

The role of socioeconomic status, peer and school context for adolescent smoking

by

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Abstract

Objective: To examine socioeconomic differences in regular tobacco smoking among German adolescents and to analyse the importance of peer and school factors for tobacco use in relation to socioeconomic status.

Methods: Data were obtained from the German part of the cross-sectional 'Health Behaviour in School-aged Children' survey in 2001/02 with a total of 5,650 respondents aged 11 to 15. Socioeconomic status was assessed using the family affluence scale. Bi- and multivariate logistic regression models adjusted for age were used to determine the independent effect of SES, and several peer and school factors, such as number of close friends, contacts of friends, classmate support, and satisfaction with school, on adolescent smoking, separately for girls and boys.

Results: Adolescent tobacco use was found to be largely unrelated to family affluence. No socioeconomic differences in regular smoking were found in boys and only minor differences in girls. Bivariate analyses showed that several social and psychosocial peer and school factors were significantly associated with smoking among both girls and boys. Peer variables were generally more important for the prediction of adolescent smoking. In multivariate analyses, peer and school factors had a much larger effect on regular smoking than family affluence suggesting that the peer and school context is more important for adolescent smoking than socioeconomic background.

Discussion: The findings support the idea of an equalising impact of peer and school variables on health inequalities in early adolescence. Health promoting actions focussing on smoking in early adolescence need to be targeted at schools and peers.

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Introduction

While health inequalities in adulthood have been a key interest of public health research for almost 30 years now, less is known about socioeconomic differences in health and health behaviour in adolescence (1-3). Adolescence did not seem to provide anything of particular interest for the genesis of socioeconomic inequalities in health (3-5). This prevailing assumption has been increasingly questioned during the past years and several studies analysed the relationship between socioeconomic status (SES) and various measures of health and health behaviour (6-12). Even though the findings vary across health outcomes and SES indicators, the evidence to date suggests that socioeconomic differences in health in adolescence are generally less consistent and less pronounced than in any other part of the life-cycle (3;4).

According to West, the attenuation of health inequalities in adolescence can be explained by a 'process of equalisation', whereby the defining features of adolescence (such as school, peers, youth culture and the media) which – alongside the family – represent basic socialising agents, cut across traditional class boundaries (such as family, neighbourhood) resulting in a homogenising effect (3;13;14). Especially in adolescence, social influences outside the family become increasingly important. Potential developmental stressors, which can affect health and health behaviour, are mainly located in these ranges of action (15). Thus, it is reasonable that socioeconomic status might lose its relevance for adolescent health and health behaviour, while factors and mechanisms associated with the peer group and school setting are getting more important and compose a moderating buffer against the health-compromising effect of socioeconomic status (2;16).

However, it is unlikely that, for example, limiting long-standing illness in childhood, or other severe diseases, is attenuated by these levelling processes. Such processes rather refer to health outcomes which are newly occurring in adolescence, such as psychosomatic complaints or injuries. Another aspect that is likely to be exposed to homogenising effects of peer and school factors is adolescent risk behaviour such as tobacco or alcohol use, which have become the most preventable causes of mortality and morbidity in most developed countries. Several studies showed that the psychosocial school environment (e.g. school climate, participation at school and performance requirements at school) is associated with smoking as well as other adolescent risk behaviours (17-19). For example, Hu et al. showed that after adjustment of several socioeconomic confounders, pupils with low school performance have a higher risk of daily smoking (20). Similar results are reported by McLellan et al. who showed that adolescents who have a negative perception of their school environment and who feel that their teachers are not supportive, exhibit higher rates of health compromising behaviours (21). On the other hand, King et al. found that students who are satisfied with their school have a lower risk of regular smoking (22). In

addition, Battistich & Hom point out that the school environment can also have a moderating effect on the relationship between social disadvantage, such as low SES, and protective factors as well as health behaviour (23).

