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## Association of occasional smoking with total mortality in the population-based Tromsø Study, 2001-2015

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2017-019107
Article Type:	Research
Date Submitted by the Author:	10-Aug-2017
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<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Epidemiology, Public health
Keywords:	EPIDEMIOLOGY, PUBLIC HEALTH, PREVENTIVE MEDICINE

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7 **Association of occasional smoking with total mortality in the**  
8 **population-based Tromsø Study, 2001-2015**  
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Field Code Changed

43  
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45 Word count including references: 4325  
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## ABSTRACT

**Objectives.** There is a shift in the smoking population from daily smokers to light or occasional smokers. The knowledge about possible adverse health effects of this new smoking pattern is limited. We investigated smoking habits with focus on occasional smoking in relation to total mortality in a follow up study of a Norwegian general population.

**Setting.** A population study in Tromsø, Norway

**Methods.** We collected smoking habits and relevant risk factors in 4020 women and 3033 men aged 30-89 years in the Tromsø Study in 2001. The subjects were followed up regarding total mortality through June 2015.

**Results.** Among the participants, there were 7 % occasional smokers. Occasional smokers were younger, more educated and used alcohol more frequently than other participants. A total of 766 women and 882 men died during follow-up. After adjustment for confounders we found that occasional smoking significantly increased mortality by 38 % (95 % CI: 8-76 %) compared to never smokers. We report a dose response relationship in the hazards of smoking (daily, occasional, former and never smoking).

**Conclusions.** Occasional smoking is not a safe smoking alternative. There is a need for information to the general population and health workers about the health hazards of occasional smoking. More work should be done to motivate this often well-educated group to quit smoking completely.

### Strengths and limitations of this study

- A longitudinal study including 7053 men and women who participated in a screening (response rate 76 % in men and 81 % in women) in 2001 with complete mortality follow-up through June 2015.
- Information of a number of possible confounding variables were available.
- Information about smoking history was collected from several questions in two questionnaires at baseline and was self-reported with no objective measures of tobacco exposure.
- Occasional smokers is an unstable and heterogeneous group of former daily smokers trying to quit, persistent occasional smokers and former quitters who are occasional smokers for a period, and this instability is mirrored by somewhat inconsistent answers to the smoking history questions.
- No information is available regarding changes in smoking habits during follow-up.

### INTRODUCTION

Smoking is an important preventable risk factor for disease and premature death. There is a shift in the smoking population from daily, addicted tobacco users to light or occasional smokers without similar nicotine dependence. Smoking prevalence in Norway has been nearly halved during the last decade, 12 % of Norwegian men and women aged 16–74 years were daily smokers in 2016 (1). Whilst daily smoking is declining, the prevalence of intermittent or occasional smoking in Norway has remained quite stable during the last decade, with 9 % occasional smokers in 2016 compared to 11 % in 2005. Occasional smoking is frequently found among young, educated people and women (2). In 2013, the Norwegian Directorate of Health launched a campaign to reach these segments of occasional smokers, focusing

particularly on the relationship between occasional smoking and acute myocardial infarction (3).

The literature so far is not large. A cohort study from Finland indicated that occasional smoking carried almost similar effect on death from any cause as daily smoking in men (4). A review from 2010 emphasized the need for more cohort studies explicitly comparing risk in daily smokers, occasional smokers and nonsmokers (1). In 2016 a large cohort study from the US among low-intensity smokers over lifetime, found that they had higher mortality risk than never smokers (5). More information about the adverse health effects of this new smoking pattern is needed both for the general population and for health professionals. In this population-based prospective study from Norway, we aimed to analyze smoking habits with focus on occasional smoking in relation total death risk in a 14-year follow-up.

## METHODS

### The Tromsø Study

The Tromsø Study is a population-based prospective multipurpose study (6). Seven surveys have been conducted, the first in 1974, the last in 2015-2016. To the fifth survey (Tromsø 5), conducted in 2001, 10353 persons were invited. These individuals were men and women who lived in the municipality of Tromsø and had participated in the second visit of the fourth survey in 1994-1995 (the majority were 62-81 years old in 2001) as well as all women and men aged 30, 40, 45, 60 or 75 years. A total of 3511 men and 4619 women aged 30-89 years attended; attendance rates of 75.7 % and 80.8 %, respectively. The participants received a questionnaire along with the invitation and were asked to bring the completed form when they came to the physical examination including non-fasting blood samples. The questionnaire

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7 included questions concerning, among other topics, smoking habits. People who attended the  
8 physical examination received a second questionnaire, which they were asked to complete and  
9 return in by mail. This questionnaire included a question on occasional smoking. The study  
10 design and data collection are described in some more detail elsewhere (6). An English  
11 translation of the questionnaires is available at the Tromsø Study web site (7)  
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17 The study adhered to the tenets of the Declaration of Helsinki and the Regional Committee for  
18 Medical and Health Research Ethics and the Norwegian Data Protection authority approved  
19 the study. All participants gave written informed consent.  
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### 25 **Questionnaires and measurements**

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28 We based information about history of smoking on several questions in two questionnaires. A  
29 total of 7999 men and women answered the question concerning daily smoking on the first  
30 questionnaire (“Do you/did you smoke daily?” with the answer alternatives “Yes, now”, “Yes,  
31 previously” or “Never”). In addition, there were questions about duration of smoking and the  
32 number of cigarettes smoked on a daily basis (if ever smoker). More than 90 % of ever  
33 smokers gave information concerning cigarettes per day and the duration of smoking (years),  
34 making computation of the number of pack-years possible.  
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43 Furthermore, 7116 subjects answered the question concerning smoking on the next  
44 questionnaire (“Do you smoke?” with the answer alternatives “Yes, daily”, “Yes, sometimes”  
45 and “No, never”), thereby giving information about occasional, but not daily, smoking. There  
46 were, however, some inconsistencies, like subjects who reported to be current daily smokers  
47 on the second questionnaire, but previous or never smokers on the former. These 63 subjects  
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were excluded from the analyses. We therefore identified four groups of subjects, including a total of 4020 women and 3033 men (68 % of the invited population).

1. Consistent daily smokers.
2. Occasional smokers: Subjects who stated to be an occasional smoker in the second questionnaire and gave information about smoking habits in the first questionnaire.
3. Former smokers: Subjects who stated to be a never smoker in the second questionnaire, but stated to be a former smoker in the first questionnaire, essentially identifying a group of subjects who had been smokers, but never smoked now, not even occasionally. These subjects may be at risk because of previous smoking.
4. Never smokers: Consistent never smokers.

The questionnaires also included a question regarding passive smoking (“Do you currently, or did you previously live together with a daily smoker after your 20th birthday?” with two answer alternatives, “Yes and “No”). Pack-years was computed as (number of cigarettes per day\*duration of smoking)/20.

Frequency of use of alcohol last year was assessed by the question “Approximately how often have you during the last year consumed alcohol?” with 8 answer alternatives from “Never consumed alcohol” to “4-7 times a week”. The highest attained level of education was self-reported and classified as follows: (1) primary/partly secondary education (up to 9 years of schooling); (2) upper secondary education (10–12 years of schooling); (3) tertiary education, short (college/university less than 4 years); (4) tertiary education, long (college/university 4 years or more).

Height and weight measurements were performed in light clothing and without footwear.

Waist circumference was measured without outerwear by using a measuring tape across the



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7 belly button. The participant was taken into a separate room with only a nurse present to  
8 measure the blood pressure. The blood pressure was measured three times at one-minute  
9 intervals on one arm after the participant had been seated for two minutes using an automatic  
10 device (Dinamap Vital Signs Monitor 1846; Criticon, Inc, Tampa, FL). The mean of the two  
11 last measurements was used in the present analyses.  
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17 The blood test included measurement of serum total cholesterol, serum high-density  
18 lipoprotein (HDL) cholesterol and triglycerides. Analysis of serum total cholesterol and  
19 triglycerides was performed by enzymatic colorimetric methods with commercial kits  
20 (CHOD-PAP; Boehringer-Manheim, Mannheim, Germany). HDL cholesterol was measured  
21 after precipitation of lower density lipoproteins with manganese chloride. All the analyses  
22 were performed by the Department of Clinical Chemistry, University Hospital of North  
23 Norway in Tromsø.  
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### 35 **Follow-up and statistical analyses**

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37 The National Causes of Death Registry covers individuals registered as residents of Norway  
38 at the time of their death, without regard to whether the death took place in Norway or abroad.  
39 The subjects were followed up regarding total mortality from the day they attended the  
40 Tromsø 5 survey and to the date of death, emigration from Norway or June 30, 2015  
41 whichever came first. There were 1648 deaths during follow-up. The mean (minimum,  
42 maximum) follow-up was 12.5 (0.2-14.3) years.  
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50 Baseline characteristics were presented as mean (standard deviations) or percentages (number  
51 of subjects). The simple descriptive statistical analyses included analyses of variance and Chi-  
52 square tests and the p-values were p for homogeneity. The relationships between smoking  
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7 habits and mortality were assessed by Cox proportional hazard regression analyses with  
8 attained age as the time factor, including 95 % confidence intervals for the hazard ratios.

