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

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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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24 25 **Questionnaires and measurements** 26

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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
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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
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15 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
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19 lipoprotein (HDL) cholesterol and triglycerides. Analysis of serum total cholesterol and
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21 triglycerides was performed by enzymatic colorimetric methods with commercial kits
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23 (CHOD-PAP; Boehringer-Manheim, Mannheim, Germany). HDL cholesterol was measured
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25 after precipitation of lower density lipoproteins with manganese chloride. All the analyses
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27 were performed by the Department of Clinical Chemistry, University Hospital of North
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29 Norway in Tromsø.

30 31 32 33 34 **Follow-up and statistical analyses**

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37 The National Causes of Death Registry covers individuals registered as residents of Norway
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39 at the time of their death, without regard to whether the death took place in Norway or abroad.
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41 The subjects were followed up regarding total mortality from the day they attended the
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43 Tromsø 5 survey and to the date of death, emigration from Norway or June 30, 2015
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45 whichever came first. There were 1648 deaths during follow-up. The mean (minimum,
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47 maximum) follow-up was 12.5 (0.2-14.3) years.

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49 Baseline characteristics were presented as mean (standard deviations) or percentages (number
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51 of subjects). The simple descriptive statistical analyses included analyses of variance and Chi-
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53 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
26 younger than other smokers. A higher proportion of occasional smokers had high education
27 levels and weekly use of alcohol. Passive smoking was most common in current smokers.
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29 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 ¹
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 ²)	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 ²)	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

¹Values are mean (standard deviations) or percentages (number of subjects)

²p-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

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

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

Detailed information about smoking history (the number of pack-years) was missing for 543 ever smokers. In separate analyses, we restricted the analytical cohort to 4164 ever smokers (current daily smokers, occasional smokers, and previous smokers) with complete information 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 ¹	95% CI	HR ²	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)				

¹ Adjusted for age and gender

² 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).
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54 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.
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40 **Competing interests**

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42 None declared.
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45 **Data sharing**

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47 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
Title and abstract	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.
Introduction		
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.
Methods		
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
Results		
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
Discussion		
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
Other information		
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>.

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

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

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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 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

1 particularly on the relationship between occasional smoking and acute myocardial infarction
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5 (3).
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8 The literature so far is not large. A cohort study from Finland indicated that occasional
9 smoking carried almost similar effect on death from any cause as daily smoking in men (4). A
10 review from 2010 emphasized the need for more cohort studies explicitly comparing risk in
11 daily smokers, occasional smokers and nonsmokers (1). In 2016, a large cohort study from the
12 US among low-intensity smokers over lifetime, found that they had higher mortality risk than
13 never smokers (5). More information about the adverse health effects of this new smoking
14 pattern is needed both for the general population and for health professionals. In this
15 population-based prospective study from Norway, we aimed to analyze smoking habits with
16 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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35 The Tromsø Study is a population-based prospective multipurpose study (6). Seven surveys
36 have been conducted, the first in 1974, the last in 2015-2016. To the fifth survey (Tromsø 5),
37 conducted in 2001, 10353 persons were invited. These individuals were men and women who
38 lived in the municipality of Tromsø and had participated in the second visit of the fourth
39 survey in 1994-1995 (the majority were 62-81 years old in 2001) as well as all women and
40 men aged 30, 40, 45, 60 or 75 years. A total of 3511 men and 4619 women aged 30-89 years
41 attended; attendance rates of 75.7 % and 80.8 %, respectively. The participants received a
42 questionnaire along with the invitation and were asked to bring the completed form when they
43 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

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28 We based information about history of smoking on several questions in two questionnaires. A
29
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,
33
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.
- 12
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
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15 last measurements was used in the present analyses.
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20 The blood test included measurement of serum total cholesterol, serum high density
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22 lipoprotein (HDL) cholesterol and triglycerides. Analysis of serum total cholesterol and
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24 triglycerides was performed by enzymatic colorimetric methods with commercial kits
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26 (CHOD-PAP; Boehringer-Manheim, Mannheim, Germany). HDL cholesterol was measured
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28 after precipitation of lower density lipoproteins with manganese chloride. All the analyses
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30 were performed by the Department of Clinical Chemistry, University Hospital of North
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32 Norway in Tromsø.
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35 36 37 38 39 **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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22 23 24 25 26 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 ¹
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 ²
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 ²)	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 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
Ever use of snuff	4.9 (31)	5.5 (64)	11.7 (29)	5.2 (40)	< 0.001
BMI (kg/m ²)	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.