The peer group constitutes another social context which is highly relevant for adolescent smoking (24;25). The relationship with peers, in general, changes in adolescence to a flexible and versatile room of experience, so that the influence of the family of origin in childhood is partially substituted. If close friends smoke, it is likely that adolescents also start smoking (26). Furthermore, smoking peers facilitate the access to cigarettes and influence perceptions towards the diffusion of tobacco use and tobacco related norms and values (27). But the opposite perspective is also discussed, namely that smoking adolescents are specifically searching for corresponding environments. Even though the school represents the primary environment, comprising the peer group, peers can also encompass neighbourhood contacts and could in this way be class-constructed. However, an equalising effect is not necessarily dependent on the social structure of the peer group, as it can have an effect of its own (3;14;28). For example, missing peer-acceptance, not finding a corresponding position in the group, or the hierarchical structure of the group itself might result in psychosocial distress that, again, could increase the risk for health-compromising behaviours or negative mental health.

The understanding of how socioeconomic status, school and peers are related to tobacco use is important for preventive and health promoting efforts because it might give valuable indications in what setting programmes are necessary and effective. So far, studies on the interplay of socioeconomic status and various psychosocial peer and school determinants of health and health behaviour were not conducted. The present study tries to disentangle some of the complex relationships of the different determinants. The following research questions are asked:

1. Do socioeconomic differences in tobacco use among German adolescents exist?
2. What peer and school factors are associated with tobacco use in adolescence?
3. Do peer and school factors have a larger impact on tobacco use than socioeconomic status?

Material and Methods

Sample

Data were obtained from the German part of the Health Behaviour in School-aged Children (HBSC) study, a multinational study that was conducted in collaboration with the World Health Organization. Cross-sectional surveys of 11-, 13- and 15-year-old adolescents are carried out every four years in a growing number of countries based on an internationally agreed protocol (29;30). The last survey (2001/02) included a

total of 35 countries from Europe and North America. The German HBSC study is based on a regional sample of four federal states of Germany: Northrhine-Westphalia, Hesse, Berlin and Saxony. Students were selected using a clustered sampling design. Schools were sampled randomly from a list of public schools in the four federal states, stratified by type of school and administrative district. Overall, 1,063 schools were contacted by letters to the school principal and the school board asking to participate in the survey. 332 schools agreed to participate. Pupils from grades 5, 7, and 9 were included in the study, representing the age groups 11, 13, and 15 years. Further details of the German HBSC study can be found elsewhere (31). The total sample included 5,650 students (49.3% boys, 50.7% girls).

Instrument and variables

Data were collected by means of a standardised questionnaire. Teachers administered the questionnaires in the classroom and were instructed to answer questions about the procedure only. Those students were included in the study who had volunteered to participate and whose parents had also signed an informed consent. The study was approved by the federal data protection commissioner of each state.

Tobacco use

The adolescents' smoking status was defined on the basis of the question: "How often do you smoke tobacco at present?" Possible responses were: 'every day', 'at least once a week, but not every day', 'less than once a week' or 'never'. Adolescents who smoke at least once a week were considered regular smokers while others were considered non-smokers.

Socioeconomic status

Data on socioeconomic status can be difficult to collect from young people because often they do not know or are not willing to reveal such information. The HBSC study has addressed this issue and has developed a measure of adolescent socioeconomic circumstances that is easily completed in a self-report situation and enables researchers to address the issue of material affluence in children's surveys (12;32-34). The "family affluence scale (FAS)" consists of four different items which reflect family expenditure and consumption. Possessing these items is considered to reflect affluence and lacking them, on the other hand, is considered as material deprivation: "Does your family own a car?" (0, 1, 2 or more), "Do you have your own bedroom for yourself?" (no=0, yes=1), "How many times did you travel away on holiday with your family during the past 12 months?" (0, 1, 2, 3 or more), "How many computers does your family own?" (0, 1, 2, 3 or more). In contrast to parental occupation, proportions of missing data on FAS items are low in all countries (less than 3%). Following previous HBSC studies, the two highest response categories ('2' and '3 or more') of the latter two items were combined (32;33). A composite FAS score was calculated by

summing the responses to these four items ranging from 0 to 7. The FAS scores were subsequently recoded into tertiles (high, medium, and low family affluence).

School factors

The HBSC study assesses various elements of the psychosocial school environment and of school adjustment. Previous studies have shown that these variables are associated with various measures of health and health behaviour (17-19;35).

