individually targeted health promotion measures.<sup>44</sup> The results of this study imply that preventive measures against daily tobacco smoking could be designed to improve at least certain aspects of social participation. A campaign, supported by the health services, to increase involvement (empowerment) in social and civic activities might have health promoting effects.<sup>18</sup> The policy should thus affect the activities within formal and informal organisations and networks. This does not exclude an individual information strategy, particularly strategies directed at adolescents, but it further suggests yet another contextual dimension of preventive measures. The mechanisms that explain intermittent smoking remain to be disentangled.

This study was supported by grants from the Swedish Medical Research Council (B93-27X-10428-01A), the Swedish Council for Social Research (F0989/2000), the Swedish Research Council (D2000-0992:5, A14-5/618), the Medical Faculty, Lund University, the National Institute of Public Health, and the Swedish Cancer Society (2684-D93-05XAA).

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