

# Best friend's and family members' smoking habits and parental divorce during childhood are associated with smoking in adulthood

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## ABSTRACT

**AIMS** – Smoking initiation during childhood or adolescence is strongly associated with friends' smoking. Likewise, adverse living conditions increase the likelihood of future deviant behaviour. We examine whether smoking by a best friend and family members during school years as well as adverse childhood experiences are associated with smoking in adulthood. **DATA AND DESIGN** – We have analysed the responses of Finnish working-aged respondents in 1998 (N=25901) and 2003 (N=20773) to questions on the smoking status of friends and family members during school years as well as their answers on a six-item scale of childhood adversities. A case-control study design was used to compare current cigarette smokers (1998 and 2003) to non-smokers (1998 and 2003). **RESULTS** – If a best friend during school years was a smoker, the subject's odds ratio (OR) of being a smoker in adulthood was 4.43 among females and 3.91 among males compared to those with a non-smoking best friend in multivariate models adjusted for smoking by family members during school years and by six childhood adversities. These associations did not differ by age. Smoking in adulthood was associated with childhood adversities, most strongly with parental divorce or separation during the subjects' school years. **CONCLUSION** – Smoking by a best friend and parental divorce or separation during school years appears to be a strong factor of smoking in later life.

**KEY WORDS** – smoking, best friend, divorce, childhood adversities, school year, population-based.

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## Introduction

Cigarette smoking is one of the most damaging and costly health behaviours and a leading cause of preventable disease and premature death (Doll et al. 2005). Smoking contributes to multiple well-documented adverse health effects, including heart disease, pulmonary disease and lung and other cancers (Doll et al. 2005; Risch et al. 1993), and it is clear that the prevention of smoking is one of the most important issues in public health.

Smoking initiation occurs mostly (80%) before the age of 18 (Raisamo et al. 2011; Lynch & Bonnie 1994). Those under 18 should not be able to purchase cigarettes in Finland, because selling to underage individuals is prohibited. The prevalence of daily cigarette use among adolescents (14–18 years) has decreased or been quite stable in the last ten years, at close to 20% (Rainio et al. 2009). Among 18-year-olds, the prevalence of smokers is higher (30%

among men and 25 % among women) than among the adult population (22 % among men and 15 % among women) (Helakorpi et al. 2012).

Smoking initiation during childhood or adolescence is strongly associated with friends' smoking and with the socialisation process towards adulthood (CDC, MMWR 2005; Kemppainen et al. 2006; Paavola et al. 1996). Smoking by a best friend seems to be an important predictor of adolescents' smoking for both boys and girls (Avenevoli & Merikangas 2003; Conrad et al. 1992; Gritz et al. 1998; Harakeh et al. 2007; Kemppainen et al. 2006; Paavola et al. 1996; Petraitis et al. 1995; Wang et al. 1997; de Vries et al. 2006; Tjora et al. 2011; Simons-Morton et al. 2010; Vartiainen et al. 2007). Such peer group homogeneity is also seen in that non-smokers tend to have non-smoking friends (Simons-Morton et al. 2010).

Similarities in smoking behaviour among friends can be caused by two processes, influence and selection. It is suggested that friends have a considerable impact on smoking. There is also 'smoking-based selection': new friends are selected on the basis of their smoking behaviour (for example, Mercken et al. 2012.). The selection and influence processes are shown in a recent longitudinal social network study from the UK (Mercken et al. 2012). Social learning theory explains how friends influence adolescent smoking. The imitation of peer smoking is an important mechanism in explaining why adolescents and young adults continue to smoke (Harakeh et al. 2007).

In addition, parental and sibling smoking has been shown to impact on adolescent smoking (Avenevoli & Merikangas

2003; Boomsma et al. 2003). Parental smoking may also play an indirect role by affecting the adolescents' susceptibility to peer influence and by influencing friendship selection (Engels et al. 2004; Kempainen et al. 2006; Simons-Morton et al. 2010). Parental monitoring similarly has a bearing on adolescent smoking (Dick et al. 2007).