The perceived quality of teaching was measured with a 5-item scale: (1) Most of the teachers don't use demonstrations in their lessons which makes it difficult to keep the perspective, (2) The pace taken by the teachers is too high, (3) Most of our teachers can explain well, (4) In most of the class hours students get bored, (5) Most of the teachers built in lots of variety into their lessons. Response categories were: 'strongly agree', 'agree', 'neither agree nor disagree', 'disagree', 'strongly disagree'. The items were aggregated to a sum score ($\alpha=0.69$) and recoded into tertiles of 'good', 'medium' and 'low' teaching quality.

Student autonomy was assessed with a 5-item scale, which is asking for student's participation possibilities at school and class level: (1) Students are allowed to work at their own pace. (2) Students choose their partners for group work. (3) Students have a say in how class time is used. (4) Students have a say in deciding what activities they do. (5) The teacher decides which students should work together. Students were also asked to indicate on a 5-point scale whether they 'strongly agree' or 'strongly disagree'. The items were aggregated to a sum score ($\alpha=0.57$) and subsequently recoded into tertiles (high, medium, low student autonomy).

Demands at school were measured with the following three items: (1) I have too much school work, (2) I find school work difficult, (3) I find school work tiring (five response options from 'strongly agree' to 'strongly disagree'). The responses to the three items were aggregated to a sum score ($\alpha=0.72$) and subsequently recoded into tertiles of 'high', 'medium' and 'low' demands.

Classmate support was assessed using a 4-item scale: (1) The students in my class(es) enjoy being together, (2) Most of the students in my class(es) are kind and helpful, (3) Other students accept me as I am, (4) When a student in my class(es) is feeling down, someone else in class tries to help (36). Responses consist of 'strongly disagree' to 'strongly agree', on a 5-point scale. Again the items were aggregated to a sum score ($\alpha=0.78$) and recoded into tertiles with 'high', 'medium' and 'low' classmate support.

Satisfaction with school was measured with a single item. "How do you feel about school at present?" (responses: like it a lot, like it a bit, don't like it very much, don't like it at all). The item was dichotomised in 'like it a lot/like it a bit' versus 'don't like it very much/don't like it at all'. Regarding academic achievement pupils were asked:

“What does your class teacher(s) think about your school performance compared to your classmates?” (responses dichotomised as ‘very good/good’ vs. ‘average/below average’). In addition, a 5-item scale on scholastic competence was included to improve the measurement of students’ perceived academic competence: (1) I feel that I am just as smart as others my age, (2) I am pretty slow in finishing my schoolwork, (3) I do very well at my class work, (4) I have trouble figuring out the answers in school, and (5) I feel that I am pretty intelligent. Response categories were ‘describes me very poorly’, ‘describes me quite poorly’, ‘describes me quite well’, ‘describes me very well’. Responses to the five items were added up to a sum score ($\alpha=0.61$) and recoded into tertiles. Regarding school-related stress, the students were asked how pressured they feel by the schoolwork they have to do (responses dichotomised as ‘not at all/a little’ versus ‘some/a lot’).

Peer factors

Peer influence was assessed by three main indicators: size of the friendship group, frequency of contacts with friends and contact through electronic media. In addition, the quality of relations with the best friend was included in the study as a measure of qualitative social support.

In order to assess the size of the friendship group, students were asked how many close friends they have at present? The question was asked separately for male and female friends. Response options were ‘none’, ‘one’, ‘two’, or ‘three or more’. The cut-off for a dichotomous variable was set at “two or more friends”, because it can be assumed that this group is large enough to exert influence on the adolescents.

The frequency of contacts with friends was used as an additional measure of peer relations outside school. These variables focus on the structure of informal relations within the social network. Pupils were asked how many days a week they usually spend time with friends right after school (0 to 6 days) and how many evenings per week they usually spend out with friends? (0 to 7 evenings). Two categories were generated to differentiate between frequent contacts (5 days or more) and seldom contacts (less than 5 days). Additionally, students were asked how often they talk to their friend(s) on the phone or send them text or e-mail messages? The response options were ‘rarely or never’, ‘1 or 2 days a week’, ‘3 or 4 days a week’, ‘5 or 6 days a week’, ‘every day’. The answers were dichotomised in ‘3 or more days’ and ‘less than 3 days’.

