

# To what extent do parents strive to protect their children from environmental tobacco smoke in the Nordic countries? A population-based study

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## Abstract

**Objective**—To assess to what extent Nordic parents strive to protect their children from environmental tobacco smoke (ETS) at home.

**Design**—A cross-sectional study using an anonymous questionnaire.

**Subjects and setting**—A stratified, random sample of 5500 households containing a child born during 1992, including 1500 households in Denmark and 1000 households in each of the countries of Finland, Iceland, Norway, and Sweden.

**Main outcome measures**—Smoking status of parents, prevalence and magnitude of weekly ETS exposure, rules regarding smoking in the home.

**Results**—82% of current smokers reported having tried to change their smoking behaviour for the sake of their children. Of all parents who answered the questionnaire, 75% reported having introduced some rules to limit ETS in their home. In households where at least one parent smoked, 57% reported that children were exposed to ETS at home. Child exposure to ETS was most prevalent in single-parent households and in households in which parents had lower levels of education. However, these parents were not less likely than other smoking parents to report having tried to change their smoking behaviour for the sake of their children.

**Conclusion**—Environmental tobacco smoke at home is still a problem for many children in the Nordic countries. However, most smoking parents reported having made efforts to change their smoking behaviour for the sake of their children; and in approximately half of all households containing at least one daily smoker, parents reported protecting their children from ETS exposure in the home. Although actual exposure may be higher owing to possible under-reporting of ETS, our results indicate a general awareness in the Nordic countries of the potential negative effects of ETS on children.

(*Tobacco Control* 1998;7:56-60)

Keywords: children, environmental tobacco smoke, homes

## Introduction

Although all of the Nordic countries have now introduced some form of restriction on

smoking in public places, there are no regulations directed at the home environment, where children may be most exposed to environmental tobacco smoke (ETS). However, in recent years there has been a growing opinion in the Nordic countries that households containing smokers should not allow smoking in the home. The “balcony smoker” has become a widely known phenomenon, braving all weathers to satisfy the hunger for nicotine.

Little is known about the extent of passive smoking among younger children with the exception of some regional studies among schoolchildren.<sup>1-5</sup> Few studies at a national level have tried to estimate the percentage of parents who smoke and expose their children to ETS. In a survey among parents of children aged 3-5 years in Oxfordshire, United Kingdom, approximately 64% of the smoking parents reported doing so while with their children.<sup>6</sup> A recent study in the United States found that 43% of children aged two months to 11 years were living in households that included at least one smoker.<sup>7</sup> Some studies have shown that the prevalence of parental smoking is much higher among parents/caregivers with lower levels of education<sup>8-15</sup> and among parents who live alone with their children.<sup>14</sup>

Our study aimed to assess reported prevalence of child exposure to ETS in the Nordic countries. The survey was initiated by the Nordic Cancer Union (NCU), a federation of the cancer societies in Denmark, Finland, Iceland, Norway, and Sweden. The study was part of a three-year intervention launched simultaneously by the NCU in all the Nordic countries, with the aim of reducing ETS exposure of young children in the home and in day care. The target population included parents, preschool personnel, and registered child-minders (“day mothers”).

## Methods

A questionnaire, along with a stamped, addressed envelope, was sent to a stratified random sample of 5500 households in the Nordic countries containing a child born during 1992. The children were approximately three years old at the time of investigation. The sample consisted of 1000 households in Finland, Iceland, Norway, and Sweden, and 1500 households in Denmark. Addresses were extracted from the Central Office of Population Records in each country. When necessary, permission was obtained from the

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Table 1 Response rate and sample characteristics

| Country | Response rate (%) | Number of households | Answered by women (%) | Parents' mean age |        | Single parent households (%) | Mean household education* |
|---------|-------------------|----------------------|-----------------------|-------------------|--------|------------------------------|---------------------------|
|         |                   |                      |                       | Male              | Female |                              |                           |
| Denmark | 56                | 845†                 | 67                    | 35                | 32     | 8                            | 4.5                       |
| Finland | 69                | 691                  | 68                    | 34                | 33     | 4                            | 4.6                       |
| Iceland | 70                | 702                  | 65                    | 34                | 31     | 12                           | 4.3                       |
| Norway  | 61                | 609                  | 56                    | 35                | 31     | 9                            | 4.4                       |
| Sweden  | 70                | 700                  | 75                    | 36                | 32     | 8                            | 3.5                       |
| Total   | 65                | 3547                 | 68‡                   | 35‡               | 32‡    | 8‡                           | 4.1‡                      |

\* Years beyond nine years of compulsory school.