In a Dutch study, smoking behaviour was found to be significantly influenced by smoking by parents, siblings and friends, although all relative risks decreased with age. Most findings were sex-dependent in that same-sex smoking family members influenced smoking behaviour more than did the smoking of family members of the opposite sex (Vink et al. 2003). While some studies show the impact of older siblings (as opposed to the influence of younger siblings) (Harakeh et al. 2007), others have detected no link to the age of the smoking siblings (Vink et al. 2003). The influence of friends and siblings has also been confirmed in a longitudinal design (Harakeh et al. 2007; Tjora et al. 2011).

A Finnish nationwide cross-sectional study of 12–18-year-olds showed that if parents told teenagers not to smoke, the risk of their later becoming a smoker decreased. The risk was higher among those with two smoking parents as opposed to those with non-smoking parents (Rainio & Rimpelä 2008). This phenomenon is shown also in Finnish longitudinal studies (Pennanen et al. 2012; Vartiainen et al. 2007). These results indicate that parents are role models to their offspring. Also, a study on adolescents of 12 or 13 years of age in six European studies suggested strong parental influence (de Vries et al. 2006). A previous study of 14–15-year-

olds from the US (Hill et al. 2005) indicated that parental smoking contributes to later smoking in teenagers even if the parents practise good family management, are opposed to teen smoking, and do not involve their children in their own use of cigarettes. A recent review shows that parents have a major effect on adolescent smoking. The parents' smoking habits also contribute to adolescent smoking (Simons-Morton et al. 2010). Childhood adversities are indicators of poor mental and physical environment during childhood.

Recent studies have revealed that emotional and economic troubles in childhood are related to adult health and well-being (Harkonmäki et al. 2007; Kuh et al. 2003; Korkeila et al. 2005; Mäkinen et al. 2006). Adverse living conditions, especially child abuse, family disorganisation and stress increase the likelihood of future deviant behaviour. Earlier studies (Widom 1989) have found that individuals who had been abused or neglected as children were more likely to use drugs as adults. Further, childhood trauma contributes to both smoking (DeFronzo & Pawlak, 1993) and alcohol abuse (DeFronzo & Pawlak 1993; Strine et al. 2012).

Our population-based study focuses on examining whether smoking by family members or best friend during the subjects' school years lead to smoking in adulthood in the long term. We also aim to establish whether adverse childhood experiences are associated with adult smoking.

## Methodology

### *Data and study variables*

The data were derived from a Health and Social Support (HeSSup) follow-up study, which is a random sample of the Finnish

working-age population. A baseline survey was carried out by postal questionnaire in 1998 (N=25,901; age groups 20–24, 30–34, 40–44, 50–54; response rate 40.0%). The questionnaire had questions on the smoking status of the respondent. Those having smoked at least 5 packs of cigarettes over their lifetime and who were smoking daily or almost daily at the time of the study were classified as current smokers. The following question was asked: 'Have you ever smoked more than 5 packs of cigarettes in your lifetime?' If the respondent said yes, he/she was asked: 'Do you smoke or have you smoked cigarettes regularly, say daily, or almost daily during your lifetime?' Current smokers were distinguished from former smokers on the basis of whether they were smoking at the time of the survey: 'Do you still smoke regularly?' A follow-up questionnaire was sent in 2003 to all the respondents of the first questionnaire in 1998 (response rate 80.2%). The information on the smoking status in adulthood was gathered from both the baseline questionnaire and the follow-up questionnaire. When a participant was a current smoker in both 1998 and 2003, she/he was classified as a smoker. Only those who had reported being current smokers both in 1998 and 2003 were thus included in the analysis. Those who reported being smokers only in 1998 or 2003 were excluded. A reference group was formed of those who were non-smokers in 1998 and 2003. Non-smokers were classified in the same way. A case-control study design was used to compare current smokers to non-smokers.

The smoking status of family members and best friend was elicited by the question: 'When you were in school, which of the following close persons smoked:

mother, father, brother, sister, best friend, no one.' Childhood adversities (yes/no) included divorce or separation of parents; long-term financial difficulties in the family; serious conflicts in the family; frequent fear of a family member; severe illness of a family member; and alcohol problem of a family member (Korkeila et al. 2010; Korkeila et al. 2005; Sumanen et al. 2005). Recent studies have indicated that emotional and economic troubles in childhood are related to adult health and well-being (Koskenvuo et al. 2010; Harkonmäki et al. 2007; Kuh et al. 2003; Korkeila et al. 2005; Mäkinen et al. 2006). As regards the reported childhood adversities, the reliability of the answers five years from measurement has been tested: they indicate a good to very good level of agreement (kappa coefficients varied between 0.60 and 0.89) (Koskenvuo et al. 2010).