¹ p-value for homogeneity

² 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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20 Adjustments for other significant predictors for mortality in this cohort (education, body mass
21 index, total serum cholesterol and serum triglycerides) changed the point estimates only
22 marginally and the conclusions were unaffected (Table 2). This was also the case when
23 further adjustments for the frequency of use of alcohol and passive smoking were undertaken.
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27 In a separate set of analyses, we included only men and women who at baseline indicated to
28 be free of ischemic heart disease (reporting no myocardial infarction or angina pectoris). In
29 this group of 6121 subjects, there were 1232 deaths. This exclusion of individuals had
30 minimal impact on the point estimate for the relationship between occasional smoking and
31 total mortality; HR=1.27 (95 % CI: 0.97, 1.67) compared to HR=1.32 (95 % CI: 1.05, 1.66) in
32 the analyses including the total population (Table 2).
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38 Detailed information about smoking history (the number of pack-years) was missing for 543
39 ever smokers. In separate analyses, we restricted the analytical cohort to 4164 ever smokers
40 (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 ¹	95% CI	HR ²	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)				

¹ Adjusted for age and gender

² 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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2
3 two times higher mortality in very light smoking females (11). Light smoking may be
4
5 comparable to occasional smoking when it comes to risk of all-cause mortality in our study.
6
7 Differences in risk compared to the present study may be due to different study populations
8
9 and length of follow up as well as various abilities to control for confounders. We have
10
11 previously shown that light smoking as well as passive smoking carried higher hazards for
12
13 myocardial infarction in women (12). Recently, a British cohort study with long follow-up
14
15 found that light smoking at baseline carried a higher mortality risk in women than in men
16
17 (10). Our results give some risk estimates supporting this finding, but we did not find a
18
19 statistically significant interaction and therefore merged the data for the two genders.
20
21

22
23
24 Norway has a strong record on national tobacco control policies since the 1970ies. The trend
25
26 of occasional smoking might be influenced by the ongoing marginalization of smoking and
27
28 increasing restrictions. Studies have shown that a large proportion of occasional smokers do
29
30 not regard themselves as smokers (8). There is common belief, based in part on successful
31
32 tobacco industry marketing to so-called “health-conscious smoking”, that occasional smoking
33
34 is safer than daily smoking (13). A Norwegian Directorate of Health survey in 2013
35
36 conducted before a campaign to reach occasional smokers, confirmed this. One third of the
37
38 occasional smokers did not believe their smoking would cause any harm to their health (3).
39
40 We do not have data to confirm these conceptions, but the relatively high education level of
41
42 occasional smokers in the present study suggests that they are well aware of the hazards of
43
44 daily smoking, as well educated people are, but may consider occasional smoking far less
45
46 detrimental or maybe without any health risks. Moreover, it is shown that occasional smokers
47
48 are not free of nicotine dependence and that their smoking appears to be driven to some
49
50 degree by the same cigarette craving that affects daily smokers, explaining why many
51
52 occasional smokers have difficulty quitting (14). This is important knowledge for health
53
54 professionals working with smoking cessation in occasional smokers.
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2
3 In 2006-2010, approximately 10 % of Norwegians aged 16-74 years were occasional smokers
4 (1). Our slightly lower prevalence may be because no subjects in our study were below 30
5
6 years, and occasional smoking is known to be more frequent among younger individuals. The
7
8 use of snuff (snus) has been increasingly popular in Norway, particularly among adolescents
9
10 and young adults (1). Approximately 3 % of the subjects included in our study reported ever
11
12 use of snuff, and it was not associated with increased mortality, but with occasional smoking
13
14 (Table 1).
15
16
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18

19
20 Population studies have risk of selection bias because those who accept the invitation to
21
22 participate in the study may not be representative of the whole target population. Non-
23
24 response is often linked to exposure status, which implies that for example individuals with
25
26 health issues, smokers and others with unhealthy lifestyle may be less likely to attend the
27
28 survey compared to non-smokers. We have previously reported lower mortality in participants
29
30 to the Tromsø Study according to attendance (6). This bias would influence our findings only
31
32 if the association between smoking habits and total mortality is different in the 68 % of the
33
34 invited population who were included in the analyses than in the remaining 32 %.
35
36
37

38
39 The participants in the Tromsø Study reported smoking habits on a self-administered
40
41 questionnaire that may imply information bias. We have no objective measures of tobacco
42
43 exposure like cotinine or thiocyanate. A previous Norwegian study showed that the relation
44
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
48
49 neutral setting, we believe that the validity was good, although we recognize that the smoking
50
51 habits probably are underreported.
52
53
54