Regarding the quality of relations with best friend, students were asked how easy it is for them to talk to their best friend about things that really bother them (response categories: ‘very easy’, ‘easy’, ‘difficult’, ‘very difficult’, ‘don’t have or see this person’)? Response options were dichotomised in ‘very easy/easy’ versus ‘difficult/very difficult’. Adolescents who indicated that they ‘don’t have or see this person’ (1.5%), were collapsed in the ‘difficult’ category.

Statistical Analysis

Logistic regression analyses were used to investigate the effect of SES (i.e. family affluence) on tobacco use. Results are presented as odds ratios with 95% confidence intervals. The highest group of family affluence served as the reference category with odds ratios being computed for the other two groups in the comparison. These analyses, as well as all the following ones, were done separately for both genders. Effects of age (dummy coded with three age groups: 11, 13 and 15) were controlled for in each analysis. Prior to multivariate analyses, cases with missing values for the key variables (smoking, family affluence, and the peer and school factors) were excluded; 3946 pupils remained in the analyses. Analyses of missing values did not show significant differences according to gender or SES indicators (family affluence/parental occupation). It needs to be acknowledged, though, that disproportionately many 11-year-olds were excluded because of missing values. In order to assess the association of socioeconomic status on tobacco use in relation with peer and school factors a series of models were calculated. First, separate bivariate logistic regression models adjusted for age were used to assess the association between the different peer and school variables. All peer and school factors were coded as dummy variables. Each variable that was significant in the bivariate analyses ($p < 0.05$) was included in one of two blocks (block 1: school and block 2: peer group) on which separate multiple logistic regression models were applied. Variables that were significant in the blocked analyses were included in the final multiple model which also contained family affluence and age using forward selection. The reduction of deviance after inclusion of a variable was used as the overall test for significance. This method has the advantage that the potential reduction of the odds ratios for SES, after adjustment for each block of peer and school variables, can be used to estimate the mediating effect of the independent variables. If these factors are unequally distributed across family affluence, the odds ratios for family affluence should be lower after adjustment of the variables. Additionally, it is possible to assess the independent effect of peer and school variables after adjustment for family affluence. All analyses were done using SPSS 14.0.

Results

Prevalence of smoking

Table 1 shows the age- and gender-specific prevalences of smoking in the sample of German adolescents. 79% of the 11- to 15-year-old boys and girls did not smoke at the time of questioning. 6% smoked occasionally and about 15% smoked regularly (at least once a week) showing very similar prevalences for girls and boys. The rate of regular smokers among 11 year-old students was still very low. Data for 13-year-olds showed that smoking was becoming an increasingly common practise. In this age group, 14-15% were regular smokers. Among 15-year-olds, about one third of

the students were regular smokers while occasional smoking was very uncommon. Also, the largest part of 15-year-old (regular) smokers smoked daily.

TABLE 1. Tobacco use among 11- to 15-year-old German adolescents by age and gender (percentages)

	Total		11-year-olds		13-year-olds		15-year-olds	
	boys	girls	boys	girls	boys	girls	boys	girls
	(n=2774)	(n=2846)	(n=1060)	(n=1034)	(n=876)	(n=912)	(n=838)	(n=900)
Non-smokers	79.2	78.0	93.1	96.6	78.1	76.5	62.8	58.2
Occasional smokers	5.5	6.3	3.6	2.3	8.3	8.9	5.0	8.1
Regular smokers	15.3	15.7	3.3	1.1	13.6	14.6	32.2	33.7
of which daily smokers	11.7	12.4	1.5	0.3	10.2	10.1	26.3	28.7

Socioeconomic differences in smoking

Significant socioeconomic differences in smoking were found only in girls: girls with low family affluence are more often regular smokers in comparison to those who are better off (Table 2). The odds ratios for girls in the medium FAS group are not significant. This is also true for the overall effect of the variable in the model. Even though the overall effect of family affluence was not significant in boys, the effect went in the same direction as for girls, i.e. higher odds ratios for regular smoking among medium and low affluent students.