The ethical committee of the University of Turku, Finland, has approved the study.

#### *Statistical analysis*

The associations between smoking in adulthood and the smoking status of one's best friend and family members during school years as well as childhood adversities were analysed through binary response logistic regression models. The adjusted models were constructed separately for women and men and by age groups. Age-adjusted associations were analysed first. The final models included all study variables: age, smoking of mother, smoking of father, smoking of brother, smoking of sister, smoking of best friend, parental divorce or separation, long-term financial difficulties, serious conflicts in the family, frequent fear of a family member, severe illness of a family member and alcohol

problem of a family member. We also tested accumulated circumstances through a logistic regression analysis and multinomial regression. Smoking was an outcome variable, while the number of childhood adversities acted as a nominal variable being an independent variable, which helped us to appreciate the accumulation of adverse circumstances in childhood on adult smoking. We then formed a new variable as reference, with scores ranging from zero to six, using no adverse circumstances (score zero).

The results are presented as odds ratios (ORs) with 95 % confidence intervals. The statistical analysis was carried out through SPSS Statistics 19 (SPSS Inc., Illinois, USA).

## **Results**

The results differed for men and women. The prevalence of smokers in 1998 was 32 % among men and 24 % among women. In 2003, the respective percentages were 26 % and 20 %. Tables 1 and 2 present the prevalence of smokers of family members and childhood adversities by sex. Current smoking (in 1998 and 2003) in adulthood compared to non-smoking was associated with smoking by one's best friend during

**Table 1.** Reported prevalence of smoking of male and female family members and best friend during respondents' school years

	Men	Women
Mother	16.0	18.5
Father	50.2	48.3
Brother	15.1	11.6
Sister	5.5	5.8
Best friend	18.9	10.0

**Table 2.** Prevalence of smokers' childhood adversities by sex

Childhood adversities	All % (n)	Men % (n)	Women % (n)
Parental divorce or separation	17.0 (4241)	17.7 (1621)	15.9 (2620)
Long-term financial difficulties	27.5 (6250)	28.9 (2416)	25.8 (3834)
Serious conflicts in the family	27.4 (6297)	29.9 (2230)	23.8 (4067)
Frequent fear of a family member	13.4 (3267)	15.7 (995)	10.0 (2272)
Severe illness of a family member	25.8 (6454)	26.6 (2505)	24.5 (3949)
Alcohol problem of a family member	24.6 (6085)	26.6 (2195)	21.7 (3890)

**Table 3.** Adjusted ORs (95% CI) for current smoking versus non-smoking in adulthood by smoking status of best friends and family members and adversities during childhood.