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10 Consistent never smokers constituted the reference category. Adjustments were performed for  
11 other significant predictors for mortality in this cohort after adjustment for sex and attained  
12 age, i.e., education, body mass index, total serum cholesterol and serum triglycerides.  
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## 20 RESULTS

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23 Mean age for both sexes (4020 women and 3033 men) was about 60 years. Among the  
24 participants, there were 33 % never smokers, 34 % former smokers, 7 % occasional smokers  
25 and 26 % consistent daily smokers (Table 1). In both sexes, occasional smokers tended to be  
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27 younger than other smokers. A higher proportion of occasional smokers had high education  
28 levels and weekly use of alcohol. Passive smoking was most common in current smokers.  
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30 Occasional and daily smokers had lower BMI compared with never and former smokers.  
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Table 1. Baseline characteristics of women and men according to smoking habits in 2001. The Tromsø Study

	Never-smokers	Former smokers	Occasional smokers	Consistent daily smokers	p-value <sup>1</sup>
Women N (%)	1648 (41.0)	1061 (26.4)	257 (6.4)	1054 (26.4)	
No. of pack-years	0	9.2 (9.1)	6.1 (7.4)	17.4 (11.0)	
Age (years)	61.8 (13.5)	60.2 (13.3)	53.3 (15.3)	56.1 (13.4)	< 0.001
Education > 12 years (%)	29.4 (461)	26.9 (277)	39.4 (98)	23.1 (235)	< 0.001
% exposed for passive smoking	58.3 (945)	77.8 (807)	75.2 (191)	86.1 (880)	< 0.001
% with weekly alcohol use	20.9 (330)	28.3 (291)	31.7 (79)	27.8 (288)	< 0.001
BMI (kg/m <sup>2</sup> )	26.9 (4.6)	27.4 (4.6)	25.5 (4.4)	24.9 (4.2)	< 0.001
Waist circumference (cm)	85.0 (11.7)	86.7 (12.3)	82.1 (11.1)	81.3 (11.0)	< 0.001
Systolic blood pressure (mmHg)	141.4 (23.4)	138.1 (22.8)	130.4 (23.1)	132.7 (22.6)	< 0.001
Total cholesterol (mmol/l)	6.3 (1.2)	6.3 (1.2)	6.0 (1.3)	6.3 (1.2)	0.003
HDL cholesterol (mmol/l)	1.6 (0.4)	1.6 (0.4)	1.6 (0.4)	1.5 (0.4)	< 0.001
Triglycerides (mmol/l)	1.4 (0.8)	1.4 (0.7)	1.3 (0.7)	1.5 (0.9)	0.006
Men N (%)	698 (23.1)	1302 (42.9)	252 (8.3)	781 (25.8)	
No. of pack-years	0	17.5 (16.0)	10.8 (16.0)	22.6 (13.2)	
Age (years)	55.9 (14.6)	65.0 (11.5)	55.5 (14.6)	58.2 (13.4)	< 0.001
Education > 12 years (%)	40.9 (278)	22.3 (280)	41.9 (104)	23.4 (176)	< 0.001
% exposed for passive smoking	35.8 (247)	76.1 (969)	69.0 (171)	84.4 (637)	< 0.001
% with weekly alcohol use	34.8 (240)	35.8 (458)	47.6 (118)	40.0 (309)	< 0.001
BMI (kg/m <sup>2</sup> )	26.8 (3.5)	27.2 (3.6)	26.7 (3.6)	26.0 (3.5)	< 0.001
Waist circumference (cm)	94.1 (9.4)	97.0 (10.6)	94.5 (10.5)	93.6 (10.2)	< 0.001
Systolic blood pressure (mmHg)	138.7 (20.1)	143.7 (20.6)	135.2 (16.5)	137.1 (19.1)	< 0.001
Total cholesterol (mmol/l)	6.0 (1.1)	6.0 (1.1)	6.0 (1.1)	6.1 (1.1)	0.36
HDL cholesterol (mmol/l)	1.3 (0.3)	1.4 (0.4)	1.3 (0.4)	1.3 (0.3)	0.006
Triglycerides (mmol/l)	1.7 (1.0)	1.7 (1.0)	1.6 (0.8)	1.7 (1.1)	0.56

<sup>1</sup>Values are mean (standard deviations) or percentages (number of subjects)

<sup>2</sup>p-value for homogeneity

Table 2 confirms that both consistent daily smoking and occasional smoking were associated with increased all-cause mortality. A total of 766 women and 882 men died during follow-up. Although the age-adjusted hazard ratio associated with occasional smoking compared to never smokers was somewhat higher in women (HR= 1.59 (95 % CI: 1.15-2.20) than in men (HR=1.23 (95 % CI: 0.88- 1.73), the overall relationships between smoking habits and total

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7 mortality were not statistically significantly different (p-value for interaction =0.07) and the  
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9 p-values for the difference in the relationships with occasional smoking was higher (p=0.3)  
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11 (data not shown). Due to the relatively low number of deaths among the individuals who  
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13 smoked occasionally, we merged results for men and women and adjusted for gender.

14 Adjustments for other significant predictors for mortality in this cohort (education, body mass  
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16 index, total serum cholesterol and serum triglycerides) changed the point estimates only  
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18 marginally and the conclusions were unaffected (Table 2). This was also the case when  
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20 further adjustments for the frequency of use of alcohol and passive smoking were undertaken.

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22 Detailed information about smoking history (the number of pack-years) was missing for 543  
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24 ever smokers. In separate analyses, we restricted the analytical cohort to 4164 ever smokers  
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26 (current daily smokers, occasional smokers, and previous smokers) with complete information  
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28 about the number of pack-years. There were 1013 deaths. The age- and gender adjusted  
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30 mortality in occasional smokers was not higher than in former smokers (HR=1.12, 95 % CI :  
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32 0.87-1.43), and adjusting for the number of pack-years in addition to age and gender  
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34 confirmed this. If anything, the relationship with occasional smoking was somewhat stronger,  
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36 but still not statistically significant.

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39 In a separate set of analyses, we restricted the analyses to subjects aged 79 or below at follow-  
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41 up, thus disregarding information from follow-up after the age of 80. A total of 6886 men and  
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43 women and 754 deaths were included in the analyses. The results with regard to mortality in  
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45 occasional smokers were essentially unchanged. Similarly as for the analyses including all  
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47 subjects, we also in this situation restricted the analytical cohort to 4094 ever smokers with  
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49 526 deaths and adjusted for the number of pack-years. The results were as for all subjects,  
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51 also including follow-up after the age of 79.  
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**Table 2.** Relationships between smoking habits and total mortality. A 14 years follow-up. The Tromsø Study.

	Subjects N (%)	Deaths N (%)	HR <sup>1</sup>	95% CI	HR <sup>2</sup>	95% CI
Consistent daily smokers	1835 (26.0)	468 (28.4)	2.13	1.86, 2.43	2.05	1.78, 2.37
Occasional smokers	509 (7.2)	88 (5.3)	1.32	1.05, 1.66	1.38	1.08, 1.76
Former smokers	2363 (33.5)	633 (38.4)	1.14	1.00, 1.30	1.18	1.03, 1.35
Never-smokers	2346 (33.3)	459 (27.9)	1.00	Reference	1.00	Reference
Total	7053 (100)	1648 (100)				

<sup>1</sup> Adjusted for age and gender

<sup>2</sup> Adjusted for age, gender, education, body mass index, serum cholesterol and serum triglycerides

## DISCUSSION

The present prospective cohort study shows that occasional smoking significantly increased mortality by more than 30 % compared to never smokers. Results were not substantially changed when analyses were restricted to those aged below 80 years at follow-up. We found that the 7 % occasional smokers constituted the youngest group of individuals, they used alcohol more frequently and they had higher educational level compared to the other study attendees.

Our results are in line with findings from other surveys of occasional smokers; they are younger than daily smokers and their level of education is more similar to non-smokers (3, 8).

A Finnish prospective cohort study studied occasional smoking habits at baseline as risk factor for total mortality (4). Their finding was about similar to ours for men, while female occasional smokers did not have an increased mortality risk. However, there was no significant difference in the association between occasional smoking and total mortality

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7 between the sexes, similar to our findings. A recent large cohort study from the US included  
8 self-reports of lifetime smoking history, and showed that persons who smoked fewer than 1 or  
9 1 to 10 cigarettes per day over their lifetime had higher all-cause mortality risks than never  
10 smokers (5). A previous large population based Norwegian cohort study found that even very  
11 light smoking (1-4 cigarettes per day) was associated with a significantly 50-60 % increased  
12 all-cause mortality (9) while a British study demonstrated a significant hazard ratio of 1.21 for  
13 light smoking compared to never smoking (10). A study from the US experienced a more than  
14 two times higher mortality in very light smoking females (11). Light smoking may be  
15 comparable to occasional smoking when it comes to risk of all-cause mortality in our study.  
16 Differences in risk compared to the present study may be due to different study populations  
17 and length of follow up as well as various abilities to control for confounders. We have  
18 previously shown that light smoking as well as passive smoking carried higher hazards for  
19 myocardial infarction in women (12). Recently, a British cohort study with long follow-up  
20 found that light smoking at baseline carried a higher mortality risk in women than in men  
21 (10). Our results may give some support to this finding, but we did not find a statistically  
22 significant interaction and therefore merged the data for the two genders.  
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38 Norway has a strong record on national tobacco control policies since the 1970ies. The trend  
39 of occasional smoking might be influenced by the ongoing marginalization of smoking and  
40 increasing restrictions. Studies have shown that a large proportion of occasional smokers do  
41 not regard themselves as smokers (8). There is common belief, based in part on successful  
42 tobacco industry marketing to so-called “health-conscious smoking”, that occasional smoking  
43 is safer than daily smoking (13). A Norwegian Directorate of Health survey in 2013  
44 conducted before a campaign to reach occasional smokers, confirmed this. One third of the  
45 occasional smokers did not believe their smoking would cause any harm to their health (3).