TABLE 2. Socioeconomic differences in regular smoking among German adolescents by gender, unadjusted prevalences (%) and odds ratios with 95% CI¹

	boys			girls		
	%	OR	(95% CI)	%	OR	(95% CI)
Family affluence	(n=1966)			(n=1980)		
high	14.9	1.00 ^a		15.4	1.00	
medium	15.1	1.10	(0.83-1.46)	17.7	1.22	(0.92-1.62)
low	17.2	1.36	(0.92-2.03)	20.3	1.44	(1.02-2.04)
p value ^b	ns			ns		

¹ logistic regression models, adjusted for age

^a reference group

^b overall effect of the variable in the model (likelihood ratio test)

in **bold** = categories which show significant higher/lower odds ratios compared to the reference group

ns = not significant.

Bivariate associations between smoking and school and peer variables

The results of the bivariate analyses of school and peer variables with regular smoking are shown in table 3 and table 4. Overall, the effects were very similar for girls and boys. Among the numerous school factors significantly associated with smoking, self-reported academic achievement and teaching quality showed the strongest ef-

fects. Boys and girls reporting low academic achievement and low levels of teaching quality were over two times more likely to smoke regularly than pupils with high academic achievement and reporting high teaching quality. Adolescents were also more likely to smoke regularly if they reported high demands at school and low scholastic competence. Boys and girls were also more likely to smoke at least once a week if they reported high levels of school-related stress and low satisfaction with school. Odds ratios were generally stronger for boys than for girls. No significant effects on smoking were found for student autonomy and classmate support.

Among peer variables, the number of close friends of the same sex was the only variable that was not significantly associated with smoking. Having a high number of friends from the opposite sex, and having a high number of peer contacts after school and in the evening, were strongly associated with regular smoking. Students were almost more than four times more likely to smoke regularly if they met their friends after school or at the evening on five or more days a week than boys and girls who met their friends on fewer days. Boys and girls were less likely to smoke regularly if it was difficult or very difficult for them to talk with their best friend about things that really bother them. A similar effect was found for frequency of peer contacts via phone, text messages or emails. Boys and girls talking with their friends on less than three days were less likely to smoke at least once a week.

Multivariate analyses

In a next step, all variables that were significant in the blocked analyses (results not shown) were included in the final multiple model which contained family affluence and age (Model 1) using forward selection. Table 5 shows the results of the multivariate analyses. Model 1 gives the odds ratios for the association between family affluence and smoking as shown in Table 2. Model 2 shows the same regression model but adjusted for all school and peer factors retained in the final multiple regression model. All variables retained in the final model were similar for boys and girls: quality of teaching, academic achievement, peer contacts after school, peer contacts in the evening and number of close friends of the opposite sex were positively associated with smoking. The number of peer contacts via phone, text messages and emails was included only in the model for boys. Adjusted for family affluence and all other peer and school variables, students who perceived the teaching quality as low were two times more likely to smoke regularly, independently of gender. Average or bad academic achievement increased the odds ratios for smoking in boys up to 1.96 and in girls up to 1.61. Compared to both school variables, peer factors showed much higher effects. Boys who met their friends often after school had an odds ratio for smoking of 3.00 (girls' OR: 2.55). Girls, who reported having two or more male friends, are almost three times more likely to smoke. The effect in boys is much lower. Overall, the peer and school variables have a much larger effect on regular smoking than family affluence. After inclusion of the school and