† In Denmark 1500 households were included in the sample, 1000 in each of the other countries.

‡ Weighted results.

Data Inspectorate. The parent/person in charge whose birthday came first after the date on which the household received the questionnaire was instructed to answer the questions. This was to ensure that the sample would include as many men as women. Parents who did not live with a partner were instructed to fill in the form themselves. Within each Nordic country the data collection was coordinated by a collaborating staff member from each of the five participating cancer societies, supervised by the authors.

The respondent's and the partner's current smoking behaviour was assessed on a three-category scale: "smoke daily", "smoke occasionally", or "never smoke". Smokers (either daily or occasional) and respondents with smoking partners were asked how many cigarettes they themselves or their partner, or both, usually smoked in the course of a week when indoors with their child. To obtain further information about tobacco smoke in the children's surroundings, all respondents were asked how often the child was present if someone smoked in the car, in the room where the child slept, in the room where the television was located, in the room where most meals were served, in other indoor places at home, and in other indoor situations outside the home. Response options were "every day", "several times a week", "about once a week", "less than once a week", or "never". All

subjects were asked if they had introduced any rules to limit smoking indoors in their own home and if they had made any effort to change their smoking behaviour for the sake of the children (yes/no format).

Results from this descriptive study are given merely as prevalence point estimates. To test for differences between prevalences, significance probabilities (p values) were obtained from tests of homogeneity. Cohen's κ was calculated to assess the agreement between categorical variables.

When estimating the overall results for the Nordic countries as a whole, appropriate weights were employed to reflect the different number of households in the different countries. The weights were: 0.222, Denmark; 0.214, Finland; 0.011, Iceland; 0.183, Norway; and 0.370, Sweden. Although the percentage distributions in the tables are weighted, the marginals (n) express the crude number of cases.

"Mean household education" was calculated as the average number of years of education completed by the respondent and spouse/partner after the nine years of compulsory schooling. For parents who did not live with a spouse/partner, mean household education was set as equal to the number of years completed by the respondent after nine years of compulsory schooling. For the analysis the units were reduced to three categories of equal size, classified as "low education", "medium education", and "high education". The cutoff level is shown in the footnotes to each table.

The number of smoking parents in the household was calculated by combining answers from two other variables: "own smoking status" and "smoking status of spouse/partner". Categories were "both", "one" and "none". "Weekly exposure to ETS" was computed by combining the values "exposed every day", "exposed several times a week", and "exposed about once a week".

When possible, reminders were sent out to increase the response rate in each country. In Denmark no reminders were allowed. In Norway, only one reminder was allowed. In Iceland, Sweden, and Finland, two reminders were sent out.

**Results**

The total response rate was 65% (3547 households). For all countries except Norway and Denmark the response rate was about 70%, as detailed in table 1. National results are not stated below but will be published elsewhere.<sup>16</sup>

Table 2 Household restrictions on smoking indoors and personal changes in smoking behaviour for the sake of the child