46 We do not have data to confirm these conceptions, but the relatively high education level of  
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7 occasional smokers in the present study suggests that they are well aware of the hazards of  
8 daily smoking, as well educated people are, but may consider occasional smoking far less  
9 detrimental or maybe without any health risks. Moreover, it is shown that occasional smokers  
10 are not free of nicotine dependence and that their smoking appears to be driven to some  
11 degree by the same cigarette craving that affects daily smokers, explaining why many  
12 occasional smokers have difficulty quitting (14). This is important knowledge for health  
13 professionals working with smoking cessation in occasional smokers.  
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21 In 2006-2010, approximately 10 % of Norwegians aged 16-74 years were occasional smokers  
22 (1). Our slightly lower prevalence may be because no subjects in our study were below 30  
23 years, and occasional smoking is known to be more frequent among younger individuals. The  
24 use of snuff (snus) has been increasingly popular in Norway, particularly among adolescents  
25 and young adults (1). Approximately 3 % of the subjects included in our study reported ever  
26 use of snuff, and it was not associated with increased mortality.  
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34 Population studies have risk of selection bias because those who accept the invitation to  
35 participate in the study may not be representative for the whole target population. Non-  
36 response is often linked to exposure status, which implies that for example individuals with  
37 health issues, smokers and others with unhealthy lifestyle may be less likely to attend the  
38 survey compared to non-smokers. We have previously reported lower mortality in participants  
39 to the Tromsø Study according to attendance (6). This bias would influence our findings only  
40 if the association between smoking habits and total mortality is different in the 68 % of the  
41 invited population who were included in the analyses than in the remaining 32 %.  
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50 The participants in the Tromsø Study reported smoking habits on a self-administered  
51 questionnaire that may imply information bias. We have no objective measures of tobacco  
52 exposure like cotinine or thiocyanate. A previous Norwegian study showed that the relation  
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7 between self-reported smoking habits and the measure of serum thiocyanate was strong if the  
8 question was asked in a neutral setting (15). As the questions about smoking were asked in a  
9 neutral setting, we believe that the validity was good, although we recognize that the smoking  
10 habits probably are underreported.  
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15 A problem in studies of the health risks related to occasional smoking is that occasional  
16 smoking is a rather unstable category consisting of a heterogeneous group of former daily  
17 smokers trying to quit, persistent occasional smokers who might regard their risk as little and  
18 former quitters who have resumed as occasional smokers for a period. This instability is  
19 mirrored by the inconsistent answers to the smoking history questions we used for  
20 categorization in our study. Only registration of long-term smoking habits can answer this  
21 question.  
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30 It is a limitation that we have not been able to include information regarding changes in  
31 smoking habits during follow-up. As the smoking prevalence in our community has declined  
32 (16), we assume that some subjects classified as occasional smokers may be classified as  
33 former smokers in part of the follow-up. On the other hand, some occasional smokers were  
34 probably previously daily smokers. Thus, our estimate of the total mortality associated with  
35 occasional smoking is probably underestimated.  
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42 Our study had the strength of a large cohort with a prospective design, high participation rate  
43 and a quite long and complete follow-up. Moreover, we were able to adjust for baseline levels  
44 of other significant risk factors for total mortality in this population. The results are probably  
45 valid for other European populations, but similar cohort studies should be conducted in other  
46 populations in order to determine the exact adverse effects of occasional smoking  
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7 In conclusion, in line with few others, this study demonstrates that occasional smoking is not  
8 a safe alternative; it increases mortality. We report a dose response relationship in the hazards  
9 of smoking (daily, occasional, former and never smoking). Governmental and non-  
10 governmental tobacco control policymakers should intensify the information about the health  
11 hazards of occasional smoking as well as work towards increased restrictions. Occasional  
12 smokers make up about one fifth of all current smokers in the Norwegian population, and  
13 more work should be done to motivate this usually well-educated group to quit smoking  
14 completely.  
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#### 25 **Contributorship**

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27 MLL and BKJ conceived and designed the research. BKJ performed the analyses. MLL and  
28 BKJ drafted the manuscript. MLL, ITG, JM, EBM, IN, HS, TW and BKJ made critical  
29 revision of the manuscript for key intellectual content. All authors have read and approved the  
30 submitted version of the manuscript.  
31  
32  
33

#### 34 **Funding**

35  
36 This research received no specific grant from any funding agency in the public, commercial or  
37 not-for-profit sectors.  
38  
39  
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#### 41 **Competing interests**

42  
43 None declared.  
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#### 46 **Data sharing**

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48 No additional data available.  
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## Ethics

All individuals gave written informed consent to participate. The Tromsø Study was approved by the Data Inspectorate of Norway and the Regional Committee of Medical and Health Research Ethics, North Norway.

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STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract: Page 2 in abstract, Introduction: follow up cohort study. (b) Provide in the abstract an informative and balanced summary of what was done and what was found: This is done in the abstract.
<b>Introduction</b>		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported: Page 3-4 Introduction
Objectives	3	State specific objectives, including any prespecified hypotheses: Page 4 Introduction, last sentence.
<b>Methods</b>		
Study design	4	Present key elements of study design early in the paper: Page 4 Methods first paragraph
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection: Page 4-7 Methods
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up: Page 4-5 Eligibility and participants. Page 7-8 Follow up. (b) For matched studies, give matching criteria and number of exposed and unexposed: Not applicable
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable. Page 5-7 Questionnaires and measurements, and 7-8 Follow-up.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Page 5-7 Questionnaires and measurements.
Bias	9	Describe any efforts to address potential sources of bias. Page 5-6 how smoking groups were made
Study size	10	Explain how the study size was arrived at: Page 4-6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why. Groupings are explained page 5-6, other variables page 6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding: page 7-8 (b) Describe any methods used to examine subgroups and interactions: Page 10 (c) Explain how missing data were addressed: Page 10 (d) If applicable, explain how loss to follow-up was addressed. Not applicable (e) Describe any sensitivity analyses. Not applicable
<b>Results</b>		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed: Methods page 4, 5, and Results page 7-10 (b) Give reasons for non-participation at each stage. This is done (c) Consider use of a flow diagram. Not done
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Methods page 4-5 and Results

		first paragraph
		(b) Indicate number of participants with missing data for each variable of interest.
		Methods and Results
		(c) Summarise follow-up time (eg, average and total amount): Page 7 Follow-up
Outcome data	15*	Report numbers of outcome events or summary measures over time: Page 9 last paragraph
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included. Page 9-10
		(b) Report category boundaries when continuous variables were categorized. Not applicable
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period. Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses: Page 9-10
<b>Discussion</b>		
Key results	18	Summarise key results with reference to study objectives: Page 11 first paragraph in Discussion
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias: Page 13-14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence: Page 15
Generalisability	21	Discuss the <u>generalisability</u> (external validity) of the study results: Page 15
<b>Other information</b>		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based: Page 15

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at <http://www.strobe-statement.org>.

# BMJ Open

## Association of occasional smoking with total mortality in the population-based Tromsø Study, 2001-2015

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2017-019107.R1
Article Type:	Research
Date Submitted by the Author:	17-Oct-2017
Complete List of Authors:	Løchen, Maja-Lisa; The Arctic University of Norway, Department of Community Medicine Gram, Inger T.; The Arctic University of Norway Mannsverk, Jan; University Hospital of North Norway Mathiesen, Ellisiv; The Arctic University of Norway, Clinical Medicine; The University Hospital of North Norway, Neurology and Neurophysiology Njolstad, Inger; The Arctic University of Norway, Community Medicine Schirmer, Henrik; The Arctic University of Norway, Clinical Medicine Wilsgaard, Tom; University of Tromsø, Faculty of Health Sciences Jacobsen, Bjarne; University of Tromsø, Dept. of Community Medicine
<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Epidemiology, Public health
Keywords:	EPIDEMIOLOGY, PUBLIC HEALTH, PREVENTIVE MEDICINE, Smoking

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## Association of occasional smoking with total mortality in the population-based Tromsø Study, 2001-2015

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Word count including references: 4775

## ABSTRACT

**Objectives.** There is a shift in the smoking population from daily smokers to light or occasional smokers. The knowledge about possible adverse health effects of this new smoking pattern is limited. We investigated smoking habits with focus on occasional smoking in relation to total mortality in a follow up study of a Norwegian general population.

**Setting.** A population study in Tromsø, Norway

**Methods.** We collected smoking habits and relevant risk factors in 4020 women and 3033 men aged 30-89 years in the Tromsø Study in 2001. The subjects were followed up regarding total mortality through June 2015.

**Results.** Among the participants, there were 7 % occasional smokers. Occasional smokers were younger, more educated and used alcohol more frequently than other participants. A total of 766 women and 882 men died during follow-up. After adjustment for confounders we found that occasional smoking significantly increased mortality by 38 % (95 % CI: 8-76 %) compared to never smokers. We report a dose response relationship in the hazards of smoking (daily, occasional, former and never smoking).

**Conclusions.** Occasional smoking is not a safe smoking alternative. There is a need for information to the general public and health workers about the health hazards of occasional smoking. More work should be done to motivate this often well-educated group to quit smoking completely.

### Strengths and limitations of this study

- A longitudinal study including 7053 men and women who participated in a screening and gave information about smoking habits in 2001 (65 % and 70 % of the invited men and women, respectively) with complete mortality follow-up through June 2015.
- Information of a number of possible confounding variables was available.
- Information about smoking history was collected from several questions in two questionnaires at baseline and was self-reported with no objective measures of tobacco exposure.
- Occasional smokers is an unstable and heterogeneous group of former daily smokers trying to quit, persistent occasional smokers and former quitters who are occasional smokers for a period, and this instability is mirrored by somewhat inconsistent answers to the smoking history questions.
- No information is available regarding changes in smoking habits during follow-up.

### INTRODUCTION

Smoking is an important preventable risk factor for disease and premature death. There is a shift in the smoking population from daily, addicted tobacco users to light or occasional smokers without similar nicotine dependence. Smoking prevalence in Norway has been nearly halved during the last decade, 12 % of Norwegian men and women aged 16–74 years were daily smokers in 2016 (1). Whilst daily smoking is declining, the prevalence of intermittent or occasional smoking in Norway has remained quite stable during the last decade, with 9 % occasional smokers in 2016 compared to 11 % in 2005. Occasional smoking is frequently found among young, educated people and women (2). In 2013, the Norwegian Directorate of Health launched a campaign to reach these segments of occasional smokers, focusing



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3 particularly on the relationship between occasional smoking and acute myocardial infarction  
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5 (3).  
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9 The literature so far is not large. A cohort study from Finland indicated that occasional  
10 smoking carried almost similar effect on death from any cause as daily smoking in men (4). A  
11 review from 2010 emphasized the need for more cohort studies explicitly comparing risk in  
12 daily smokers, occasional smokers and nonsmokers (1). In 2016, a large cohort study from the  
13 US among low-intensity smokers over lifetime, found that they had higher mortality risk than  
14 never smokers (5). More information about the adverse health effects of this new smoking  
15 pattern is needed both for the general population and for health professionals. In this  
16 population-based prospective study from Norway, we aimed to analyze smoking habits with  
17 focus on occasional smoking in relation total death risk in a 14-year follow-up.  
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## 32 **METHODS**

