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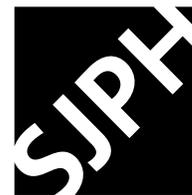
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ORIGINAL ARTICLE

Gender differences in daily smoking prevalence in different age strata: A population-based study in southern Sweden

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Abstract

Objectives: To investigate gender differences in daily smoking prevalence in different age groups in southern Sweden. **Methods:** The 2004 public-health survey in Skåne is a cross-sectional study. A total of 27,757 persons aged 18–80 years answered a postal questionnaire, which represents 59% of the random sample. A logistic regression model was used to investigate the associations between gender and daily smoking according to age. The multivariate analysis was performed to investigate the importance of possible confounders (country of origin, education, snus use, alcohol consumption, leisure-time physical activity, and BMI) on the gender differences in daily smoking in different age groups. **Results:** 14.9% of the men and 18.1% of the women were daily smokers. Middle-aged respondents were daily smokers to a significantly higher extent than young and old respondents. The prevalence of daily smoking also varied according to other demographic, socioeconomic, health related behaviour, and BMI characteristics. The crude odds ratios of daily smoking were 1.79 (1.42–2.26) among women compared to men in the 18–24 years age group, and 0.95 (0.80–1.12) in the 65–80 years age group. These odds ratios changed to 2.00 (1.49–2.67) and 0.95 (0.76–1.18), respectively, when all confounders were included. **Conclusions:** For the first time in Sweden women have a higher prevalence of daily smoking than men. The odds ratios of daily smoking are highest among women compared to men in the youngest age group of 18–24 years and the odds ratios decrease with increasing age. The findings point to a serious public health problem. Strategic interventions targeting young women's tobacco smoking are needed.

Key Words: Daily smoking, gender, gender differences, health related behaviours, Sweden

Introduction

During most of the 20th century the gap in life expectancy between men and women grew wider in high-income countries. Female life expectancy increased faster from a higher starting level. This development was mostly attributed in the literature to behavioural factors such as, for instance, smoking. However, in recent decades this trend of widening sex differences in life expectancy has been reversed in most high-income countries [1]. Recent studies indicate that one important explanation behind this reversal of the trend in sex differences in life expectancy from divergence to convergence may be the recent female and male trends in tobacco smoking [2,3]. In Sweden the difference between

female and male life expectancy decreased from 5.6 to 4.5 years between 1990 and 2003/2004. The prevalence of daily tobacco smoking has also, for the first time, been higher among women than among men in Sweden since the late 1990s although the smoking prevalence continues to decrease for both men and women [4]. Similar patterns have been observed in, for example the USA [2], Canada [3], and Denmark [5].

The prevalence of daily smoking depends on a number of different factors including the recruitment of new smokers, which occurs mainly among adolescents and young adults; rates of smoking cessation; and mortality rates among smokers compared to non-smokers. Smoking cessation is for

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instance a complex process that includes social, psychosocial, psychological (mental health), and biological factors [6]. In Sweden, as in other Western countries, daily smoking is associated with age, country of origin [7], and socioeconomic factors such as education [8]. An accumulation of several poor health related behaviours such as smoking, alcohol consumption at risk, low physical activity, and less healthy dietary intake is more common among men than among women [4]. Since the 1980s snus or non-smoked tobacco has been suggested as a less harmful alternative for current cigarette smokers, although this notion has not remained undisputed [9]. Sweden has become a country of interest in this regard, since Sweden was granted an exemption from the general ban on manufacturing and marketing snus within the European Community when it joined in 1995 [10]. For this reason Sweden has probably the highest prevalence of non-smoked tobacco use among men, approximately 20%, in the world [9].

It should be noted that trends in differences between men and women in life expectancy may theoretically be due to both biological and social factors. However, social factors affecting smoking behaviour seem more plausible as explanations in particular for the already described trends divergence and convergence over time. It thus seems important to distinguish between the "sex" and "gender" concepts. Sex refers to biological sex, while gender refers to the parallel and socially unequal division into femininity and masculinity which is a social construct [11].