|  | "Yes" (%) | p     | n    |
|--|-----------|-------|------|
| <i>Q: Are there any rules in your home to limit your own or others' smoking indoors?</i> |           |       |      |
| All households   | 75        |       | 3453 |
| Smoking behaviour  |           |       |      |
| Households with smokers  | 78        | ref.  | 1074 |
| Smoke-free households  | 73        | 0.006 | 2379 |
| <i>Q: Have you ever tried to change your smoking habits for the sake of your child?</i>  |           |       |      |
| All ever-smokers (current + former smokers)  | 80        |       | 1558 |
| Smoking status   |           |       |      |
| Current smokers (daily + occasional)   | 82        | ref.  | 1033 |
| Former smokers   | 76        | 0.010 | 525  |
| Mothers (ever-smokers)   | 83        |       | 1031 |
| Marital status   |           |       |      |
| Single   | 90        | ref.  | 176  |
| Married/cohabitant   | 83        | 0.026 | 824  |
| Education*   |           |       |      |
| High   | 75        | ref.  | 206  |
| Medium   | 84        | 0.012 | 425  |
| Low  | 86        | 0.001 | 400  |
| Fathers (ever-smokers)   | 72        |       | 526  |
| Education*   |           |       |      |
| High   | 63        | ref.  | 113  |
| Medium   | 77        | 0.013 | 246  |
| Low  | 70        | 0.257 | 167  |

Ref. = reference category for significance test.

\* The cutoffs for age and level of education are the same as in table 3.

Table 3 Exposure of children to ETS at home during the course of a week, according to number of parents who smoke in the household, level of household education, and family structure

|   | Exposing children (%) | p      | No cigarettes* | n    |
|---|-----------------------|--------|----------------|------|
| All households                          | 25                    |        | 38             | 3454 |
| Parents smoking daily                   |                       |        |                |      |
| None                                    | 11                    | ref    | 14             | 2344 |
| One                                     | 54                    | <0.001 | 28             | 793  |
| Both                                    | 69                    | <0.001 | 66             | 271  |
| Households containing parents who smoke | 57                    |        | 39             | 1064 |
| Education†                              |                       |        |                |      |
| High                                    | 52                    | ref.   | 28             | 281  |
| Medium                                  | 56                    | 0.443  | 36             | 369  |
| Low                                     | 63                    | 0.011  | 48             | 335  |
| Family structure                        |                       |        |                |      |
| Two parents                             | 55                    | ref.   | 41             | 935  |
| Single parent                           | 73                    | <0.001 | 30             | 129  |

\* Number of cigarettes smoked in the vicinity of the children per week (25% of the respondents living in households where children were exposed weekly to ETS did not cite the number of cigarettes to which their children were exposed. The figures in this column are based on the mean of the 75% who answered.)

Ref. = reference category for significance test.

† Low ≤2 years after 9 years of compulsory school; medium 2.1–4.0 years; high ≥4 years.

#### PREVALENCE OF PARENTAL SMOKING

Data on own and spouse/partner's smoking behaviour were obtained from 1182 men and 2338 women. On average, 20% of the Nordic parents reported smoking daily, whereas an additional 10% smoked occasionally. There was no difference in smoking behaviour between fathers and mothers. For mothers, self-reported daily smoking was 15% among those who lived with a spouse/partner and 47% among single mothers. For both parents, but for mothers especially, the prevalence of smoking decreased with increased education. The percentage of daily smokers among mothers with a low level of education was three times higher than among mothers with a high level of education. We used a simple test to check for respondent's under-reporting of smoking status by comparing the self-reported smoking prevalence for married/cohabitant *mothers* with the prevalence for the partner as reported by married/cohabitant *fathers*, and vice versa. We found no statistically significant difference between self-reported and partner-reported smoking status, with the estimated difference being one percentage point for men and three percentage points for women.

Of the investigated families, 29% included at least one parent who smoked daily. In households with dual parenthood, both parents were found to smoke daily in 8% of the households whereas one parent was a smoker in 20%. The prevalence of reported daily smoking was particularly high in single-head households (47%). The proportion of

smoke-free households decreased significantly with lesser level of "household education". For "high", "medium", and "low" level of education the percentage was 83%, 72%, and 59% respectively.

#### CHILDREN AS A MODIFYING FACTOR OF CHANGE IN PARENTAL SMOKING BEHAVIOUR

Three out of four households reported having introduced rules of some kind to limit smoking indoors (table 2). The proportion who reported having imposed restrictions on smoking indoors was smaller for households in which neither parents smoked than for households in which at least one parent smoked.