55
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
59
60

1
2
3 (16). In Tromsø 5 (2001), it was 28 % current smokers, 20 % in Tromsø 6 (2007-2008) and 14
4
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).
8

9
10 A particular problem in studies of the health risks related to occasional smoking is that
11
12 occasional smoking is a rather unstable category consisting of a heterogeneous group of
13
14 former daily smokers trying to quit, persistent occasional smokers who might regard their risk
15
16 as little and former quitters who have resumed as occasional smokers for a period. This
17
18 instability is mirrored by the inconsistent answers to the smoking history questions we used
19
20 for categorization in our study. Among the subjects who stated to be occasional smokers on
21
22 the second questionnaire in our study population, 28 %, 60 % and 13 %, respectively, reported
23
24 to be current, ex- and never daily smokers on the first questionnaire.
25
26
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29
30 A total of 3729 of the subjects included in our analyses also answered a question concerning
31
32 occasional smoking in the Tromsø 6 survey in 2007-2008, and information about occasional
33
34 smoking was therefore available from both surveys. We found that 39 % of those who at
35
36 baseline (in 2001) were classified as occasional smokers reported the same in 2007-2008
37
38 (Tromsø 6). When comparing with their self-reported classification as current, ex- and never
39
40 smokers in 2007-2008, 13 % of occasional smokers in 2001 reported to be current daily
41
42 smokers in 2007-2008 and 65 % reported to be previous daily smokers. Thus, the changing
43
44 smoking habits among the occasional smokers make it difficult to precisely assess the strength
45
46 of the relationship between occasional smoking and total mortality. Only registration of long-
47
48 term smoking habits can answer this question.
49
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52 Another limitation in our study is that we lack information about usage patterns among the
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54 occasional smokers, e.g., how often they smoked and how many cigarettes they smoked per
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56 occasion.
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Our study had the strength of a large cohort with a prospective design, high participation rate and a quite long and complete follow-up. Moreover, we were able to adjust for baseline levels of other significant risk factors for total mortality in this population. The results are probably valid for other European populations, but similar cohort studies should be conducted in other populations in order to determine the exact adverse effects of occasional smoking. In particular, there is a need for larger studies as there were relatively few occasional smokers in our study and therefore only 88 deaths.

In conclusion, in line with a few others, this study demonstrates that occasional smoking is not a safe alternative; it increases mortality. We report a dose response relationship in the hazards of smoking (daily, occasional, former and never smoking). Governmental and non-governmental tobacco control policymakers should intensify the information about the health hazards of occasional smoking as well as work towards increased restrictions. Occasional smokers make up about one third of all current smokers in the Norwegian population, and more work should be done to motivate this usually well-educated group to quit smoking completely.

Contributorship

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

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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.

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9.4 (Occupation)

14.7 (Mark)

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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)

	Duration			Duration	
	No complaint	Some complaint	Severe complaint	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: Fracture in the wrist/forearm Yes No

Hip fracture?..... Yes No

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?

No 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

8. SMOKING

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

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"/>

8.1 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 20th 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?.....	<input type="checkbox"/>	<input type="checkbox"/>
Cigars/cigarillos?.....	<input type="checkbox"/>	<input type="checkbox"/>
A pipe?.....	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="text"/>
How old were you when you began daily smoking? Age in years	<input type="text"/>
How many years in all have you smoked daily? Number of years	<input type="text"/>

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
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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)	<input type="checkbox"/>	<input type="checkbox"/>
Old age pension, early retirement (AFP) or survivor pension	<input type="checkbox"/>	<input type="checkbox"/>
Rehabilitation/reintegration benefit	<input type="checkbox"/>	<input type="checkbox"/>
Disability pension (full or partial)	<input type="checkbox"/>	<input type="checkbox"/>
Unemployment benefits during unemployment	<input type="checkbox"/>	<input type="checkbox"/>
Social welfare benefits	<input type="checkbox"/>	<input type="checkbox"/>
Transition benefit for single parents	<input type="checkbox"/>	<input type="checkbox"/>

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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.? 3
 (Note: duration of activity at least 4 hours a week)

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

11. FAMILY AND FRIENDS

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

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cholesterol-lowering drugs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/>

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?

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Label

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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? m² (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: 30px; height: 20px;" type="text"/> <input style="width: 30px; height: 20px;" type="text"/> <input style="width: 30px; height: 20px;" type="text"/>	T

T1. NEIGHBORHOOD AND HOME (cont.)

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

- Norwegian
- Sami
- Kven/
Finnish
- Other

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 Yes, sometimes No, never

1 2 3 4 5 6 7 8 9 10 11 12 13 14

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

1 2 3

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?.....

