

# Cigarette smoking gives more respiratory symptoms among women than among men

## The Nord-Trøndelag Health Study (HUNT)

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### Abstract

**Study objective**—Studies have indicated that women are more vulnerable to the effect of tobacco smoking compared with men. The aim of this study was to explore the prevalence of reported respiratory symptoms and diseases according to smoking burden, age and sex.

**Design**—Questionnaire in a cross sectional population based study.

**Setting**—The BONT (Bronchial obstruction in Nord-Trøndelag) study is part of a comprehensive health survey of all inhabitants aged above 19 years in the county of Nord-Trøndelag, Norway, which was carried out from 1995 to 1997.

**Participants**—A total of 65 717 subjects, 71.3% of the total population aged 20–100, answered the main questionnaire.

**Main results**—In all, 12.7% men and 12.1% women reported episodes of wheezing or breathlessness during the past 12 months, 8.8% men and 8.4% women reported that they had or had had asthma, 7.5% men and 8.2% women had ever used asthma medication, and 4.0% men and 3.0% women reported chronic bronchitis. Thirty per cent of men and 31% of women were smokers, and average pack years of smoking were 15.9 and 10.3, respectively. Among previous and current smokers, significant more women reported episodes of wheezing or breathlessness, current asthma and persistent coughing compared with men with the same smoke burden (pack years) and daily number of cigarettes.

**Conclusion**—The prevalence of reported asthma and use of asthma medication was higher than reported in previous Scandinavian studies. Respiratory symptoms increased by smoking burden. Comparing the prevalence of symptoms and current asthma among women and men with the same smoke burden or daily cigarette consumption, women seemed to be more susceptible to the effect of tobacco smoking than men.

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Respiratory symptoms vary by sex, smoking habits and age. There is increasing evidence of higher susceptibility in women to tobacco smoking compared with men.<sup>1</sup> Studies indicate that women have increased smoking related bronchial responsiveness, lower level and faster decline of FEV1, and higher prevalence of

asthma compared with smoking men.<sup>2–6</sup> Studies from Copenhagen showed greater impact of smoking on lung function and higher risk of being admitted to hospital for chronic obstructive pulmonary disease (COPD) in women than in men.<sup>7,8</sup>

The aim of this study was to estimate the prevalence of respiratory symptoms and diseases in a large adult population covering the age range from 20 to 100 years old by sex, age, current cigarette smoking habits and lifelong cigarette smoking burden.

### Methods

From August 1995 to June 1997 all residents aged 20 years and more (92 000), of the Nord-Trøndelag County, Norway, were invited to participate in a health study (HUNT). The invitation included a comprehensive Questionnaire I with focus on health, diseases, symptoms and risk factors. At the screening further questionnaires with more disease specific questions were added.

### STUDY AREA

Nord-Trøndelag County (22 463 km<sup>2</sup>) is situated in the middle part of Norway. The county has mostly mild coastal climate, but also typical inland areas with cold dry winters. The total population in 1995 was 127 000 residents, 97% being of white origin. The area is generally rural with a scattered population, but with several densely populated areas and small cities, the largest of which has 21 000 residents. Fifteen per cent of men and 6% of women worked as farmers. Except for previous mining industry in the two smallest municipalities, there is hardly any industrial pollution in the county.

### QUESTIONNAIRES

The questions related to respiratory illnesses, diseases and smoking habits are listed in the appendix. Subjects, who reported “ever asthma” (having had asthma at one time or another) and episodes of wheezing or breathlessness during the past 12 months, were defined as having current asthma. Chronic bronchitis was defined as coughing with phlegm in periods of at least three months during each of the past two years.<sup>9</sup>

The smoking status was classified as never smokers (never smoked daily), ex-smokers (ceased smoking one or more years earlier) and current smokers.

Pack years was calculated as number of years of smoking × number of cigarettes a day/20.