	Model 1: age-adjusted	Model 2: Like Model 1+all covariates
<b>Women</b>		
<b>Smoking relative/friend during school years</b> (ref.: non-smoking relative/friend)		
Mother	3.21 (2.83–3.64)	2.08 (1.80–2.40)
Father	2.23 (2.00–2.49)	1.85 (1.63–2.08)
Brother	1.96 (1.71–2.25)	1.39 (1.19–1.62)
Sister	2.68 (2.26–3.18)	1.54 (1.27–1.87)
Best friend	5.13 (4.47–5.88)	4.43 (3.82–5.13)
<b>Childhood adversities</b> (ref.: no adversity)		
Parental divorce or separation	2.39 (2.09–2.74)	1.77 (1.51–2.07)
Long-term financial difficulties	1.39 (1.23–1.57)	0.90 (0.78–1.04)
Serious conflicts in the family	1.67 (1.49–1.88)	0.98 (0.84–1.15)
Frequent fear of a family member	1.83 (1.59–2.11)	1.33 (1.11–1.59)
Severe illness of a family member	1.19 (1.05–1.34)	1.09 (0.96–1.25)
Alcohol problem of a family member	1.91 (1.70–2.15)	1.12 (0.97–1.30)
<b>Men</b>		
<b>Smoking relative/friend during school years</b> (ref.: non-smoking relative/friend)		
Mother	2.25 (1.90–2.67)	1.61 (1.33–1.95)
Father	2.02 (1.76–2.30)	1.85 (1.59–2.16)
Brother	2.43 (2.04–2.89)	1.89 (1.56–2.28)
Sister	2.36 (1.85–3.01)	1.40 (1.07–1.84)
Best friend	4.12 (3.50–4.86)	3.91 (3.29–4.64)
<b>Childhood adversities</b> (ref.: no adversity)		
Parental divorce or separation	2.26 (1.87–2.72)	1.73 (1.40–2.13)
Long-term financial difficulties	1.54 (1.32–1.79)	1.13 (0.95–1.35)
Serious conflicts in the family	1.56 (1.32–1.83)	1.00 (0.81–1.23)
Frequent fear of a family member	1.65 (1.31–2.07)	1.14 (0.87–1.49)
Severe illness of a family member	1.04 (0.89–1.21)	0.90 (0.76–1.06)
Alcohol problem of a family member	1.73 (1.47–2.03)	1.07 (0.87–1.30)

**Table 4a.** Adjusted women's ORs (95% CI) for current smoking versus non-smoking in adulthood by smoking status of best friends and family members in four age groups in adulthood.

	Model 1	Model 2: Like Model 1 + all covariates
<b>20-24</b>		
Mother	3.82 (3.08-4.74)	2.27 (1.75-2.95)
Father	2.71 (2.21-3.32)	1.77 (1.39-2.26)
Brother	2.90 (2.17-3.86)	2.28 (1.64-3.16)
Sister	4.63 (3.29-6.51)	3.01 (2.05-4.41)
Best friend	5.47 (4.33-6.91)	4.32 (3.34-5.57)
<b>30-34</b>		
Mother	2.98 (2.35-3.79)	1.93 (1.47-2.55)
Father	2.49 (2.00-3.11)	2.02 (1.57-2.61)
Brother	1.86 (1.39-2.49)	1.35 (0.97-1.88)
Sister	2.04 (1.48-2.82)	1.12 (0.77-1.64)
Best friend	5.25 (4.01-6.88)	4.95 (3.68-6.66)
<b>40-44</b>		
Mother	3.42 (1.98-3.08)	2.35 (1.75-3.16)
Father	2.21 (1.79-2.73)	2.14 (1.69-2.71)
Brother	1.88 (1.47-2.40)	1.40 (1.06-1.84)
Sister	2.70 (1.98-3.67)	1.58 (1.11-2.24)
Best friend	4.56 (3.46-5.99)	4.08 (3.03-5.49)
<b>50-54</b>		
Mother	2.29 (1.65-3.16)	1.68 (1.18-2.38)
Father	1.53 (1.22-1.93)	1.47 (1.15-1.89)
Brother	1.48 (1.10-1.99)	1.03 (0.74-1.43)
Sister	1.71 (1.06-2.74)	0.89 (0.52-1.53)
Best friend	5.14 (3.59-7.35)	4.97 (3.38-7.31)

school years. The reference group in these analyses was non-smokers in 1998 and 2003. Age-adjusted OR was 5.1 and 4.1 for females and males, respectively. Multiple adjustments had little effect on the results (Table 3).

In the fully adjusted model, the OR of having a smoking mother was 2.1 (95 % CI: 1.8-2.4) among female adult smokers compared to non-smokers, while the OR of having a smoking father was 1.9 (95 % CI: 1.6-2.1). Corresponding values among male adult smokers were 1.6 (95 % CI: 1.3-2.0) and 1.9 (95 % CI: 1.6-2.2), respec-

tively. The ORs of having smoking siblings were also raised for men and women (Table 3).

The OR of current smoking later among those having a smoking best friend during school years did not change in the long term. The OR among females in the full model was between 4.1 and 5.0 in all age groups, and the highest in the oldest age group (Table 4a). Among males, the OR also remained high in the full model, at between 3.7 and 4.6 (Table 4b).