### 33 **The Tromsø Study**

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36 The Tromsø Study is a population-based prospective multipurpose study (6). Seven surveys  
37 have been conducted, the first in 1974, the last in 2015-2016. To the fifth survey (Tromsø 5),  
38 conducted in 2001, 10353 persons were invited. These individuals were men and women who  
39 lived in the municipality of Tromsø and had participated in the second visit of the fourth  
40 survey in 1994-1995 (the majority were 62-81 years old in 2001) as well as all women and  
41 men aged 30, 40, 45, 60 or 75 years. A total of 3511 men and 4619 women aged 30-89 years  
42 attended; attendance rates of 75.7 % and 80.8 %, respectively. The participants received a  
43 questionnaire along with the invitation and were asked to bring the completed form when they  
44 came to the physical examination including also non-fasting blood samples. The questionnaire  
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3 included questions concerning, among other topics, smoking habits. People who attended the  
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5 physical examination received a second questionnaire, which they were asked to complete and  
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7 return in by mail. This questionnaire included a question on occasional smoking. The study  
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9 design and data collection are described in some more detail elsewhere (6). An English  
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11 translation of the questionnaires is available at the Tromsø Study web site (7)  
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14 The study adhered to the tenets of the Declaration of Helsinki and the Regional Committee for  
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16 Medical and Health Research Ethics and the Norwegian Data Protection authority approved  
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18 the study. All participants gave written informed consent.  
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### 20 21 22 23 24 25 **Questionnaires and measurements** 26

27  
28 We based information about history of smoking on several questions in two questionnaires. A  
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30 total of 7999 men and women answered the question concerning daily smoking on the first  
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32 questionnaire (“Do you/did you smoke daily?” with the answer alternatives “Yes, now”, “Yes,  
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34 previously” or “Never”). In addition, there were questions about duration of smoking and the  
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36 number of cigarettes smoked on a daily basis (if ever smoker). More than 90 % of ever  
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38 smokers gave information concerning cigarettes per day and the duration of smoking (years),  
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40 making computation of the number of pack-years possible.  
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44 Furthermore, 7116 subjects answered the question concerning smoking on the next  
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46 questionnaire (“Do you smoke?” with the answer alternatives “Yes, daily”, “Yes, sometimes”  
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48 and “No, never”), thereby giving information about occasional, but not daily, smoking. There  
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50 were, however, some inconsistencies, like subjects who reported to be a current daily smoker  
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52 on the second questionnaire, but a previous or never smoker on the former or a never smoker  
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54 on the second questionnaire and current smoker on the first. These subjects were excluded  
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3 from the analyses. We therefore identified four groups of subjects, including a total of 4020  
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5 women and 3033 men (68 % of the invited population).  
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- 8 1. Consistent daily smokers.
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10 2. Occasional smokers: Subjects who stated to be an occasional smoker in the second  
11 questionnaire and gave information about smoking habits in the first questionnaire.  
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13 3. Former smokers: Subjects who stated to be a never smoker in the second  
14 questionnaire, but stated to be a former smoker in the first questionnaire, essentially  
15 identifying a group of subjects who had been smokers, but never smoked now, not  
16 even occasionally. These subjects may be at risk because of previous smoking.  
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18 4. Never smokers: Consistent never smokers.  
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27 The questionnaires also included a question regarding passive smoking (“Do you currently, or  
28 did you previously live together with a daily smoker after your 20th birthday?” with two  
29 answer alternatives, “Yes and “No”). Pack-years was computed as (number of cigarettes per  
30 day\*duration of smoking)/20. An English translation of the questionnaires is available at the  
31 Tromsø Study web site (7) and as supplementary files 1 and 2.  
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39 Frequency of use of alcohol last year was assessed by the question “Approximately how often  
40 have you during the last year consumed alcohol?” with 8 answer alternatives from “Never  
41 consumed alcohol” to “4-7 times a week”. The highest attained level of education was self-  
42 reported and classified as follows: (1) primary/partly secondary education (up to 9 years of  
43 schooling); (2) upper secondary education (10–12 years of schooling); (3) tertiary education,  
44 short (college/university less than 4 years); (4) tertiary education, long (college/university 4  
45 years or more).  
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3 Height and weight measurements were performed in light clothing and without footwear.  
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5 Waist circumference was measured without outerwear by using a measuring tape across the  
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7 belly button. The participant was taken into a separate room with only a nurse present to  
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9 measure the blood pressure. The blood pressure was measured three times at one-minute  
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11 intervals on one arm after the participant had been seated for two minutes using an automatic  
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13 device (Dinamap Vital Signs Monitor 1846; Criticon, Inc, Tampa, FL). The mean of the two  
14  
15 last measurements was used in the present analyses.  
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19 The blood test included measurement of serum total cholesterol, serum high density  
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21 lipoprotein (HDL) cholesterol and triglycerides. Analysis of serum total cholesterol and  
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23 triglycerides was performed by enzymatic colorimetric methods with commercial kits  
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25 (CHOD-PAP; Boehringer-Manheim, Mannheim, Germany). HDL cholesterol was measured  
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27 after precipitation of lower density lipoproteins with manganese chloride. All the analyses  
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29 were performed by the Department of Clinical Chemistry, University Hospital of North  
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31 Norway in Tromsø.  
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#### 40 **Follow-up and statistical analyses**

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42 The National Causes of Death Registry covers individuals registered as residents of Norway  
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44 at the time of their death, without regard to whether the death took place in Norway or abroad.  
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46 The subjects were followed up regarding total mortality from the day they attended the  
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48 Tromsø 5 survey and to the date of death, emigration from Norway or 30 June 2015,  
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50 whichever came first. There were 1648 deaths during follow-up. The mean (minimum,  
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52 maximum) follow-up was 12.5 (0.2-14.3) years.  
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3 Baseline characteristics were presented as mean (standard deviations) or percentages (number  
4 of subjects). The simple descriptive statistical analyses included analyses of variance and Chi-  
5 square tests and the p-values were p for homogeneity. The relationships between smoking  
6 habits and mortality were assessed by Cox proportional hazard regression analyses with  
7 attained age as the continuous time variable, including 95 % confidence intervals for the  
8 hazard ratios. Consistent never smokers constituted the reference category. Adjustments were  
9 performed for other significant predictors for mortality in this cohort after adjustment for sex  
10 and attained age, i.e., education, body mass index, total serum cholesterol and serum  
11 triglycerides.  
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## 27 **RESULTS**

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30 Mean age for both sexes (4020 women and 3033 men) was about 60 years. Among the  
31 participants, there were 33 % never smokers, 34 % former smokers, 7 % occasional smokers  
32 and 26 % consistent daily smokers (Table 1). In both sexes, occasional smokers tended to be  
33 younger than other smokers. A higher proportion of occasional smokers had high education  
34 levels and weekly use of alcohol. Passive smoking was most common in current smokers. The  
35 use of snuff (both current and previous use) was most prevalent in men and in occasional  
36 smokers. Occasional and daily smokers had lower BMI compared with never and former  
37 smokers.  
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Table 1. Baseline characteristics of women and men according to smoking habits in 2001. The Tromsø Study

	Never-smokers	Former smokers	Occasional smokers	Consistent daily smokers	p-value <sup>1</sup>
Women N (%)	1648 (41.0)	1061 (26.4)	257 (6.4)	1054 (26.4)	
No. of pack-years	0	9.2 (9.1)	6.1 (7.4)	17.4 (11.0)	< 0.001 <sup>2</sup>
Age (years)	61.8 (13.5)	60.2 (13.3)	53.3 (15.3)	56.1 (13.4)	< 0.001
Education > 12 years (%)	29.4 (461)	26.9 (277)	39.4 (98)	23.1 (235)	< 0.001
% exposed for passive smoking	58.3 (945)	77.8 (807)	75.2 (191)	86.1 (880)	< 0.001
% with weekly alcohol use	20.9 (330)	28.3 (291)	31.7 (79)	27.8 (288)	< 0.001
Ever use of snuff	0.4 (5)	1.3 (10)	2.1 (5)	0.6 (6)	0.02
BMI (kg/m <sup>2</sup> )	26.9 (4.6)	27.4 (4.6)	25.5 (4.4)	24.9 (4.2)	< 0.001
Waist circumference (cm)	85.0 (11.7)	86.7 (12.3)	82.1 (11.1)	81.3 (11.0)	< 0.001
Systolic blood pressure (mmHg)	141.4 (23.4)	138.1 (22.8)	130.4 (23.1)	132.7 (22.6)	< 0.001
Total cholesterol (mmol/l)	6.3 (1.2)	6.3 (1.2)	6.0 (1.3)	6.3 (1.2)	0.003
HDL cholesterol (mmol/l)	1.6 (0.4)	1.6 (0.4)	1.6 (0.4)	1.5 (0.4)	< 0.001
Triglycerides (mmol/l)	1.4 (0.8)	1.4 (0.7)	1.3 (0.7)	1.5 (0.9)	0.006
Men N (%)	698 (23.1)	1302 (42.9)	252 (8.3)	781 (25.8)	
No. of pack-years	0	17.5 (16.0)	10.8 (13.3)	22.6 (13.2)	< 0.001 <sup>2</sup>
Age (years)	55.9 (14.6)	65.0 (11.5)	55.5 (14.6)	58.2 (13.4)	< 0.001
Education > 12 years (%)	40.9 (278)	22.3 (280)	41.9 (104)	23.4 (176)	< 0.001
% exposed for passive smoking	35.8 (247)	76.1 (969)	69.0 (171)	84.4 (637)	< 0.001
% with weekly alcohol use	34.8 (240)	35.8 (458)	47.6 (118)	40.0 (309)	< 0.001
Ever use of snuff	4.9 (31)	5.5 (64)	11.7 (29)	5.2 (40)	< 0.001
BMI (kg/m <sup>2</sup> )	26.8 (3.5)	27.2 (3.6)	26.7 (3.6)	26.0 (3.5)	< 0.001
Waist circumference (cm)	94.1 (9.4)	97.0 (10.6)	94.5 (10.5)	93.6 (10.2)	< 0.001
Systolic blood pressure (mmHg)	138.7 (20.1)	143.7 (20.6)	135.2 (16.5)	137.1 (19.1)	< 0.001
Total cholesterol (mmol/l)	6.0 (1.1)	6.0 (1.1)	6.0 (1.1)	6.1 (1.1)	0.36
HDL cholesterol (mmol/l)	1.3 (0.3)	1.4 (0.4)	1.3 (0.4)	1.3 (0.3)	0.006
Triglycerides (mmol/l)	1.7 (1.0)	1.7 (1.0)	1.6 (0.8)	1.7 (1.1)	0.56

Values are mean (standard deviations) or percentages (number of subjects). There were some missing values for some variables.