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Table 1 Mean age, body mass index, and number of pack years in ever smokers with standard deviation (SD), and smoking habits by sex and age groups. Nord-Trøndelag, Norway 1997

	Age 20–44 years		Age 45–69 years		Age 70+ years		All	
	Men	Women	Men	Women	Men	Women	Men	Women
Number	12 602	14 442	13 119	14 074	5022	6458	30 743	34 974
Age	33.4 (7.0)	33.1 (7.1)	55.6 (7.3)	55.8 (7.3)	76.5 (5.7)	77.3 (5.5)	50.0 (17.0)	50.4 (17.8)
Body mass index (kg/m <sup>2</sup> )	25.9 (3.5)	25.0 (4.3)	27.0 (3.4)	26.9 (4.6)	26.5 (3.5)	27.6 (4.6)	26.5 (3.5)	26.3 (4.6)
Number of pack years in ever smokers	9.3 (7.7)	7.2 (5.9)	19.0 (14.4)	13.2 (9.9)	21.9 (17.0)	12.8 (10.9)	16.0 (13.9)	10.3 (4.6)
Smoking habits*								
Never smoker	6 444	6 404	3 700	5 810	1058	3908	11 202	16 122
Ex-smoker	2 016	2 449	4 872	3 139	2468	804	9 356	6 392
Current smoker	3 539	4 977	4 079	4 338	1057	619	8 675	9 934

\*1510 men and 2526 women had missing data on smoking habits.

#### NON-RESPONDER STUDY

In a non-responder study, 2.5% of the non-responders (685 persons) were randomly selected for a telephone interview with the same questions as in the survey. If no telephone contact was established after three attempts made for each subject on various occasions, a questionnaire was mailed to the subjects.

#### STATISTICAL ANALYSIS

Statistical Package for the Social Sciences version 8.0 (SPSS Inc, Chicago, Illinois) was used for all analyses. Differences between continuous variables were analysed by Student's *t* test and dichotomous variables by the  $\chi^2$  test. The Mantel-Haenszel method was used to analyse significance of trends. Body mass index (BMI, kg/m<sup>2</sup>) has been reported to be an independent risk factor for onset of asthma in adult women,<sup>9,10</sup> and was therefore included in the analyses. Analyses of covariance were used to calculate prevalence adjusted for covariates as age, pack years and BMI. Sex specific risk of reporting respiratory diseases and symptoms by smoke exposure were calculated by multiple logistic regression with age, BMI, pack years or number of daily cigarettes in current smokers in the model. When education and different work categories were included in the model, education did not contribute significantly to the explained variance, but some work categories did. They did not, however, in the saturated model change the  $\beta$  estimates significantly for BMI or pack years, and were therefore not included in the final model (table 3). Interaction of sex and pack years was used to test sex dependent susceptibility to smoke burden. The direct method of standardisation<sup>11</sup> was used in age adjustment of prevalence in the non-responder group.

#### ETHICS

The study was approved by the Regional Committee for Ethics in Medical Research and the Norwegian Data Inspectorate.

## Results

#### ATTENDANCE

A total of 73.9% women and 65.6% men completed the main questionnaire (total 71.3%) (table 1). The response rates were 48.9% (20–29 years), 69.7% (30–39 years), 80.6% (40–69 years), 76.6% (70–79 years) and 51% (80+ years).

Table 2 Prevalence (%) of self reported asthma, use of asthma medication, coughing and smoking status in responders (*n*=65 717) and in non-responders (*n*=326). Nord-Trøndelag, Norway 1997

Self reported symptoms and smoking habits	Responders (%)	Non-responders (%)	<i>p</i> Value
Ever asthma	8.6	9.1	0.79
Asthma medication	8.0	9.5	0.52
Coughing	14.9	10.8	0.04
Coughing with phlegm	8.3	6.2	0.08
Chronic bronchitis	3.5	3.0	0.74
Never smoker	44.3	39.7	0.10
Ex-smoker	25.5	24.8	0.78
Current smoker	30.2	35.5	0.04

Prevalence in non-responders age adjusted by direct method standardisation (total study population as reference).

#### NON-RESPONDER STUDY

Of 685 subjects randomly selected to the non-responder study, 326 subjects (47.6%) responded either to a telephone interview or the questionnaire. The most important reason for non-attending in age group 20–69 was lack of time/moved away (54%), while in those aged 70 years or more immobilising disease (21%) and follow up by medical doctor (28%) were important reasons.