Approximately eight out of 10 current smokers and former smokers reported having made an effort to change their smoking behaviour for the sake of their children (table 2). Among ever-smokers (current plus former smokers), mothers had tried to change their smoking behaviour more often than fathers had ( $p < 0.001$ ). Interestingly, mothers with a lower level of education were more likely than highly educated mothers to have made an effort to change their smoking behaviour because of their children (table 2).

#### EXPOSURE TO ETS

One in four Nordic children in the 1992 birth cohort appeared to be exposed weekly to ETS in indoor situations at home (table 3). The prevalence of children's ETS exposure was obviously highest in households containing smokers. Where one or both parents smoked daily, 57% exposed their children to ETS on a weekly basis. Where both parents were reported to smoke daily, children were exposed to ETS in seven out of 10 households. In these households, an average of 66 cigarettes were smoked indoors in the presence of a child in the course of a week. In households where only one parent smoked daily, approximately half stated that cigarettes were smoked in the vicinity of children in indoor situations in the course of a week. The average amount was 28 cigarettes per week. Further, one in 10 children living with smoke-free parents were exposed to ETS weekly in their own home. In these households the average number of cigarettes smoked when children were present was 14 per week (table 3). The exposure varied across level of household education.

Exposure in households with smokers was also associated with family structure, with single mothers being more likely to expose their

Table 4 Child exposure to ETS at home, in the car, or in other indoor situations

| Place of exposure                 | Every day (%) |    | Several times a week (%) |    | Once a week or less (%)* |    | Never (%) |    | n    |      |
|-----------------------------------|---------------|----|--------------------------|----|--------------------------|----|-----------|----|------|------|
|                                   | AH            | SH | AH                       | SH | AH                       | SH | AH        | SH | AH   | SH   |
| Car                               | 0             | 1  | 3                        | 9  | 7                        | 14 | 90        | 76 | 3443 | 1070 |
| Room where the children sleep     | 0             | 0  | 0                        | 0  | 1                        | 2  | 99        | 98 | 3450 | 1070 |
| Room where television located     | 7             | 22 | 5                        | 11 | 14                       | 8  | 74        | 59 | 3450 | 1072 |
| Room where most meals are eaten   | 6             | 21 | 6                        | 15 | 13                       | 10 | 75        | 55 | 3449 | 1072 |
| Other indoor places at home       | 2             | 7  | 4                        | 11 | 11                       | 10 | 83        | 72 | 3414 | 1043 |
| Indoors areas other than the home | 1             | 2  | 13                       | 24 | 54                       | 51 | 32        | 23 | 3441 | 1050 |

\* Combining two answer categories: "Approximately once a week" and "Less than once a week".

AH = all households; SH = households where at least one parent is a daily smoker.

children to ETS (table 3). Single mothers tended to have less education than cohabitant mothers did. The weighted mean number of years after compulsory school was 4.1 and 3.5, respectively (not shown in the table). However, a logistic regression analysis showed that the “single mother effect” persisted after adjusting for education.

The most frequent situations when children were exposed to ETS at home were while the family watched television and in combination with meals (table 4). Only a small minority of households reported that smoking occurred in the presence of children in the car or in the child’s bedroom.

### Discussion

Of children living in households containing at least one daily smoker, more than half were reported to be exposed to environmental tobacco smoke in their own home. However, most parents reported having made efforts to change their smoking behaviour for the sake of their children.

Approximately eight out of 10 parents living in households where at least one of them smoked claimed to have introduced some rules in their home to limit smoking indoors (table 2), and four out of 10 households containing at least one daily smoker reported having eliminated indoor smoking in the home in the vicinity of their children (table 3). For children living in households where both parents smoked, or living with a single smoking parent, the situation was much worse. Even so, 30% of these parents stated that they did not expose their children to ETS indoors at home.