The aim of this study is to investigate gender differences in daily smoking prevalence in different age groups in southern Sweden, taking demographic, socioeconomic factors, snus use, alcohol consumption, leisure-time physical activity, and BMI factors into account.

Methods and material

Study population

The 2004 public-health survey in Skåne is a cross-sectional study. A total of 27,963 randomly selected persons aged 18–80 years answered a postal questionnaire in the Autumn (September–December) of 2004, resulting in a 59% participation rate. Two letters of reminder were also sent to the respondents, and a subsequent phone call was made to the remaining non-respondents. A total of 27,757 respondents returned complete answers (correct person in the household according to age and sex answered

the questionnaire). The random sample was weighted by age, sex and geographic area in order to increase the statistical power in some smaller administrative areas. This has been corrected by a weighting variable, so that the data in this study are representative for the entire Skåne region.

Dependent variable

The *smoking* item ("Do you smoke?") contains four alternatives: daily smoker, intermittent (non-daily) smoker, stopped smoking and never smoked. Daily smoking was measured as the proportion of daily smokers of the entire population in the sample.

Independent variables

Age groups were divided into the age groups 18–24, 25–34, 35–44, 45–54, 55–64 and 65–80 years.

All analyses in Tables I and II were stratified by *sex/gender*.

Country of origin. All persons born in countries other than Sweden were merged into a single category, which yielded the two categories "Sweden" and "other".

Education was divided by length of education into 9 or less years, 10–12 years, and 13 years of education or more.

Snus use was assessed by the question "Do you use snus daily?" with the alternative answers "Yes" and "No".

Alcohol consumption was classified as at "risk" or "no risk" by four items including "How often have you drunk alcohol during the past 12 months?": 4 times per week or more, 2–3 times a week, 2–4 times a month, 1 time a month or less, and never; "How many glasses do you drink on a typical day when you drink alcohol?": 1–2, 3–4, 5–6, 7–9, and 10 times or more; "How often do you drink six glasses or more at the same occasion?": daily or almost daily, every week, every month, more seldom than once a month, and never; "How often during the past 12 months have you drunk alcohol to such an extent that you became intoxicated?". The results on the four questions were calculated into a score that yielded the "risk" or "no risk" results (thoroughly described in reference [12]).

Leisure-time physical activity was assessed by an item "How much have you done physical exercise during leisure-time during the past 12 months?" with four alternative answers including "Regular exercise and training (running, badminton, gymnastics, or similar at least three times per week at least 30 minutes per occasion)", "moderate, regular exercise during

Table I. Prevalence (%) of smoking, demographic, socioeconomic status, snus use, alcohol consumption, leisure-time physical activity, and BMI. $n = 27,757$. The public-health survey in Skåne 2004.

	Men ($n = 12,626$)	Women ($n = 15,131$)	Total ($n = 27,757$)
Smoking			
Daily smoker	14.9	18.1	16.6
Intermittent	4.5	4.7	4.6
Smoker			
Stopped smoking	28.7	21.7	24.9
Never smoked	51.9	55.5	53.9
(Missing)	(282)	(506)	(788)
Age			
18–24	8.8	9.6	9.2
25–34	14.1	15.9	15.1
35–44	17.5	18.2	17.9
45–54	18.2	17.6	17.9
55–64	20.6	19.2	19.9
65–80	20.9	19.5	20.1
(Missing)	(0)	(0)	(0)
Country of origin			
Sweden	88.5	88.0	88.2
Other countries	11.5	12.0	11.8
(Missing)	(570)	(477)	(1047)
Education			
13+ years	32.4	39.0	36.0
10–12 years	23.9	23.6	23.7
–9 years	43.7	37.4	40.3
(Missing)	(1095)	(1592)	(2687)
Daily snus use			
Yes	19.5	2.3	10.2
No	80.5	97.7	89.8
(Missing)	(568)	(735)	(1303)
Alcohol consumption			
No risk	86.4	91.7	89.3
Risk	13.6	8.3	10.7
(Missing)	(213)	(444)	(657)
Leisure-time physical activity			
Not sedentary	83.2	84.7	84.0
Sedentary	16.8	15.3	16.0
(Missing)	(188)	(356)	(544)
Body mass index (BMI)			
Normal weight (BMI –24.9)	43.0	59.6	52.0
Overweight (BMI 25.0–29.9)	44.7	28.1	35.7
Obesity (BMI 30.0–)	12.3	12.3	12.3
(Missing)	(221)	(444)	(665)