The only significant difference in reported symptoms and diseases was lower prevalence of coughing in non-responders compared with responders, even though a significant higher prevalence of smoking was found in the non-responder group (table 2).

#### SMOKING HABITS

A total of 29.7% of men and 30.6% of women reported current smoking, while 32% of men and 19.7% of women were ex-smokers (table 1). In age group 20–59 years smoking was more prevalent in women than in men (35.8% versus 31.0%, *p*<0.001), in contrast with subjects aged 60 or more (18.4% versus 26.5% in women and men respectively, *p*<0.001). On average men started to smoke at younger age than women (18.4 versus 19.8 years, *p*<0.001), and had higher average daily cigarette consumption (13.1 versus 9.7 cigarettes, *p*<0.001). In "ever smokers" the average number of pack years were 16.0 and 10.3 for men and women respectively (*p*<0.001).

#### SYMPTOMS AND RESPIRATORY DISEASE

##### Episodes of wheezing or breathlessness

In all, 12.7% of men and 12.1% of women reported episodes of wheezing or breathlessness during the past 12 months. Smokers reported these symptoms twice as prevalent as never smokers, and the prevalence increased by

Table 3 Prevalence (%) of self reported respiratory symptoms, asthma, chronic bronchitis and use of asthma medication in 34 974 women and 30 743 men by age groups and smoking habits, with 95% confidence intervals. Nord-Trøndelag, Norway 1997

	Age 20–44 years				Age 45–69 years				Age 70+ years			
	Men		Women		Men		Women		Men		Women	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
<b>Wheezing/breathless</b>												
Never smoker	7.9	7.2, 8.6	7.7	7.0, 8.4	7.6	6.7, 8.5	9.2	8.4, 10.0	11.4	9.5, 13.3	12.4	11.4, 13.4
Ex-smoker	9.9	8.6, 11.2	9.8	8.6, 11.0	12.5	11.6, 13.4	12.2	11.0, 13.4	18.9	17.3, 20.5	18.0	15.3, 20.7
Smoker	15.4	14.2, 16.6	15.9	14.9, 16.9	18.6	17.4, 19.8	17.7	16.6, 18.8	24.0	21.4, 26.6	20.7	17.5, 23.9
Total	10.3	9.8, 10.8	10.9	10.4, 11.4	13.0	12.4, 13.6	12.7	12.1, 13.3	18.2	17.1, 19.3	13.9	13.0, 14.8
<b>Ever asthma</b>												
Never smoker	8.1	7.4, 8.8	7.7	7.0, 8.4	7.3	6.5, 8.1	6.8	6.2, 7.4	6.8	5.3, 8.3	7.6	6.8, 8.4
Ex-smoker	9.8	8.5, 11.1	9.7	8.5, 10.9	9.3	8.5, 10.1	8.8	7.8, 9.8	12.2	10.9, 13.5	11.9	9.7, 14.1
Smoker	8.3	7.4, 9.2	9.0	8.2, 9.8	8.4	7.5, 9.3	9.8	8.9, 10.7	11.2	9.3, 13.1	10.6	8.2, 13.0
Total	8.5	8.0, 9.0	8.5	8.0, 9.0	8.4	7.9, 8.9	8.3	7.8, 8.8	10.7	9.8, 11.6	8.5	7.8, 9.2
<b>Asthma medication</b>												
Never smoker	7.3	6.7, 7.9	7.9	7.2, 8.6	5.6	4.9, 6.3	6.7	6.1, 7.3	5.9	4.5, 7.3	6.6	5.8, 7.4
Ex-smoker	9.0	7.7, 10.3	9.3	8.1, 10.5	8.2	7.4, 9.0	9.0	8.0, 10.0	11.9	10.6, 13.2	12.4	10.1, 14.7
Smoker	6.5	5.7, 7.3	9.5	8.7, 10.3	6.8	6.0, 7.6	9.3	8.4, 10.2	11.2	9.3, 13.1	9.4	7.1, 11.7
Total	7.3	6.8, 7.8	8.7	8.2, 9.2	7.1	6.7, 7.5	8.1	7.6, 8.6	10.3	9.4, 11.2	7.6	6.9, 8.3
<b>Daily coughing in periods</b>												
Never smoker	9.8	9.1, 10.5	9.7	9.0, 10.4	10.8	9.8, 11.8	11.8	11.0, 12.6	11.5	9.6, 13.4	11.7	10.7, 12.7
Ex-smoker	11.2	9.8, 12.6	9.8	8.6, 11.0	10.6	9.7, 11.5	11.7	10.6, 12.8	16.2	14.7, 17.7	14.7	12.2, 17.2
Smoker	24.3	22.9, 25.7	23.2	22.0, 24.4	29.4	28.0, 30.8	23.4	22.1, 24.7	29.7	26.9, 32.5	21.6	18.4, 24.8
Total	14.2	13.6, 14.8	14.4	13.8, 15.0	16.5	15.9, 17.1	15.3	14.7, 15.9	17.9	16.8, 19.0	13.0	12.2, 13.8
<b>Coughing with phlegm</b>												
Never smoker	4.9	4.4, 5.5	4.5	4.0, 5.0	5.3	4.6, 6.0	5.6	5.0, 6.2	7.2	5.6, 8.8	5.9	5.2, 6.7
Ex-smoker	6.4	5.4, 7.5	4.5	3.7, 5.4	6.4	5.7, 7.1	5.9	5.1, 6.8	10.4	9.2, 11.6	9.5	7.5, 11.5
Smoker	13.8	12.7, 15.0	13.1	12.2, 14.1	17.2	16.0, 18.4	13.0	12.0, 14.0	22.1	19.6, 24.7	14.3	11.5, 17.0
Total	7.7	7.3, 8.2	7.6	7.1, 8.0	9.4	8.9, 9.9	8.0	7.5, 8.4	12.1	11.2, 13.0	7.2	6.6, 7.9
<b>Chronic bronchitis</b>												
Never smoker	1.4	1.1, 1.7	1.2	0.9, 1.5	2.3	1.8, 2.8	2.7	2.3, 3.1	2.6	1.6, 3.5	3.0	2.4, 3.5
Ex-smoker	1.5	1.0, 2.0	1.4	1.0, 1.9	3.5	3.0, 4.0	2.8	2.2, 3.4	5.7	4.8, 6.7	5.0	3.5, 6.5
Smoker	4.7	4.0, 5.4	3.8	3.3, 4.4	8.4	7.6, 9.3	5.5	4.8, 6.2	12.7	10.7, 14.7	7.3	5.3, 9.4
Total	2.4	2.1, 2.6	2.2	1.9, 2.4	4.7	4.3, 5.0	3.7	3.3, 4.0	6.5	5.8, 7.2	3.6	3.1, 4.1