<sup>1</sup> p-value for homogeneity

<sup>2</sup> p-value not including never smokers

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7 Table 2 confirms that both consistent daily smoking and occasional smoking were associated  
8 with increased all-cause mortality. A total of 766 women and 882 men died during follow-up.  
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10 Although the age-adjusted hazard ratio associated with occasional smoking compared to never  
11 smokers was somewhat higher in women (HR= 1.59 (95 % CI: 1.15-2.20)) than in men  
12 (HR=1.23 (95 % CI: 0.88- 1.73)), the overall relationships between smoking habits and total  
13 mortality were not statistically significantly different (p-value for interaction =0.07) and the  
14 p-values for the difference in the relationships with occasional smoking was higher (p=0.3)  
15 (data not shown). Due to the relatively low number of deaths among the individuals who  
16 smoked occasionally, we merged results for men and women and adjusted for gender.  
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27 Adjustments for other significant predictors for mortality in this cohort (education, body mass  
28 index, total serum cholesterol and serum triglycerides) changed the point estimates only  
29 marginally and the conclusions were unaffected (Table 2). This was also the case when  
30 further adjustments for the frequency of use of alcohol and passive smoking were undertaken.  
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37 In a separate set of analyses, we included only men and women who at baseline indicated to  
38 be free of ischemic heart disease (reporting no myocardial infarction or angina pectoris). In  
39 this group of 6121 subjects, there were 1232 deaths. This exclusion of individuals had  
40 minimal impact on the point estimate for the relationship between occasional smoking and  
41 total mortality; HR=1.27 (95 % CI: 0.97, 1.67) compared to HR=1.32 (95 % CI: 1.05, 1.66) in  
42 the analyses including the total population (Table 2).  
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51 Detailed information about smoking history (the number of pack-years) was missing for 543  
52 ever smokers. In separate analyses, we restricted the analytical cohort to 4164 ever smokers  
53 (current daily smokers, occasional smokers, and previous smokers) with complete information  
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about the number of pack-years. There were 1013 deaths. The age- and gender adjusted mortality in occasional smokers was not higher than in former smokers (HR=1.12, 95 % CI: 0.87-1.43), and adjusting for the number of pack-years in addition to age and gender confirmed this. If anything, the relationship with occasional smoking was somewhat stronger, but still not statistically significant.

In a separate set of analyses, we restricted the analyses to subjects aged 79 or below at follow-up, thus disregarding information from follow-up after the age of 80. A total of 6886 men and women and 754 deaths were included in the analyses. The results with regard to mortality in occasional smokers were essentially unchanged. Similarly as for the analyses including all subjects, we also in this situation restricted the analytical cohort to 4094 ever smokers with 526 deaths and adjusted for the number of pack-years. The results were as for all subjects, also including follow-up after the age of 79.

**Table 2.** Relationships between smoking habits and total mortality. A 14 years follow-up. The Tromsø Study.

	Subjects N (%)	Deaths N (%)	HR <sup>1</sup>	95% CI	HR <sup>2</sup>	95% CI
Consistent daily smokers	1835 (26.0)	468 (28.4)	2.13	1.86, 2.43	2.05	1.78, 2.37
Occasional smokers	509 (7.2)	88 (5.3)	1.32	1.05, 1.66	1.38	1.08, 1.76
Former smokers	2363 (33.5)	633 (38.4)	1.14	1.00, 1.30	1.18	1.03, 1.35
Never-smokers	2346 (33.3)	459 (27.9)	1.00	Reference	1.00	Reference
Total	7053 (100)	1648 (100)				

<sup>1</sup> Adjusted for age and gender

<sup>2</sup> Adjusted for age, gender, education, body mass index, serum cholesterol and serum triglycerides



## DISCUSSION

The present prospective cohort study shows that occasional smoking significantly increased mortality by more than 30 % compared to never smokers. Results were not substantially changed when analyses were restricted to those aged below 80 years at follow-up. We found that the 7 % occasional smokers constituted the youngest group of individuals, they used alcohol more frequently and they had higher educational level compared to the other study attendees.

Our results are in line with findings from other surveys of occasional smokers; they are younger than daily smokers and their level of education is more similar to non-smokers (3, 8).

A Finnish prospective cohort study studied occasional smoking habits at baseline as risk factor for total mortality (4). Their finding was about similar to ours for men, while female occasional smokers did not have an increased mortality risk. However, there was no significant difference in the association between occasional smoking and total mortality between the sexes, similar to our findings. A recent large cohort study from the US included self-reports of lifetime smoking history, and showed that persons who smoked fewer than 1 or 1 to 10 cigarettes per day over their lifetime had higher all-cause mortality risks than never smokers (5). A previous large population-based Norwegian cohort study found that even very light smoking (1-4 cigarettes per day) was associated with a significantly 50-60 % increased all-cause mortality (9) while a British study demonstrated a significant hazard ratio of 1.21 for light smoking compared to never smoking (10). A study from the US experienced a more than

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3 two times higher mortality in very light smoking females (11). Light smoking may be  
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5 comparable to occasional smoking when it comes to risk of all-cause mortality in our study.  
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7 Differences in risk compared to the present study may be due to different study populations  
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9 and length of follow up as well as various abilities to control for confounders. We have  
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11 previously shown that light smoking as well as passive smoking carried higher hazards for  
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13 myocardial infarction in women (12). Recently, a British cohort study with long follow-up  
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15 found that light smoking at baseline carried a higher mortality risk in women than in men  
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17 (10). Our results give some risk estimates supporting this finding, but we did not find a  
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19 statistically significant interaction and therefore merged the data for the two genders.  
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24 Norway has a strong record on national tobacco control policies since the 1970ies. The trend  
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26 of occasional smoking might be influenced by the ongoing marginalization of smoking and  
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28 increasing restrictions. Studies have shown that a large proportion of occasional smokers do  
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30 not regard themselves as smokers (8). There is common belief, based in part on successful  
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32 tobacco industry marketing to so-called “health-conscious smoking”, that occasional smoking  
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34 is safer than daily smoking (13). A Norwegian Directorate of Health survey in 2013  
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36 conducted before a campaign to reach occasional smokers, confirmed this. One third of the  
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38 occasional smokers did not believe their smoking would cause any harm to their health (3).  
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40 We do not have data to confirm these conceptions, but the relatively high education level of  
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42 occasional smokers in the present study suggests that they are well aware of the hazards of  
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44 daily smoking, as well educated people are, but may consider occasional smoking far less  
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46 detrimental or maybe without any health risks. Moreover, it is shown that occasional smokers  
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48 are not free of nicotine dependence and that their smoking appears to be driven to some  
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50 degree by the same cigarette craving that affects daily smokers, explaining why many  
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52 occasional smokers have difficulty quitting (14). This is important knowledge for health  
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54 professionals working with smoking cessation in occasional smokers.  
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3 In 2006-2010, approximately 10 % of Norwegians aged 16-74 years were occasional smokers  
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5 (1). Our slightly lower prevalence may be because no subjects in our study were below 30  
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7 years, and occasional smoking is known to be more frequent among younger individuals. The  
8  
9 use of snuff (snus) has been increasingly popular in Norway, particularly among adolescents  
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11 and young adults (1). Approximately 3 % of the subjects included in our study reported ever  
12  
13 use of snuff, and it was not associated with increased mortality, but with occasional smoking  
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15 (Table 1).  
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19 Population studies have risk of selection bias because those who accept the invitation to  
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21 participate in the study may not be representative of the whole target population. Non-  
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23 response is often linked to exposure status, which implies that for example individuals with  
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25 health issues, smokers and others with unhealthy lifestyle may be less likely to attend the  
26  
27 survey compared to non-smokers. We have previously reported lower mortality in participants  
28  
29 to the Tromsø Study according to attendance (6). This bias would influence our findings only  
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31 if the association between smoking habits and total mortality is different in the 68 % of the  
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33 invited population who were included in the analyses than in the remaining 32 %.  
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39 The participants in the Tromsø Study reported smoking habits on a self-administered  
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41 questionnaire that may imply information bias. We have no objective measures of tobacco  
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43 exposure like cotinine or thiocyanate. A previous Norwegian study showed that the relation  
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45 between self-reported smoking habits and the measure of serum thiocyanate was strong if the  
46  
47 question was asked in a neutral setting (15). As the questions about smoking were asked in a  
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49 neutral setting, we believe that the validity was good, although we recognize that the smoking  
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51 habits probably are underreported.  
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56 It is a limitation that we have not been able to include information regarding changes in  
57  
58 smoking habits during follow-up. The smoking prevalence in our community has declined  
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3 (16). In Tromsø 5 (2001), it was 28 % current smokers, 20 % in Tromsø 6 (2007-2008) and 14  
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5 % in Tromsø 7 (2015-2016). Seven percent of the Tromsø 7 population reported to be  
6  
7 occasional smokers, 19 % had previously been (7).  
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10  
11 A particular problem in studies of the health risks related to occasional smoking is that  
12  
13 occasional smoking is a rather unstable category consisting of a heterogeneous group of  
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15 former daily smokers trying to quit, persistent occasional smokers who might regard their risk  
16  
17 as little and former quitters who have resumed as occasional smokers for a period. This  
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19 instability is mirrored by the inconsistent answers to the smoking history questions we used  
20  
21 for categorization in our study. Among the subjects who stated to be occasional smokers on  
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23 the second questionnaire in our study population, 28 %, 60 % and 13 %, respectively, reported  
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25 to be current, ex- and never daily smokers on the first questionnaire.  
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30 A total of 3729 of the subjects included in our analyses also answered a question concerning  
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32 occasional smoking in the Tromsø 6 survey in 2007-2008, and information about occasional  
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34 smoking was therefore available from both surveys. We found that 39 % of those who at  
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36 baseline (in 2001) were classified as occasional smokers reported the same in 2007-2008  
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38 (Tromsø 6). When comparing with their self-reported classification as current, ex- and never  
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40 smokers in 2007-2008, 13 % of occasional smokers in 2001 reported to be current daily  
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42 smokers in 2007-2008 and 65 % reported to be previous daily smokers. Thus, the changing  
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44 smoking habits among the occasional smokers make it difficult to precisely assess the strength  
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46 of the relationship between occasional smoking and total mortality. Only registration of long-  
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48 term smoking habits can answer this question.  
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53 Another limitation in our study is that we lack information about usage patterns among the  
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55 occasional smokers, e.g., how often they smoked and how many cigarettes they smoked per  
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57 occasion.  
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3 Our study had the strength of a large cohort with a prospective design, high participation rate  
4 and a quite long and complete follow-up. Moreover, we were able to adjust for baseline levels  
5 of other significant risk factors for total mortality in this population. The results are probably  
6 valid for other European populations, but similar cohort studies should be conducted in other  
7 populations in order to determine the exact adverse effects of occasional smoking. In  
8 particular, there is a need for larger studies as there were relatively few occasional smokers in  
9 our study and therefore only 88 deaths.  
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14 In conclusion, in line with a few others, this study demonstrates that occasional smoking is  
15 not a safe alternative; it increases mortality. We report a dose response relationship in the  
16 hazards of smoking (daily, occasional, former and never smoking). Governmental and non-  
17 governmental tobacco control policymakers should intensify the information about the health  
18 hazards of occasional smoking as well as work towards increased restrictions. Occasional  
19 smokers make up about one third of all current smokers in the Norwegian population, and  
20 more work should be done to motivate this usually well-educated group to quit smoking  
21 completely.  
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### 38 **Contributorship**