leisure time (1–2 times per week at least 30 minutes per occasion of running, swimming, tennis, badminton, or other activities that make you sweat”, “moderate exercise during leisure time (walking, bicycling or other similar activity at least 2 hours per week without sweating)”, and sedentary leisure time (mostly reading, watching TV, watching a movie, walking and bicycling less than 2 hours

per week)”. This variable was dichotomized with the three first alternatives as “not sedentary”, and the fourth alternative as “sedentary”.

Body mass index (BMI) was calculated after measuring length (single cm) and weight (single kg). BMI was classified into normal weight (BMI 24.9) which thus also includes underweight, overweight (BMI 25.0–29.9), and obesity (BMI 30.0+). In the multiple regressions BMI was used as a continuous variable.

Statistics

Prevalence (%) of the smoking, demographic, socioeconomic position, snus use, alcohol consumption, leisure-time physical activity, and BMI variables were calculated (Table I). Crude odds ratios and 95% confidence intervals (OR, 95% CI) were calculated in order to analyze associations between demographic, socioeconomic position, snus use, alcohol consumption, leisure-time physical activity, and BMI variables, and daily smoking (Table II). The multivariate analysis was performed using a logistic regression model to investigate the importance of possible confounders (age within each age group, country of origin, education, snus use, alcohol consumption, leisure-time physical activity, and BMI) on the association between gender and daily smoking (Table III). The statistical analysis was performed using the SPSS software package [13].

Results

Table I shows that the prevalence of daily smoking was 14.9% among men and 18.1% among women. In contrast, the prevalence of male ever smokers who had stopped smoking was 28.7% and the corresponding prevalence among women was only 21.7%. Male and female prevalences of age distribution, country of origin, education, snus use, alcohol consumption, leisure-time physical activity, and BMI are also presented in Table I.

Table II shows that middle-aged men and women were daily smokers to a significantly higher extent than younger respondents. Both male and female respondents born in other countries than Sweden, with medium and low education, alcohol consumption at risk, and sedentary (low) leisure-time physical activity status were daily smokers to a significantly higher extent than their corresponding reference categories. Daily snus use was significantly more prevalent among non smokers among both men and women.

Table II. Prevalences (%) and odds ratios (ORs) with 95% confidence intervals (95% CI) of daily smoking (whole population) according to sociodemographic variables, snus use, alcohol consumption, leisure-time physical activity, and BMI. *n* (men) = 12,626 and *n* (women) = 15,131. The public-health survey in Skåne 2004.