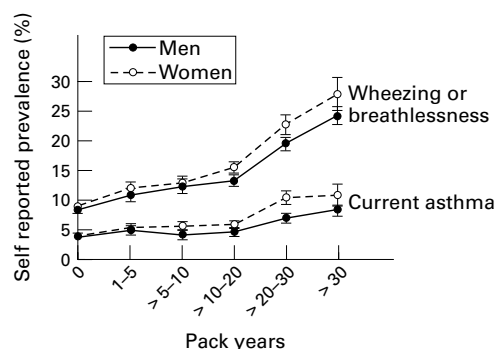


Figure 1 Age adjusted prevalence (%) of self reported episodes of wheezing or breathlessness in the past 12 months and current asthma by number of pack years in men and women (95% confidence intervals). Nord-Trøndelag, Norway 1997.

smoking burden (p for trend<0.001) (table 3, fig 1). Among never smokers more women than men (9.2% versus 8.6% when adjusted by age and BMI, p < 0.001), reported wheezing or breathlessness and the difference between sexes increased by increasing smoke burden (pack years) (table 4, fig 1).

**Ever asthma and current asthma**

Some 8.8% of men and 8.4% of women reported “ever asthma” (table 3), and 4.8% of men and 5.1% of women was categorised as having current asthma. The lowest cumulative prevalence of asthma was reported in the group aged 40–49 (7.9%) as compared with the groups aged 20–29 (9.3%, p<0.001) and 70–79 (9.6%, p<0.001). In those reporting ever asthma, 97.5% of women and 96.9% of men reported that they had been given the diagnosis by a medical doctor.