39  
40 MLL and BKJ conceived and designed the research. BKJ performed the analyses. MLL and  
41 BKJ drafted the manuscript. MLL, ITG, JM, EBM, IN, HS, TW and BKJ made critical  
42 revision of the manuscript for key intellectual content. All authors have read and approved the  
43 submitted version of the manuscript.  
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### 51 **Funding**

52  
53 This research received no specific grant from any funding agency in the public, commercial or  
54 not-for-profit sectors.  
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### Competing interests

None declared.

### Data sharing

No additional data available.

### Ethics

All individuals gave written informed consent to participate. The Tromsø Study was approved by the Data Inspectorate of Norway and the Regional Committee of Medical and Health Research Ethics, North Norway.

### Acknowledgment

The publication charges for this article have been funded by a grant from the publication fund of UiT The Arctic University of Norway.

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# Personal Invitation

Don't write here

5.3 (Municipality)

(County)

(Country)

⊥

9.3 (Business)

9.4 (Occupation)

14.7 (Mark)



**1. YOUR OWN HEALTH**

1.1 What is your current state of health? (Tick one only)

Poor  1      Not so good  2      Good  3      Very good  4

1.2 Do you have, or have you had?:

	Yes	No	Age first time
Asthma.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
Hay fever .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
Chronic bronchitis/emphysema .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
Diabetes .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
Osteoporosis .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
Fibromyalgia/chronic pain syndrome .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
Psychological problems for which you have sought help .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
A heart attack .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
Angina pectoris (heart cramp) .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
Cerebral stroke/brain haemorrhage .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>

1.3 Have you noticed attacks of sudden changes in your pulse or heart rhythm in the last year? ..... Yes  No

1.4 Do you get pain or discomfort in the chest when: Walking up hills, stairs or walking fast on level ground? Yes  No

1.5 If you get such pain, do you usually:

Stop?  1      Slow down?  2      Carry on at the same pace?  3

1.6 If you stop, does the pain disappear within 10 minutes? ..... Yes  No

1.7 Can such pain occur even if you are at rest?..... Yes  No

**2. MUSCULAR AND SKELETAL COMPLAINTS**

2.1 Have you suffered from pain and/or stiffness in muscles and joints during the last 4 weeks? (Give duration only if you have had problems)

	No complaint	Some complaint	Severe complaint	Duration	
				Up to 2 weeks	2 weeks or more
Neck/shoulders .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Arms, hands .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Upper part of your back...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lumbar region .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hips, legs, feet .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other places .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1      2      3      1      2

2.2 Have you ever had:

	Yes	No	Age last time
Fracture in the wrist/forearm .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>
Hip fracture?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> <input type="text"/>

**3. OTHER COMPLAINTS**

3.1 Below is a list of various problems. Have you experienced any of this during the last week (including today)? (Tick once for each complaint)

	No complaint	Little complaint	Pretty much	Very much
Sudden fear without reason .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Felt afraid or anxious .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Faintness or dizziness .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Felt tense or upset .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tend to blame yourself .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleeping problems .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Depressed, sad .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feeling of being useless, worthless .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feeling that everything is a struggle .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feeling of hopelessness with regard to the future	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1      2      3      4

**4. USE OF HEALTH SERVICES**

4.1 How many times in the last 12 months have you been to/used: (Tick once for each line)

	None	1-3 times	4 or more
General practitioner (GP) .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medical officer at work .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Psychologist or psychiatrist (private or out-patient clinic) .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other specialist (private or out-patient clinic) .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency GP (private or public) .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hospital admission .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Home nursing care .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physiotherapist .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chiropractor .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dentist .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternative practitioner .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**5. CHILDHOOD/YOUTH AND AFFILIATION**

5.1 How long altogether have you lived in the county?   year (Put 0 if less than half a year)

5.2 How long altogether have you lived in the municipality?   year (Put 0 if less than half a year)

5.3 Where did you live most of the time before the age of 16? (Tick one option and specify)

Same municipality ....  1

Another municipality in the county .....  2      Which one: \_\_\_\_\_

Another county in Norway  3      Which one: \_\_\_\_\_

Outside Norway .....  4      Country:: \_\_\_\_\_

5.4 Have you moved within the last five years?  1      Yes, one time  2      Yes, more than once  3

**6. BODY WEIGHT**

6.1 Estimate your body weight when you were 25 years old:    kg

**7. FOOD AND BEVERAGES**

**7.1 How often do you usually eat these foods?** (Tick once per line)

	Rarely /never	1-3 times /month	1-3 times /week	4-6 times /week	1-2 times /day	3 times or more /day
Fruit, berries .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cheese (all types).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Potatoes .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Boiled vegetables .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fresh vegetables/salad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fatty fish (e.g. salmon, trout, mackerel, herring)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**7.2 What type of fat do you usually use?** (Tick once per line)

	Don't use	Butter	Hard margarine	Soft/light margarine	Oils	Other
On bread .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
For cooking .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**7.3 Do you use the following dietary supplements:**

	Yes, daily	Sometimes	No
Cod liver oil, fish oil capsules .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vitamins and/or mineral supplements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**7.4 How much of the following do you usually drink?** (Tick once per line)

	Rarely /never	1-6 glasses /week	1 glass /day	2-3 glasses /day	4 glasses or more /day
Full milk, full-fat curdled milk, yoghurt .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Semi-skimmed milk, semi-skimmed curdled milk, low-fat yoghurt .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skimmed milk, skimmed curdled milk .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extra semi-skimmed milk .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Juice .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mineral water (e.g. Farris, Ramløsa etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cola-containing soft drink .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other soda/soft drink .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**7.5 Do you usually drink soft drink:** with sugar  1 without sugar  2

**7.6 How many cups of coffee and tea do you drink daily?** Number of cups (Put 0 for the types you don't drink daily)

Filtered coffee .....	<input type="text" value=""/>
Boiled coffee/coarsely ground coffee for brewing .....	<input type="text" value=""/>
Other type of coffee .....	<input type="text" value=""/>
Tea .....	<input type="text" value=""/>

**7.7 Approximately how often have you during the last year consumed alcohol?** (Do not count low-alcohol and alcohol-free beer)

Never consumed alcohol	Have not consumed alcohol last year	A few times last year	About 1 time a month
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
2-3 times per month	About 1 time a week	2-3 times a week	4-7 times a week
<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8

To those who have consumed the last year:

**7.8 When you drink alcohol, how many glasses or drinks do you normally drink?** number

**7.9 Approximately how many times during the last year have you consumed alcohol equivalent to 5 glasses or drinks within 24 hours?** Number of times

**7.10 When you drink, do you normally drink:** (Tick one or more)

Beer	Wine	Spirits
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**8. SMOKING**

**8.1 How many hours a day do you normally spend in smoke-filled rooms?** Number of total hours

**8.2 Did any of the adults smoke at home while you were growing up?** Yes  No

**8.3 Do you currently, or did you previously live together with a daily smoker after your 20<sup>th</sup> birthday?** Yes, now  Yes, previously  Never

**8.4 Do you/did you smoke daily?**  If NEVER: Go to question 9 : (EDUCATION AND WORK)

**8.5 If you smoke daily now, do you smoke:** Yes No

Cigarettes?.....

Cigars/cigarillos?.....

A pipe?.....

**8.6 If you previously smoked daily, how long is it since you quit?** Number of years

**8.7 If you currently smoke, or have smoked previously:**

How many cigarettes do you or did you normally smoke per day? Number of cigarettes

How old were you when you began daily smoking? Age in years

How many years in all have you smoked daily? Number of years

**9. EDUCATION AND WORK**

**9.1 How many years of education have you completed?** Number of years

(Include all the years you have attended school or studied)

**9.2 Do you currently have paid work?**

Yes, full-time  1 Yes, part-time  2 No  3 T

**9.3 Describe the activity at the workplace where you had paid work for the longest period in the last 12 months.** (e.g. Accountancy firm, school, paediatric department, carpentry workshop, garage, bank, grocery store, etc.)

**Business:** \_\_\_\_\_

If retired, enter the former business and occupation. Also applies to 9.4

**9.4 Which occupation/title have or had you at this workplace?** (e.g. Secretary, teacher, industrial worker, nurse, carpenter, manager, salesman, driver, etc.)

**Occupation:** \_\_\_\_\_

**9.5 In your main occupation, do you work as self-employed, as an employee or family member without regular salary?**

Self-employed  Employee  Family member

**9.6 Do you believe that you are in danger of losing your current work or income within the next two years?** Yes  No

**9.7 Do you receive any of the following benefits?** Yes No

Sickness benefit (are on sick leave) .....