Daily smoking (of whole population)	Men		Women	
	%	OR (95% CI)	%	OR (95% CI)
Age				
18–24	10.6	1.00	17.4	1.00
25–34	10.8	1.03 (0.81–1.31)	15.0	0.83 (0.70–1.00)
35–44	14.2	1.40 (1.11–1.75)	17.9	1.03 (0.87–1.22)
45–54	19.4	2.03 (1.64–2.53)	24.4	1.51 (1.28–1.77)
55–64	18.5	1.92 (1.55–2.38)	19.8	1.17 (0.99–1.37)
65–80	11.2	1.07 (0.85–1.33)	10.7	0.57 (0.47–0.68)
(Missing)	(0)		(0)	
Country of origin				
Sweden	12.8	1.00	16.9	1.00
Other countries	26.1	2.40 (2.10–2.74)	20.0	1.23 (1.09–1.40)
(Missing)	(640)		(552)	
Education				
13+ years	8.0	1.00	10.2	1.00
10–12 years	15.5	2.12 (1.81–2.48)	19.8	2.17 (1.92–2.46)
–9 years	19.0	2.71 (2.36–3.11)	23.1	2.65 (2.37–2.96)
(Missing)	(544)		(663)	
Daily snus use				
No	20.4	1.00	2.5	1.00
Yes	14.0	0.64 (0.55–0.73)	1.4	0.57 (0.40–0.81)
(Missing)	(542)		(688)	
Alcohol consumption				
No risk	13.5	1.00	16.4	1.00
Risk	20.7	1.67 (1.47–1.90)	29.7	2.16 (1.90–2.46)
(Missing)	(278)		(387)	
Leisure-time physical activity				
Not sedentary	12.5	1.00	15.7	1.00
Sedentary	25.2	2.36 (2.10–2.66)	29.1	2.19 (1.97–2.45)
(Missing)	(236)		(394)	
Body mass index (BMI)				
Normal weight (BMI <24.9)	15.2	1.00	17.8	1.00
Overweight (BMI 25.0 and lower)	13.6	0.95 (0.82–1.12)	17.2	0.93 (0.80–1.08)
Obesity (BMI 30.0 and higher)	15.8	1.14 (1.03–1.27)	16.1	0.89 (0.78–1.02)
(Missing)	(314)		(535)	

Table III shows that the crude odds ratios of daily smoking among women compared to men were highest (and significant) in the 18–24 year age group, 1.79 (1.42–2.26), and lowest (and not significant with a small inverse female male odds ratio) in the 65–80 year age group, 0.95 (0.80–1.12). The odds ratios of female compared to male prevalence of daily smoking showed intermediate levels for the intermediary age groups 25–34, 35–44, 45–54 and 55–64 years with significant odds ratios in all of them with the exception of the 55–64 years age group. Multiple adjustments did not reduce the odds ratios to any important extent. The female compared to male odds ratios of daily smoking remained significant in these final models with adjustments for all independent variables for the 18–24, 25–34, 35–44, and 45–4 year age groups.

Discussion

This study shows that the odds ratios of daily smoking are highest among women compared to men in the youngest age group 18–24 years and decrease with increasing age. In the oldest age groups 55–64 and 65–80 years there were no significant differences in daily smoking prevalence either before or after multiple adjustments, with a not significant but lower odds ratio in the 65–80 year age group. The gender differences in the younger age groups in daily smoking were somewhat reduced but remained significant in all these age groups even after adjustments for demographic, socioeconomic, snus use, health related behaviours, and BMI variables.

For a couple of years women in Sweden have had a higher prevalence of daily smoking than men.

Table III. Crude and adjusted odds ratios and 95% confidence intervals (ORs, 95% CI) of daily smoking in different age groups. The public-health survey in Skåne 2004.

	OR (95%CI) ^a	OR (95%CI) ^b	OR (95%CI) ^c	OR (95% CI) ^d
18–24 years				
Men	1.00	1.00	1.00	1.00
Women	1.79 (1.42–2.26)	1.79 (1.42–2.26)	2.25 (1.73–2.93)	2.00 (1.49–2.67)
25–34 years				
Men	1.00	1.00 (1.20–1.75)	1.00	1.00
Women	1.46 (1.21–1.75)	1.45 (1.20–1.75)	1.54 (1.26–1.91)	1.65 (1.30–2.09)
35–44 years				
Men	1.00	1.00	1.00	1.00
Women	1.32 (1.14–1.54)	1.33 (1.14–1.57)	1.47 (1.23–1.74)	1.44 (1.18–1.75)
45–54 years				
Men	1.00	1.00	1.00	1.00
Women	1.33 (1.16–1.52)	1.33 (1.16–1.52)	1.36 (1.17–1.58)	1.31 (1.11–1.54)
55–64 years				
Men	1.00	1.00	1.00	1.00
Women	1.09 (0.95–1.24)	1.08 (0.94–1.24)	1.17 (1.01–1.36)	1.08 (0.92–1.27)
65–80 years				
Men	1.00	1.00	1.00	1.00
Women	0.95 (0.80–1.12)	0.96 (0.81–1.13)	1.01 (0.83–1.23)	0.95 (0.76–1.18)