“Ever smoking” women reported current asthma more frequently than “ever smoking” men (6.4% versus 5.7%, p=0.005). A similar pattern was also found among current smokers (fig 1). The prevalence of current asthma increased with increasing number of cigarettes per day in women, amounting to 10.4% in those smoking more than 20 cigarettes per day. In men, however, no such increase with increasing cigarette consumption was found. With increasing smoke burden and current smoker’s daily cigarette consumption, more

Table 4 Multiple logistic regression of episodes of wheezing or breathlessness, current asthma, persistent coughing and chronic bronchitis in men (n=26 914) and women (n=30 809) by pack year adjusted by age and body mass index. Nord-Trøndelag, Norway 1997

Independent variables	Wheezing or breathlessness		Current asthma		Persistent coughing		Chronic bronchitis	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<b>Men</b>								
Age (y)	1.005	1.002, 1.007	1.008	1.004, 1.012	0.996	0.994, 0.998	1.022	1.017, 1.026
Body mass index (kg/m <sup>2</sup> )	1.053	1.042, 1.064	1.050	1.034, 1.066	1.002	0.992, 1.011	0.982	0.964, 1.001
Number of pack years	1.025	1.023, 1.028	1.015	1.011, 1.018	1.032	1.030, 1.035	1.015	1.011, 1.020
<b>Women</b>								
Age (y)	1.001	0.999, 1.003	0.998	0.995, 1.001	0.997	0.995, 0.999	1.010	1.006, 1.014
Body mass index (kg/m <sup>2</sup> )	1.063	1.054, 1.070	1.062	1.051, 1.073	1.021	1.014, 1.028	1.025	1.011, 1.040
Number of pack years	1.038	1.035, 1.042	1.030	1.025, 1.035	1.048	1.044, 1.051	1.030	1.023, 1.036

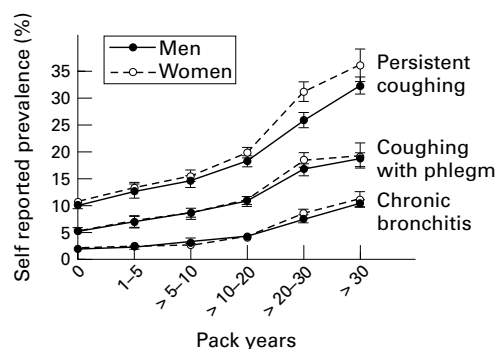


Figure 2 Age adjusted prevalence of persistent coughing, coughing with phlegm and chronic bronchitis by number of pack years in men and women (95% confidence intervals). Nord-Trøndelag, Norway 1997.

women than men reported current asthma (table 4, fig 1).

#### Coughing, phlegm and chronic bronchitis

Persistent coughing was reported more than twice among smokers compared with never smokers throughout all age groups except in the oldest group of women. Men reported higher crude prevalence than women did in all cough related questions. With increasing smoking burden and daily cigarette consumption the prevalence of coughing increased, and even for this symptom we found higher susceptibility in women compared with men (table 4, fig 2).

#### SMOKING CESSATION IN RELATION TO SYMPTOMS AND SEX

Among women who reported coughing, there was an increase of 40% that had quit smoking compared with those without symptoms (table 5). Among men, no such relation was seen. Among reporters of asthma related complaints, twice as many women and 1.7 as many men had quit smoking compared with those without respiratory symptoms. However, more "ever smoking" men than women had quit smoking, regardless of whether they reported respiratory symptoms at the screening or not. In subjects with current asthma 23.3% women and 39% men were ex-smokers and 38.5% women and 32.8% men were current smokers.