The data show that single parents and parents with lower socioeconomic status expose their children more to ETS (table 3) but are just as likely to report having “tried” to change their smoking behaviour because of their children (table 2). Thus, rules about smoking in the home appear to be less likely to succeed in these homes. The relatively high prevalence of daily smoking in households whose residents had a lower level of education and in single-head households indicates a socioeconomic pattern of smoking that is typical of many developed countries with a long history of tobacco use.<sup>17</sup>

The main areas for children’s exposure to ETS at home were the room where most meals are eaten and the room where the television is located (table 4). More than 35% of the households in which at least one of the parents smoked exposed their children to cigarette smoke every day or several times a week in these two indoor areas. Hence, children’s exposure to ETS would be drastically reduced if smoking parents changed their smoking behaviour while watching television, or went outside or into an other room to smoke after their meal.

It is difficult to quantify the “dose” of ETS that passive smokers inhale. A standard environmental inventory questionnaire for estimation of indoor concentrations has been suggested<sup>18</sup> but the methodology for quantifying ETS exposure alone is still in its infancy.

Three approaches to data collection are generally applied when measuring exposure to environmental tobacco smoke: using self-reported data in questionnaires, relying on information about the smoking behaviour of household members,<sup>8–12</sup> and, in some studies, basing the calculation on the number of cigarettes consumed by household members each day.<sup>19–21</sup> A more direct measurement involves chemical investigation of indoor air particle samples in the home.<sup>22–23</sup> The most frequently used objective method, however, is to test for levels of biochemical markers for the uptake of ETS in non-smokers,<sup>13–23</sup> often in combination with a questionnaire supplying self-reported data from the parents.<sup>10–13–22–24–26</sup>

In our study, the method of data collection was to use an anonymous mailed questionnaire to be filled in by the parents. This was a feasible way of obtaining information on ETS exposure in a study population of this size. However, depending on information from parents to assess child exposure to ETS may be susceptible to several problems of validity, the most important being under-reporting of ETS exposure. A recent study comparing reported ETS exposure at home and in the work place to cotinine levels showed that the prevalence of detectable cotinine was higher than the reported exposure to ETS.<sup>7</sup> One explanation was under-reporting of ETS; however, an alternative explanation was ETS exposure outside the home and the workplace.<sup>7</sup> Our study did not assess cotinine levels to validate reported ETS exposure. This is a weakness in the study design. However, using cotinine levels as a “gold standard” to validate ETS exposure in specific places (in this case at home) is problematic, because the children may be exposed in other places as well.

In Norway, the Data Inspectorate gave permission to send only one reminder. In Denmark the regulations from the Data Inspection Authority did not permit any reminders. In the other countries, two reminders were sent. This may explain the difference in response rate in Norway and Denmark on the one hand, and in the other countries on the other. One consequence of a low response rate is the potential for selection bias owing to a lower response rate among smokers than among non-smokers. This has been reported in many health surveys.<sup>27–28</sup> For both genders, the prevalence of daily smoking was below the figures for daily smoking in comparable age groups reported in the national smoking statistics. However, this discrepancy could also be due to real differences in smoking prevalence between parents of young children and childless adults.<sup>29</sup>

Despite using the birthday criteria to select which of the parents was to answer the questions, women were over-represented in all countries. One reason is that children lived with their mother in 97% of cases where the parents were divorced or separated. Female over-representation was lowest in Norway, which was the only country where the male parent appeared as the reference person for the

household, and was thus the addressee. In the other countries, the addressees for the letter were the children themselves.

### Conclusion

Although 25% of the investigated cohort of children were still exposed to ETS in their own home, our data indicate that there may be a widespread willingness among Nordic parents of 2–3-year-old children to reduce or eliminate indoor smoking in the vicinity of children. A clear majority of smoking parents in this study reported having made an effort to change their smoking behaviour for the sake of their children, and many claimed to have succeeded in eliminating ETS in the home when the children were present. There is no reason to believe that similar results could not be achieved in other countries.

In the Nordic countries the phenomenon of the “balcony smoker” is widely known. Who are these smokers who cannot or will not give up smoking, but have the “courtesy” not to expose their fellow human beings to ETS? What are the motivating factors? These are interesting questions for future investigation.

Although actual exposure to ETS may be higher due to possible under-reporting of ETS, our results indicate a general awareness in the Nordic countries of the potential negative effects of ETS exposure on children.

This study was initiated and financed by the Nordic Cancer Union.

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