^aCrude. ^bAdjusted for age. ^cAdjusted for age, country of origin and education. ^dAdjusted for age, country of origin, education, snus use, alcohol consumption, leisure-time physical activity, and BMI.

The prevalence of daily smoking among men in Sweden has been declining since the late 1960s. Among women the daily smoking prevalence increased until the late 1970s, but since then it has declined. The daily smoking prevalence was 36% among men and 28% among women in 1980. Since 1980 the daily smoking prevalence has been declining among both men and women, although the smoking cessation rate has been higher among men throughout the period. In the early 1990s the two prevalence curves crossed each other at the level of approximately a 26–27% prevalence of daily smoking. Since the mid or late 1990s the prevalence of daily smoking has been higher among women than among men [4]. The findings of the present study may be interpreted to suggest that the gender difference in smoking prevalence is likely to increase in the future because the higher overall female daily smoking prevalence compared to men seems to be concentrated in the younger age strata.

Similar patterns of converging male and female smoking prevalence have been observed in a number of other Western countries such as for example Belgium, Canada, Denmark, France, the USA and Italy, although Norway and Sweden are the only countries in which the female smoking prevalence is higher than the male smoking prevalence [14].

The changing patterns of gender differences in daily smoking prevalence may also be observed in smoking attributable mortality rates. The age adjusted lung cancer mortality among men was

35/100,000 in 1970, 41/100,000 in 1990, and 33/100,000 in 2002. There has been a continuous decline in lung cancer mortality since 1990 among men in Sweden. In contrast, the age adjusted lung cancer mortality among women in Sweden has continuously increased from 8/100,000 in 1970 to 25/100,000 in 2002. The mortality in chronic obstructive pulmonary disease (COPD) increased among men from 8/100,000 in 1970 to 12/100,000 in 2002, and among women from 3/100,000 in 1970 to 12/100,000 in 2002 [4].

The associations between gender and daily smoking differ according to age. In the younger age groups there were significant differences in daily smoking according to gender in favour of men. In the older age groups the gender differences in daily smoking were not significant, and in the age group 65–80 years were somewhat (not significantly) lower among women. One important explanation for the not significant differences in daily smoking prevalence in the older age groups may be the higher smoking cessation rates among men than among women, which has been observed in this as well as in previous studies [15]. The significant odds ratios in the younger age groups were only partly reduced, to lower but still significant levels, by the introduction of demographic, socio-economic, snus use, health related behaviours, and BMI variables in the multiple models. The higher prevalence of snus use among men, for instance, seems to be of importance in reducing the female–male odds ratios of daily smoking.

The explanations behind the higher likelihood of daily smoking among young women as compared to men, independent of other potential confounders, are not well known. However, there are plausible explanations for the gender inequity in the behavioural risk patterns among young people today. First, gender equity is likely to be interpreted as women taking on men's destructive behaviours, such as excessive tobacco and alcohol use. Second, there are aggressive marketing strategies which target young women and encourage them to start smoking at an early age. Unfortunately, tobacco control legislations and policies resulting in high prices for cigarettes have been shown to have an impact on the prevalence of smoking or quantity smoked for men but no effect on either smoking prevalence or quantity smoked by women [16]. Third, society norms including expectations on body image, appearance and well-being for women push women to lifestyles that can maintain such expectations. Tobacco smoking is believed by many women (particularly the young) to contribute to slenderness and beauty. These beliefs are also projected in marketing campaigns. In fact, there is evidence for gender differences in smoking initiation, by which teenage girls have a higher likelihood than boys of early initiation of smoking [17]. In addition women have greater expectations that smoking will reduce poor psychological health [18]. These plausible explanations call for multi-component strategic interventions that can reach young women and modify unhealthy behaviours.