#### Discussion

In this population based cross sectional study we found higher prevalence of self reported asthma and use of asthma medication than previous studies in eastern Norway, including the city of Oslo 1972,<sup>12</sup> Northern Sweden

Table 5 Sex specific and age adjusted prevalence of self reported smoking cessation in ever smoking women (16 326) and men (18 031) according to symptoms, chronic bronchitis, asthma and use of asthma medication. (95% confidence intervals). Nord-Trøndelag, Norway 1997

Symptom/disease	Women		Men	
	%	95% CI	%	95% CI
No symptom	19.3	18.8, 19.8	32.0	31.4, 32.5
Coughing in periods	27.3	25.8, 28.9	31.0	29.4, 32.5
Coughing with phlegm	25.8	23.7, 28.0	31.3	29.3, 33.4
Chronic bronchitis	29.6	26.1, 33.4	32.9	30.0, 36.0
Wheezing or breathlessness	35.2	33.2, 37.2	43.2	41.4, 45.0
Ever asthma	42.7	40.3, 45.2	54.5	52.1, 56.8
Current asthma	41.1	38.1, 44.1	52.4	49.3, 55.5
Use of asthma medication	43.1	40.6, 45.6	56.3	53.8, 58.8

#### KEY POINTS

- Higher prevalence of reported asthma and use of asthma medication than reported in previous Scandinavian studies.
- The prevalence of respiratory symptoms increased by smoking burden (number of pack years).
- More women than men were current smokers.
- Women seemed to be more susceptible to the effect of tobacco smoking than men.

1986,<sup>13</sup> Southern Sweden 1992<sup>14</sup> and Denmark 1997.<sup>15</sup> The reporting of "ever asthma", ever having used asthma medication and current asthma had the lowest prevalence in the middle aged group (40–49 years). There was a strong association between tobacco smoking and respiratory symptoms, and smokers reported symptoms more than twice as frequent compared with never smokers. With increasing smoking burden, more women reported symptoms such as episodes of wheezing or breathlessness, persistent coughing, in addition to current asthma than men did. In a cross sectional study, however, causation cannot be directly inferred.

The questions of asthma, asthma medication and coughing used in this study were similar to those used by others.<sup>16–17</sup> Unlike others, we combined the question of wheezing and breathlessness in one question, limiting the comparison of these symptoms with other studies.

#### PARTICIPANTS AND QUESTIONS

The participation rate was about 10% lower in all age groups compared with a similar health survey in 1984–86,<sup>18</sup> with lowest rates in younger age groups, especially among men. Some people are sceptical of such studies and actively choose not to participate. This could explain that only about 50% answered the non-responder study. Other reasons for non-attendants in this survey were time consuming examinations and absence from work. A high prevalence of smokers in non-responders or late responders compared with early responders is in accordance with other studies where smoking habits have been examined.<sup>18–20</sup> Equal distributions of respiratory symptoms do not preclude non-responder bias,<sup>21</sup> but we have no reason to believe that our study overestimates the prevalence of respiratory symptoms and diseases.

#### RESPIRATORY SYMPTOMS AND DISEASES BY SEX

The study confirms a clear relation between tobacco smoking and respiratory symptoms like wheezing, breathlessness and coughing.<sup>22–25</sup>

More women reported respiratory symptoms compared with men in never smokers and smokers with comparable smoke burden or number of cigarettes. Generally, women seem to have lower threshold for reporting such symptoms compared with men.<sup>24–26</sup> It has however, been proposed that respiratory symptoms



are more sensitive markers of change in general health, but less specific markers regarding respiratory diseases in women compared with men.<sup>1</sup> This is confirmed by studies showing that respiratory symptom as shortness of breath is equally predictive of mortality in both sexes.<sup>27, 28</sup> Although, this does not explain the increasing sex difference with increasing smoke burden.

Regarding coughing with phlegm, no sex difference by increasing smoke burden was reported. This symptom is probably underestimated in women as they are less likely to report phlegm than men.<sup>1</sup>

Higher prevalence of respiratory symptoms and current asthma in women compared with men with the same smoke burden or daily cigarette consumption indicate that women are more susceptible to tobacco smoking than men. Cyclical hormonal variations<sup>1</sup> and possible anti-oestrogenic effect of smoking<sup>29</sup> have been discussed as reasons. Given the same degree of inhalation per cigarette, female airways probably are exposed to higher relative concentration of gases and particles compared with men. In Copenhagen comparable sex difference in smoking effect was found both on lung function and risk of hospitalisation for patients with COPD.<sup>8</sup> Higher prevalence of coughing as well as wheezing and breathlessness attributable to tobacco smoking in women than men could indicate future increase of COPD, especially among women.