The influence of sisters' and mothers' smoking on female smokers (Table

**Table 4b.** Adjusted men's ORs (95% CI) for current smoking versus non-smoking in adulthood by smoking status of best friends and family members in four age groups in adulthood.

	<b>Model 1</b>	<b>Model 2: Like Model 1 + all covariates</b>
<b>20-34</b>		
Mother	2.35 (1.73-3.19)	1.55 (1.07-2.25)
Father	2.03 (1.52-2.69)	1.67 (1.18-2.37)
Brother	2.29 (1.52-3.44)	1.88 (1.20-2.95)
Sister	2.57 (1.55-4.25)	1.67 (0.95-2.93)
Best friend	4.17 (3.05-5.69)	3.85 (2.76-5.37)
<b>30-34</b>		
Mother	2.35 (1.74-3.19)	1.84 (1.29-2.61)
Father	2.08 (1.60-2.71)	1.77 (1.30-2.43)
Brother	2.62 (1.78-3.86)	2.14 (1.40-3.28)
Sister	1.95 (1.27-3.00)	1.24 (0.76-2.02)
Best friend	4.49 (3.25-6.18)	4.57 (3.25-6.42)
<b>40-44</b>		
Mother	1.76 (1.23-2.53)	1.27 (0.85-1.90)
Father	2.07 (1.59-2.71)	1.91 (1.42-2.58)
Brother	2.91 (2.14-3.96)	2.28 (1.61-3.24)
Sister	2.63 (1.67-4.14)	1.28 (0.76-2.17)
Best friend	4.02 (2.89-5.59)	3.72 (2.62-5.30)
<b>50-54</b>		
Mother	2.71 (1.75-4.19)	2.02 (1.25-3.27)
Father	1.90 (1.46-2.45)	2.10 (1.58-2.79)
Brother	1.95 (1.42-2.68)	1.52 (1.07-2.17)
Sister	2.49 (1.36-4.56)	1.49 (0.76-2.93)
Best friend	3.80 (2.70-5.36)	3.67 (2.54-5.30)

4a) compared to non-smokers was highest among the 20-24-year-olds. In all age groups, the influence of mothers' smoking among females was high. The influence of sisters and brothers smoking among females was important in the youngest age group, but less so in the older age groups. With males (Table 4b), the influence of mothers, fathers and brothers was elevated in all age groups, with the exception of a non-significant result for mother's influence in age group 40-44.

The OR of current smoking in adulthood was associated with parental divorce

or separation during the subjects' school years. The ORs were 2.4 among females (95 % CI: 2.1-2.7) and 1.8 (95 % CI: 1.5-2.1) in the full model. Among males, the corresponding full-model ratios were 2.3 (95 % CI: 1.9-2.7) and 1.7 (95 % CI: 1.4-2.1) (Table 3). Frequent fear of a family member during school years among females carried a 1.8 risk of being a smoker in adulthood (95 % CI: 1.6-2.1) and remained significant also in the full model, at 1.3 (95 % CI: 1.1-1.6). Among males, the respective risk was 1.7 (95 % CI: 1.3-2.1), and non-significant in the full model. Other listed childhood

**Table 5.** Odds ratios among men and women by multinomial regression for current smoking versus non-smoking by accumulated childhood adverse circumstances

Number of childhood adversities in 1998*	Men	Women
0*		
1	1.36 (1.19–1.55)	1.40 (1.25–1.56)
2	1.66 (1.42–2.00)	1.99 (1.75–2.26)
3	2.45 (1.97–3.03)	2.33 (2.01–2.71)
4	2.49 (1.89–3.29)	2.83 (2.36–3.40)
5	2.56 (1.70–3.85)	3.19 (2.52–4.04)
6	2.69 (1.04–6.95)	2.89 (1.69–4.94)

\*Reference group: No adverse circumstances

adversities such as financial difficulties, serious conflicts, severe illness and alcohol problems also had elevated risks among both sexes with ORs ranging between 1.9–1.2 among females and 1.7–1.5 among males (among men severe illness was non-significant). However, most adversities had non-significant results in the full model.

The multinomial regression analysis showed a linear increase between the number of childhood adversities and smoking in adulthood. As an independent nominal variable, the number of adversities increased with increasing smoking prevalence in adulthood. The OR ranges from 1.4 up to 3.2 (Table 5).