(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?

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 Yes, socially Yes, both at work and social life No, never

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 Somewhat Little Not

5.4 Do you use the following dietary supplements?

Yes, daily 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 Yes, I try to gain weight Yes, I try to lose weight

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

No 1-2 times More than 2 times

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

Severe injury requiring hospital admission Ankle fracture Peptic ulcer Peptic ulcer surgery Neck surgery Prostate surgery

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

Cancer Psoriasis Thyroid disease Glaucoma Cataract Osteoarthritis (arthrosis) Bent fingers Skin contractions in your palms Kidney stone Appendectomy Hernia surgery Surgery/treatment for urine incontinence Epilepsy Poliomyelitis (polio) Parkinson's disease Migraine Leg ulcer Allergy and hypersensitivity: Atopic eczema (e.g. childhood eczema) Hand eczema Food allergy Other hypersensitivity (not allergy)

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)

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 only 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 st time | Never used |
| Drugs for osteoporosis..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="text"/> <input type="text"/> years | <input type="checkbox"/> |
| Tablets for diabetes | <input type="checkbox"/> | <input type="checkbox"/> | <input type="text"/> <input type="text"/> years | <input type="checkbox"/> |
| Drugs for hypothyroidism (thyroxine) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="text"/> <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):** T
- (one name per line)

T10. ILLNESS IN THE FAMILY

1 **10.1 Tick for the relatives who have or have ever had**
 2 **any of the diseases: (Tick for each line)**

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

13 **10.2 How many siblings and children do you have?**

14 Brothers Sisters Children

15 Number

16 **10.3 Do you usually do extra caring work because**
 17 **of illness etc. in your close family?**

18 Yes, daily/almost daily 1 Yes, sometimes 2 No 3

19 **10.4 Do you/your family receive home aid**
 20 **or home nursing care?.....**

21 Yes No

22 **10.5 Is your mother alive?**

23 Yes No Age at death years

24 **10.6 Is your father alive?**

25 Yes No years

T11. MOBILE TELEPHONE

26 **11.1 Do you have (own, rent, etc.) a mobile telephone?**

27 Yes, always 1 Yes, sometimes 2 No 3

28 If Yes:
 29 **What do you use your mobile telephone for, and how**
 30 **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
31 Conversations..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32 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

33 **12.1 If you have given birth, fill in each child's birth year and**
 34 **how many months you breastfed after delivery.**

35 (If you did not breastfeed, write 0)

Child:	Birth year:	Number of months breastfed:
36 1 st child	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>
37 2 nd child	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>
38 3 rd child	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>
39 4 th child	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>
40 5 th child	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>
41 6 th child	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>

42 (If more children, use additional sheet)

T12. THE REST IS TO BE ANSWERED BY WOMEN ONLY

43 **12.2 If you still have menstruate or are pregnant:**
 44 **What date did your last menstruation start?**

45 Day Month Year

46 **12.3 If you no longer menstruate; why did**
 47 **your periods stop? (Tick once)**

48 It stopped by itself 1
 49 Uterus surgery 2
 50 Surgically removed both ovaries 3
 51 Other reason (e.g. radiation, chemotherapy) ... 4

52 **12.4 Do you use or have you used prescribed**
 53 **estrogen (tablets or patches)?.....**

54 Yes No
 55 If YES:
 56 **How old were you when**
 57 **you started taking estrogen ?** years

58 If you stopped using estrogen,
 59 **How old were you when**
 60 **you stopped taking estrogen?.....** years

61 **12.5 Do you use or have you used oral**
 62 **contraceptive pills?.....**

63 Yes No
 64 If YES:
 65 **How old were you when**
 66 **you started taking the pill?.....** years

67 **How many years in total**
 68 **have you taken the pills?....** Number of years

69 If you have given birth:
 70 **How many years did you take the pill**
 71 **before your first delivery?....** Number of years

72 If you stopped taking the pill:
 73 **How old were you when you stopped?....** years

74 **12.6 Apart from pregnancy and after giving**
 75 **birth, have you ever stopped having**
 76 **menstruation for 6 months or more?**

77 Yes No
 78 If YES:
 79 **How many times?.....** times

80 **12.7 How is your current menstruation status?**

81 I have not had menstruation in the last year 1
 82 I have regular menstruation 2
 83 I have irregular menstruation 3

84 **12.8 When you were 25-29 years old, how many days**
 85 **usually passed between the start of two periods?**

86 Minimum days Maximum days Do not know

87 **The periods were of approximately**
 88 **equal length every time?.....** Yes No

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

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