Old age pension, early retirement (AFP) or survivor pension .....

Rehabilitation/reintegration benefit .....

Disability pension (full or partial) .....

Unemployment benefits during unemployment .....

Social welfare benefits .....

Transition benefit for single parents .....

10. EXERCISE AND PHYSICAL ACTIVITY

10.1 How has your physical activity in leisure time been during this last year?  
Think of a weekly average for the year.  
Time spent going to work is count as leisure time. Answer both questions.

Hours per week

	None	Less than 1	1-2	3 or more
Light activity (not sweating/out of breath)...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hard physical activity (sweating/out of breath).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4

10.2 Describe exercise and physical exertion in your leisure time. If your activity varies much e.g. between summer and winter, then give an average. The question refers only to the last year. (Tick the most appropriate box)

Reading, watching TV or other sedentary activity? .....  1

Walking, cycling or other forms of exercise at least 4 hours a week? .....  2  
(Include walking or cycling to work, Sunday walk/stroll, etc.)

Participation in recreational sports, heavy gardening, etc.? (Note: duration of activity at least 4 hours a week)  3

Participation in hard training or sports competitions, regularly several times a week? .....  4

11. FAMILY AND FRIENDS

11.1 Do you live with: Spouse/partner?..... Yes  No

11.2 How many good friends do you have? Number of friends  
Count the ones you can talk confidentially with and who can give you help when you need it. Do not count people you live with, but do include other relatives.

11.3 How much interest do people show for what you do? (Tick only once)

Great interest	Some interest	Little interest	No interest	Uncertain
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

11.4 How many associations, sport clubs, groups, religious communities or similar do you take part in? Number  
(Write 0 if none)

11.5 Do you feel that you can influence what happening in your local community where you live? (Tick only once)

Yes, a lot	Yes, some	Yes, a little	No	Never tried
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

12. ILLNESS IN THE FAMILY

12.1 Have one or more of your parents or siblings had a heart attack (heart wound) or angina pectoris (heart cramp)? ..... Yes  No  Don't know

12.2 Tick for the relatives who have or have had any of the illnesses: (Tick for each line)

	Mother	Father	Brother	Sister	Child	None of these
Cerebral stroke or brain haemorrhage .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart attack before age of 60 years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Asthma.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cancer .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diabetes .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12.3 If any relatives have diabetes, at what age did they get diabetes (if for e.g. many siblings, consider the one who got it earliest in life):

Don't know, not applicable	Mother's age	Father's age	Brother's age	Sister's age	Child's age
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. USE OF MEDICINES

With medicines, we mean drugs purchased at pharmacies. Supplements and vitamins are not considered here.

13.1 Do you use: Now  Previously, but not now  Never used

Blood pressure lowering drugs .....

Cholesterol-lowering drugs .....

13.2 How often have you during the last 4 weeks used the following medicines? (Tick once for each line)

	Not used in the last 4 weeks	Less than every week	Every week but not daily	Daily
Painkillers non-prescription ....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Painkillers on prescription .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleeping pills .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tranquillizers .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antidepressants .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other prescription medicines ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	2	3	4

13.3 For those medicines you have checked in points 13.1 and 13.2, and that you've used during the last 4 weeks:

State the name and the reason that you are taking/have taken these (disease or symptom):  
(Tick for each duration you have used the medicine)

Name of the medicine: (one name per line)	Reason for use of the medicine	How long have you used the medicine	
		Up to 1 year	1 year or more
		<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>

If there is not enough space here, you may continue on a separate sheet that you attach

14. THE REST OF THE FORM IS TO BE ANSWERED BY WOMEN ONLY

14.1 How old were you when you started menstruating? Age in years

14.2 If you no longer menstruating, how old were you when you stopped menstruating? Age in years

14.3 Are you pregnant at the moment? Yes  No  Uncertain  Above fertile age

14.4 How many children have you given birth to? Number of children

14.5 Do you use, or have you ever used? (Tick once for each line)

	Now	Before, but not now	Never
Oral contraceptive pills/mini pill/contraceptive injection .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hormonal intrauterine device (IUD) (not ordinary IUD) ..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Estrogen (tablets or patches) .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Estrogen (cream or suppositories)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14.6 If you use/have used prescription estrogen: How long have you used it? Number of years

14.7 If you use contraceptive pills, mini pill, contraceptive injection, hormonal IUD or estrogen, what brand do you use?

Label

## Additional questions to the health survey in Troms and Finnmark 2001-2002

The main aim of the Tromsø Study is to improve our knowledge about cardiovascular diseases in order to aid prevention. The study is also intended to improve our knowledge of cancer and other general conditions, such as allergies, muscle pains and mental conditions. We would therefore like you to answer some questions about factors that may be relevant for your risk of getting these and other illnesses. This form is part of the Health Survey, which has been approved by the Norwegian Data Inspectorate and the Regional Board of Research Ethics. The answers will only be used for research purposes and will be treated strictly confidential.

### T1. NEIGHBORHOOD AND HOME

**1.1** In which municipality did you live at the age of 1 year? *(If you have not lived in Norway, state country of residence instead of the municipality)*

**1.2** What type of house do you live in? *(Tick only once)*

- Detached house/villa.....  1
- Farm .....  2
- Flat/apartment .....  3
- Terraced/semi-detached house .....  4
- Institution/care home .....  5
- Other .....  6

**1.3** How big is your house?  m<sup>2</sup> (gross)

**1.4** Are you bothered by: *(Tick once for each line)*

	No complaint	Little complaint	Severe complaint
Moisture, drought or coldness in your home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other forms of bad indoor climate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Traffic noise (cars or aircraft)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other noise (industrial, construction, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neighbour noise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drinking water quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air pollution from traffic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air pollution from wood/oil heating, factory etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**1.5** What home language did your grandparents have? *(Tick for one or more alternatives)*

	Norwegian	Sami	Kven/ Finnish	Other language
Mother's mother ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mother's father .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Father's mother ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Father's father .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The information you give us may later be linked with information from other public health registers in accordance with the rules laid down by the Data Inspectorate and the Regional Board of Research Ethics.

If you are unsure about what to answer, tick the box that you feel fits best.

The completed form should be sent to us in the enclosed prepaid envelope. Thank you in advance for helping us.

Yours sincerely

Department of Community Medicine  
University of Tromsø

National Health  
Screening Service

If you do not wish to answer the questionnaire, tick the box below and return the form. Then you will not receive reminders.

I do not wish to answer the questionnaire

Date of completion:

Day	Month	Year
<input style="width: 30px; height: 20px;" type="text"/>	<input style="width: 30px; height: 20px;" type="text"/>	<input style="width: 60px; height: 20px;" type="text"/>

### T1. NEIGHBORHOOD AND HOME (cont.)

**1.6** What do you consider yourself as? *(Tick for one or more alternatives)*

Norwegian	Sami	Kven/ Finnish	Other
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**1.7** Do you feel that you have enough good friends? Yes  No

**1.8** How often do you normally take part in organised gatherings, e.g. sewing circles, sports clubs, political meetings or other associations? *(Tick only once)*

- Never, or just a few times a year .....  1
- 1-3 times a month .....  2
- Approximately once a week .....  3
- More than once a week .....  4

### T2. PAID AND UNPAID WORK

**2.1** If you have paid or unpaid work, how would you describe your work? *(Tick only once)*

- Mostly sedentary work? *(e.g. office work, mounting)* .....  1
- Work that requires a lot of walking? *(e.g. shop assistant, light industrial work, teaching)* .....  2
- Work that requires a lot of walking and lifting? *(e.g. Postman, nursing, construction)* .....  3
- Heavy manual labour? *(e.g. forestry, heavy farm-work, heavy construction)* .....  4

**2.2** Can you decide yourself how your work (paid or unpaid) should be organised? *(Tick only once)*

- No, not at all .....  1
- To a small extent .....  2
- Yes, to a large extent .....  3
- Yes, I decide myself .....  4

**2.3** Are you on call, do you work

Yes  No



**T3. TOBACCO**

**3.1 Do you smoke?**

Yes, daily  1 Yes, sometimes  2 No, never  3

If "Yes, sometimes"

**What do you smoke?**

Cigarettes  Pipe  Cigar/cigarillos

**3.2 Have you used or do you use snuff daily?**

Yes, now  Yes, previously  Never

If YES:

**How many years altogether have you used snuff?**  years

**T4. ALCOHOL**

**4.1 Are you a teetotaler?**  Yes  No

**4.2 How many times a month do you normally drink alcohol?**  Number of times  
*(Do not count low-alcohol beer. Put 0 if less than once a month)*

**4.3 How many glasses of beer, wine or spirits do you normally drink in a fortnight?**  
*(Do not count low-alcohol beer. Put 0 if you do not drink alcohol)*

Beer  Wine  Spirits

**4.4 For approximately how many years has your alcohol consumption been at the same level you described above?**  years

**4.5 Have you, in one or more periods in the last 5 years consumed so much alcohol that it has inhibited your work or social life?**

Yes, at work  1 Yes, socially  2 Yes, both at work and social life  3 No, never  4

**T5. FOOD AND DIETARY SUPPLEMENTS**

**5.1 Do you usually eat breakfast every day?**  Yes  No

**5.2 How many times a week do you eat a warm dinner?**  times

**5.3 How important is it for you to have a healthy diet?**

Very  1 Somewhat  2 Little  3 Not  4

**5.4 Do you use the following dietary supplements?**

Yes, daily Yes, sometimes No

Iron tablets

Calcium tablets or bonemeal

Vitamin D supplements

Cod liver oil

**T6. BODY WEIGHT**

**6.1 Do you currently try to change your body weight?**

No  1 Yes, I try to gain weight  2 Yes, I try to lose weight  3

**6.2 What weight would you be satisfied with (your "ideal weight")?**

**T7. ILLNESSES AND INJURIES**

**7.1 Have you ever had:**

*Tick once for each question. Also give the age at the time. If you have had the condition several times, how old were you the last time*

	Yes	No	Age last time
Severe injury requiring hospital admission	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> years
Ankle fracture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> years
Peptic ulcer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> years
Peptic ulcer surgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> years
Neck surgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> years
Prostate surgery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> years