## Discussion

Smoking in adulthood was strongly associated with smoking by a best friend and family members during the subjects' school years. It was also associated with parental divorce or separation during these years.

The results on the significance of best friends' smoking are in line with earlier studies. The influence of friends and siblings has already been confirmed (Harakeh et al. 2007; Simons-Morton et al. 2010).

Moreover, ninth-grade adolescents in Russian Karelia and eastern Finland indicated that a best friend's smoking was the most important predictor of their own smoking (Kemppainen et al. 2006). The three studies also confirm earlier findings (Gritz et al. 1998; Paavola et al. 1996; Wang et al. 1997). In addition, the importance of family members' smoking as a predictor of adolescents' smoking has been shown in earlier research (Kemppainen et al. 2006; Rainio & Rimpelä 2008). The possible cultural differences between these studies have been taken into account.

The prevalence of smokers in our study seems to equal the level of Finnish population-based prevalence of the same time period (Helakorpi et al. 1999; Helakorpi et al. 2003). In our study, smoking among females appears to correlate more strongly with mothers' smoking, while with males it is the fathers' and brothers' smoking that appears stronger. In a Dutch study, the participants' smoking behaviour was found to be significantly influenced by the smoking behaviour of parents, siblings and friends, but all relative risks decreased with age, and most findings were sex-dependent in that same-sex smoking family members



influenced smoking behaviour more than did opposite-sex family members (Vink et al. 2003).

As the associations in our study are of the same magnitude in different age groups, it is safe to assume that the associations do not weaken with age.

Kandel (Kandel 1980) and White (White 1996) have indicated that the influence of friends compared to parents has been underestimated. Our results show that the influence of a best friend is very strong. Stanton et al. (1996) have suggested that once children have tried smoking, their choice of friends is a function of their smoking status. Meanwhile, Engels et al. (1997) concluded that the process of selection underlying the homogeneity of one's behaviour may be more important than direct relationships.

In our study, childhood adversities – such as parental divorce or separation during the subjects' school years – were associated cumulatively with smoking in adulthood among both sexes. It has already been shown that those living in an incomplete family have a greater tendency to smoke (DeFronzo & Pawlak 1993). A longitudinal Finnish study of 16–32-year-olds indicated that parental divorce is a sign of stress in childhood and has long-term effects in adulthood (Huurre et al. 2006). The study found a greater effect for women than for men, but did not consider smoking as an outcome. In our study, the OR was practically the same among men and women. In addition, our study lists other childhood adversities such as financial difficulties, serious conflicts, severe illness and alcohol problems as also leading to elevated risks among both sexes. However, most of these had non-significant results in the full

model. This is partly explained by the correlation between these study variables. In our data, childhood adversities were correlated with each other (the range of Pearson correlation among men was from -0.06 to 0.47 and among women from -0.03 to 0.54). The highest correlations were seen between 'frequent fear of a family member' and 'serious conflicts in the family' (men  $r=0.47$ , women  $r=0.54$ , all  $r=0.52$ ) and 'serious conflicts in the family' and 'alcohol problem of a family member' (men  $r=0.47$ , women  $r=0.51$ , all  $r=0.50$ ).

The main strength of our study is that it combined the smoking status in adulthood in 1998 and 2003. Childhood adversities showed a high correlation in 1998 and 2003. The kappa coefficient varied between 0.60 and 0.89 (Koskenvuo et al. 2010), indicating that the retrospective data on childhood adversities are likely to be reliable (Koskenvuo et al. 2010; Sumanen et al. 2005).

A weakness of the study is the relatively low response rate at baseline in 1998. A careful non-response analysis was done of the baseline data, which suggests that the key demographic differences and the physical health-related differences were small between respondents and non-respondents (Korkeila et al. 2001).

## Conclusion

Smoking by a best friend during one's school years seems to be a very strong factor in smoking later in life. The ORs remained high in later life, which has not been seen in earlier research. Our study also shows that smoking in adulthood is associated with childhood adversities among both sexes, especially with parental divorce or separation during school years.

**Declaration of Interest** None.

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