#### DISEASE AND SYMPTOM PREVALENCE

There is a wide geographical variation in prevalence of asthma and use of asthma medication.<sup>30</sup> The prevalence of self reported asthma and use of asthma medication was higher than found in earlier Scandinavian studies<sup>12, 13, 15, 31</sup> and in crude agreement with more recent studies.<sup>14, 32</sup> This could reflect an increasing incidence of asthma, but also increased focus on asthma and asthma treatment in Norway. A high prevalence of asthma in the group aged 20–29, consistent with other studies,<sup>14</sup> could support the hypothesis of increasing asthma incidence in younger age cohorts, but this is under debate.<sup>33</sup>

Lack of increase in prevalence of “ever asthma” or current asthma with age in never smokers, are in agreement with the ECHRS study<sup>30</sup> and a study from Southern Sweden.<sup>14</sup> In a chronic disease like asthma, one could expect increase in cumulative prevalence. The absence of this age effect could partly be explained by increasing recall bias with age, low symptom perception, and under-diagnosis of asthma in elderly.<sup>34, 35</sup> A change of diagnostic criteria during the past decades could also mask an increasing prevalence with age.

#### SMOKING AND SMOKING CESSATION

According to the WHO the overall smoking prevalence in Norway is 35.5% in women and 36.4% in men, and only Danish women have higher proportion of smoking than Norwegian women have. Norwegian men are ranked 62 in the world.<sup>36</sup> We found that men reported smoking cessation more frequently than

women did, regardless of reporting respiratory symptoms at the screening or not.

Even though women feel more pressure from family and society to quit smoking, and are equally likely to quit smoking compared with men, they are less likely to remain abstinent than men are. One important problem in motivating women to cease smoking is that they more probably view weight control as a benefit of smoking.<sup>37–39</sup>

A higher prevalence of asthma among ex-smokers compared with smokers have been found in several studies.<sup>40, 41</sup> We confirmed this among men, but not among women. There was a similar sex difference in reported use of asthma medication. These findings might support the view that mostly men without asthma-like symptoms go on smoking (the healthy smoker effect).<sup>42</sup> A previous study has indicated a higher tendency for smoking men to be given the diagnosis of chronic obstructive lung disease compared with women.<sup>43</sup> This study could not identify differences in use of diagnosis as chronic bronchitis and asthma between the sexes.

In conclusion, the respiratory symptoms were clearly associated with tobacco smoking. At the same smoking burden, more women reported respiratory symptoms and current asthma than men did. Even if symptoms seemed to motivate more women than men to cease smoking, more men had quit smoking regardless of whether they had or did not have respiratory symptoms. High prevalence of smoking in young women combined with a possible increased susceptibility to tobacco smoking compared with men, might contribute to future increase in serious smoke related diseases in Norwegian women. To prevent this scenario it is necessary to develop programmes that encourage non-smoking in adolescents and effectively aid adults in ceasing to smoke. Different strategies seem to be necessary for men and women.<sup>44</sup>

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#### Appendix

Questions regarding respiratory symptoms and diseases: (in parentheses the questions as given in tables and text).

#### QUESTIONNAIRE I

1 Do you cough daily during periods of the year? (persistent coughing)

If Yes:

Do you usually bring up phlegm when coughing? (coughing with phlegm)

Have you had cough with phlegm for periods of at least three months during each of the past two years? (chronic bronchitis)

2 Have you had any attack of wheezing or breathlessness during the past 12 months? (wheezing or breathlessness past 12 months)

- 3 Do you have or have you had asthma? (ever asthma)
  - 4 Do you use or have you used asthma medication? (ever use of asthma medications)
  - 5 Do you smoke?  
Cigarettes daily?  
Cigars/cigarillos daily?  
Pipe daily?  
Never smoked daily
  - 6 If you have smoked earlier; how many years is it since you stopped?
  - 7 If you smoke daily now or have smoked earlier:  
How many cigarettes do you smoke or did you smoke usually per day?  
How old were you when you started smoking?  
How many years altogether have you smoked?
- QUESTIONNAIRE II
- 1 Have you been diagnosed as having asthma by your doctor?
  - 2 Have you been diagnosed as having chronic bronchitis or emphysema by your doctor?
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