Recent studies also suggest that the prevalence of smoking is higher among adolescent girls than adolescent boys in Sweden [19]. If these recruitment patterns remain, the gender differences in smoking are likely to further increase in the future resulting in a slower increase in female compared to male life expectancy in the future. It seems that female adolescents and young adults may be a very important target group for tobacco prevention.

A higher proportion of heavy smokers among women than among men may be one plausible explanation for the trend of increasing sex differences in daily smoking prevalence in favour of men. However, this notion is not supported by the data in this study. A 59.8% proportion of the male daily smokers but only 46.2% of the female daily smokers smoke 15 cigarettes per day or more (not shown in tables).

The results of this study suggest, although it is impossible in a cross-sectional study to prove, that differing gender differences according to age in daily smoking may be one explanation why gender differences in life expectancy are converging. The notion that health related behaviours may be a

major factor influencing mortality rates and life expectancy have been confirmed in several studies from different European countries including Denmark [20] and Russia [21] in recent years.

Differing trends in daily smoking prevalence and life expectancy according to gender may be discussed in a broader social science perspective including changing gender roles in a changing society [22]. However, this issue calls for further analyses of longitudinal data beyond the scope of this article.

Implications for public health policies and interventions

It is now the third year since Sweden passed legislation against smoking in public places. Additionally, Sweden attempts to limit access to cigarettes by adding an extra taxation rate on the price of cigarettes, making them more expensive. In spite of these structural strategies, a proportion of young women who smoke every day are still larger than that of men. This raises serious concerns about not reaching the young women. It seems clear that young women need a combination of structural and individual-based strategies to motivate them to stop smoking. Most of all preventing young women from early initiation of smoking may be important. Thus schools and media have a substantial role to play.

Strengths and limitations

The participation rate is 59% which may be regarded as acceptable considering current participation rates in most Western countries. The distributions of age, sex and education correspond well with the age, sex and education distribution in the general population registers in Skåne. In contrast, persons born in countries other than Sweden constitute approximately 12% of the population in this study compared to approximately 16% in the general Skåne population in the corresponding age groups. The group born in countries other than Sweden is thus clearly underrepresented in this study. Still, the risk of selection bias was considered low in a previous survey study on a random sample conducted with almost exactly the same sampling design and the same participation rate (59%) in Skåne in 2000 [23]. The prevalence rates and gender differences in the prevalence rates correspond well with other data from Sweden [4].

The validity of items assessing smoking has previously been analysed on several occasions. The results have consistently shown that self reported tobacco smoking is a valid and reliable instrument for the measurement of tobacco smoking habits in a population [24–26].

Age, country of origin, education, snus use, alcohol consumption, leisure-time physical activity, and BMI might be confounders of the association between sex/gender and daily smoking. Adjusting for these variables affected the estimates to the extent illustrated in Table III.

The cross-sectional study design is a very important weakness, because the direction of causality is not possible to disentangle. However, the aim of this study is to explore the sex/gender differences in daily smoking in different age strata.

Conclusions

Women have had a higher prevalence of daily smoking than men for almost a decade. The odds ratios of daily smoking are highest among women compared to men in the youngest age group 18–24 years and decrease with increasing age. The gender differences in daily smoking remained significant in several younger age groups even after adjustments for demographic, socioeconomic, snus use and health related behaviour variables. The findings point to a serious public health problem. Strategic interventions targeting young women's tobacco smoking are needed.

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