**7.2 Do you have, or have you ever had:**  
*(Tick once for each question)*

	Yes	No
Cancer	<input type="checkbox"/>	<input type="checkbox"/>
Psoriasis	<input type="checkbox"/>	<input type="checkbox"/>
Thyroid disease	<input type="checkbox"/>	<input type="checkbox"/>
Glaucoma	<input type="checkbox"/>	<input type="checkbox"/>
Cataract	<input type="checkbox"/>	<input type="checkbox"/>
Osteoarthritis (arthrosis)	<input type="checkbox"/>	<input type="checkbox"/>
Bent fingers	<input type="checkbox"/>	<input type="checkbox"/>
Skin contractions in your palms	<input type="checkbox"/>	<input type="checkbox"/>
Kidney stone	<input type="checkbox"/>	<input type="checkbox"/>
Appendectomy	<input type="checkbox"/>	<input type="checkbox"/>
Hernia surgery	<input type="checkbox"/>	<input type="checkbox"/>
Surgery/treatment for urine incontinence	<input type="checkbox"/>	<input type="checkbox"/>
Epilepsy	<input type="checkbox"/>	<input type="checkbox"/>
Poliomyelitis (polio)	<input type="checkbox"/>	<input type="checkbox"/>
Parkinson's disease	<input type="checkbox"/>	<input type="checkbox"/>
Migraine	<input type="checkbox"/>	<input type="checkbox"/>
Leg ulcer	<input type="checkbox"/>	<input type="checkbox"/>

Allergy and hypersensitivity:

	Yes	No
Atopic eczema (e.g. childhood eczema)	<input type="checkbox"/>	<input type="checkbox"/>
Hand eczema	<input type="checkbox"/>	<input type="checkbox"/>
Food allergy	<input type="checkbox"/>	<input type="checkbox"/>
Other hypersensitivity (not allergy)	<input type="checkbox"/>	<input type="checkbox"/>

**7.3 Have you had common cold, influenza, gastroenteritis, etc. during the last 14 days?**

**7.4 Have you during the last 3 weeks had common cold, influenza, bronchitis, pneumonia, sinusitis, or other respiratory infection?**

**7.5 Have you ever had bronchitis or pneumonia?**

**7.6 Have you during the last 2 years had bronchitis or pneumonia?**  
*(Tick only once)*

No  1 1-2 times  2 More than 2 times  3

**T8. SYMPTOMS**

**8.1 Have you in the last two weeks felt:**  
(Tick once for each question)

	No	A Little	A lot	Very much
1 Nervous or worried .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Bothered by anxiety.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Confident and calm .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Irritable.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Happy and optimistic .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Down/depressed .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Lonely.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**8.2 Do you cough about daily for periods of the year?**

If YES:

**Is your cough productive?** .....  Yes  No

**Have you had this kind of cough for as long as 3 months in each of the last two years?**.....  Yes  No

**8.3 Have you had episodes with wheezing in the chest?**  Yes  No

If YES:

**Has this occurred:** (Tick once for each question)

At night .....  Yes  No

In connection with respiratory infections .....  Yes  No

In connection with physical exertion .....  Yes  No

In connection with very cold weather .....  Yes  No

**8.4 Do you get pain in the calf while walking** .....  Yes  No

If YES:

**How long can you go before you notice the pain?**.....    meter

**8.5 Do you get short-winded in the following situations?**  
(Tick once for each question)

While walking fast on level ground or slight up hills .....  Yes  No

While walking calmly on level ground .....  Yes  No

While washing or dressing yourself .....  Yes  No

While resting .....  Yes  No

**8.6 Do you have to stop because of short-windedness while walking in your own pace on level ground?...**  Yes  No

**8.7 Have you during the last year suffered from pain and/or stiffness in muscles and joints that have lasted continuously for at least 3 months?**.....  Yes  No

If YES:

**Has the complaint reduced your leisure time activity?** .....  Yes  No

**For how long has the complaint endured in total?**

approx.  years and  months

**Has the complaint reduced your ability to work during the last year?** (Also applies to domestic workers and pensioners) (Tick once)

No/insignificantly  1 To some extent  2 Significantly reduced  3 Do not know  4

**Have you been on sick leave due to these complaints during the last year?**  Yes  No  Do not work

**T8. SYMPTOMS (continue)**

**8.8 How often do you suffer from sleeplessness?**  
(Tick only once)

Never, or just a few times a year .....  1

1-3 times a month .....  2

Approximately once a week .....  3

More than once a week .....  4

**8.9 If you suffer from sleeplessness monthly or more frequently, what time of the year does it affect you most?**

No particular time of the year .....  1

Especially during the polar night .....  2

Especially during the midnight sun season .....  3

Especially in spring and autumn .....  4

**8.10 Have you in the last year suffered from sleeplessness to the extent that it has affected your ability to work ?** .....  Yes  No

**8.11 Do you usually sleep during the day?**.....  Yes  No

**8.12 How often do you suffer from urinary incontinence?**

Never .....  1

Not more than once a month .....  2

Two or more times a month .....  3

Once a week or more .....  4

**8.13 Are you able to walk down 10 steps without holding on to something (e.g. a handrail) ...**  Yes  No

**8.14 Do you use glasses?**.....  Yes  No

**8.15 Do you use a hearing aid?**.....  Yes  No

**8.16 How is your memory?**  
(Tick once for each question)

Do you forget what you just have heard or read?.....  Yes  No

Do you forget where you have placed things?.....  Yes  No

Is it more difficult to remember now than earlier?..  Yes  No

Do you more often write memos now than earlier?  Yes  No

If "YES" on one of these questions;  
**Is this a problem in your daily life?**.....  Yes  No

**T9. MEDICINES**

**9.1 Do you use, or have you used any of the following medicines:**

	Now	Previously, but not now	Age when used 1 <sup>st</sup> time	Never used
Drugs for osteoporosis.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> years	<input type="checkbox"/>
Tablets for diabetes .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> years	<input type="checkbox"/>
Drugs for hypothyroidism (thyroxine) .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/> years	<input type="checkbox"/>

**9.2 Do you use any medicines which you take as injections?** .....  Yes  No

If YES:  
**Give the name of the medicines (for injection):**

(one name per line)

**T10. ILLNESS IN THE FAMILY**

**10.1 Tick for the relatives who have or have ever had any of the diseases: (Tick for each line)**

	Mother	Father	Brother	Sister	Child	None of these
Heart attack (heart wound)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Angina pectoris (heart cramp)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High blood pressure .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aneurysm.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gastric/duodenal ulcer ....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hip fracture .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Psychological problems ..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Allergy .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Osteoarthritis (arthrosis) ..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dementia .....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**10.2 How many siblings and children do you have?**

	Brothers	Sisters	Children
Number	<input type="text"/>	<input type="text"/>	<input type="text"/>

**10.3 Do you usually do extra caring work because of illness etc. in your close family?**

Yes, daily/almost daily	Yes, sometimes	No
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

**10.4 Do you/your family receive home aid or home nursing care?.....**

Yes  No

**10.5 Is your mother alive? .....**

Yes  No  Age at death  years

**10.6 Is your father alive? .....**

Yes  No  Age at death  years

**T11. MOBILE TELEPHONE**

**11.1 Do you have (own, rent, etc.) a mobile telephone?**

Yes, always	Yes, sometimes	No
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

**If Yes: What do you use your mobile telephone for, and how often do you use it? (Tick once for each line)**

	Number of times per day				
	30 or more	10-29	2-9	1 or less	Never
Conversations..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Text messaging	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**T12. THE REST IS TO BE ANSWERED BY WOMEN ONLY**

**12.1 If you have given birth, fill in each child's birth year and how many months you breastfed after delivery.**

*(If you did not breastfeed, write 0)*

Child:	Birth year:	Number of months breastfed:
1 <sup>st</sup> child	<input type="text"/>	<input type="text"/>
2 <sup>nd</sup> child	<input type="text"/>	<input type="text"/>
3 <sup>rd</sup> child	<input type="text"/>	<input type="text"/>
4 <sup>th</sup> child	<input type="text"/>	<input type="text"/>
5 <sup>th</sup> child	<input type="text"/>	<input type="text"/>
6 <sup>th</sup> child	<input type="text"/>	<input type="text"/>

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(If more children, use additional sheet)

**T12. THE REST IS TO BE ANSWERED BY WOMEN ONLY**

**12.2 If you still have menstruate or are pregnant: What date did your last menstruation start?**

Day	Month	Year
<input type="text"/>	<input type="text"/>	<input type="text"/>

**12.3 If you no longer menstruate; why did your periods stop? (Tick once)**

It stopped by itself .....	<input type="checkbox"/> 1
Uterus surgery .....	<input type="checkbox"/> 2
Surgically removed both ovaries .....	<input type="checkbox"/> 3
Other reason (e.g. radiation, chemotherapy) ...	<input type="checkbox"/> 4

**12.4 Do you use or have you used prescribed estrogen (tablets or patches)?.....**

Yes  No

If YES:  
How old were you when you started taking estrogen? .....

If you stopped using estrogen,  
How old were you when you stopped taking estrogen?.....

**12.5 Do you use or have you used oral contraceptive pills?.....**

Yes  No

If YES:  
How old were you when you started taking the pill?.....

How many years in total have you taken the pills?....

If you have given birth:  
How many years did you take the pill before your first delivery?....

If you stopped taking the pill:  
How old were you when you stopped?....

**12.6 Apart from pregnancy and after giving birth, have you ever stopped having menstruation for 6 months or more?**

Yes  No

If YES:  
How many times?.....

**12.7 How is your current menstruation status?**

I have not had menstruation in the last year	<input type="checkbox"/> 1
I have regular menstruation .....	<input type="checkbox"/> 2
I have irregular menstruation .....	<input type="checkbox"/> 3

**12.8 When you were 25-29 years old, how many days usually passed between the start of two periods?**

Minimum	Maximum	Do not know
<input type="text"/> days	<input type="text"/> days	<input type="checkbox"/>

The periods were of approximately equal length every time?.....

How many days did a typical menstrual bleeding period last?...

**Thank you for the help!  
Remember to mail the form today!**