TABLE 3. Associations between school factors and smoking among 11- to 15-year-old German students, odds ratios (OR) and 95% CI

	boys		girls	
	OR	(95% CI)	OR	(95% CI)
Demands at school				
low	1.00 ^a		1.00	
medium	1.14	(0.78-1.66)	1.30	(0.92-1.85)
high	2.06	(1.48-2.87)	1.58	(1.14-2.17)
p value ^b	p<0.001		p<0.05	
Student autonomy				
high	1.00		1.00	
medium	0.90	(0.65-1.25)	0.86	(0.63-1.18)
low	0.98	(0.70-1.36)	1.19	(0.86-1.64)
p value	ns		ns	
Classmate support				
high	1.00		1.00	
medium	0.94	(0.67-1.32)	0.99	(0.73-1.34)
low	1.10	(0.78-1.56)	1.01	(0.73-1.40)
p value	ns		ns	
Teaching quality				
good	1.00		1.00	
medium	1.61	(1.07-2.44)	1.04	(0.70-1.56)
low	2.66	(1.81-3.89)	2.12	(1.47-3.06)
p value	p<0.001		p<0.001	
Academic achievement				
very good/good	1.00		1.00	
average/below average	2.22	(1.67-2.94)	1.98	(1.52-2.59)
p value	p<0.001		p<0.001	
Scholastic competence				
high	1.00		1.00	
medium	1.18	(0.85-1.62)	1.40	(0.99-1.97)
low	1.58	(1.15-2.15)	1.91	(1.39-2.64)
p value	p<0.05		p<0.001	
Satisfaction with school				
like it a lot/ a bit	1.00		1.00	
don't like it very much/at all	1.93	(1.46-2.55)	1.73	(1.31-2.27)
p value	p<0.001		p<0.001	
School-related stress				
not at all/ a little	1.00		1.00	
some/a lot	1.58	(1.19-2.08)	1.42	(1.09-1.86)
p value	p<0.001		p<0.05	

¹ separate logistic regression models, adjusted for age

^a reference group

^b overall effect of the variable in the model (likelihood ratio test)

bold = categories which show significant higher/lower odds ratios compared to the reference group

ns = not significant.

TABLE 4. Associations between peer factors and smoking among 11- to 15-year-old German students, odds ratios (OR) and 95% CI

	boys		girls	
	OR	(95% CI)	OR	(95% CI)
Number of close friends				
0-1 friends	1.00	1.00	1.00	
2 or more friends	1.43	(0.81-2.51)	1.02	(0.68-1.54)
p value	ns		ns	
Number of close friends				
0-1 friends	1.00		1.00	
2 or more friends	2.50	(1.92-3.27)	3.58	(2.63-4.89)
p value	p<0.001		p<0.001	
Peer contacts				
0-4 days per week	1.00		1.00	
5 or more days per week	4.44	(3.38-5.81)	3.79	(2.92-4.91)
p value	p<0.001		p<0.001	
Peer contacts				
0-4 days per week	1.00		1.00	
5 or more days per week	3.91	(2.86-5.34)	3.62	(2.66-4.93)
p value	p<0.001		p<0.001	
Talk to best friend				
very easy/easy	1.00		1.00	
difficult/very difficult	0.56	(0.37-0.85)	0.44	(0.22-0.87)
p value	p<0.01		p<0.05	
Electronic contact				
3 or more days per week	1.00		1.00	
rarely/never	0.45	(0.33-0.60)	0.54	(0.38-0.77)
p value	p<0.001		p<0.001	

¹ separate logistic regression models, adjusted for age

^a reference group

^b overall effect of the variable in the model (likelihood ratio test)

bold = categories which show significant higher/lower odds ratios compared to the reference group

ns = not significant.

peer variables, the odds ratios for medium and low family affluence are not reduced, suggesting that these variables have an independent effect and do not essentially mediate the relationship between family affluence and smoking.

TABLE 5. Final model on the association between smoking and family affluence, peer and school factors among 11- to 15-year-old German students, odds ratios (OR) and 95% CI

	boys (n=1966)		girls (n=1980)	
	Model 1 ¹		Model 2 ²	
	OR	95% CI	OR	95% CI
Family affluence				
high	1,00 ^a		1,00	
medium	1.10	(0.83-1.46)	1.16	(0.85-1.57)
low	1.36	(0.92-2.03)	1.25	(0.81-1.93)
School				
Teaching quality				
good			1.00	
medium			1.52	(0.97-2.38)
low			2.44	(1.62-3.69)
Academic achievement				
very good/good			1.00	
average/below average			1.96	(1.45-2.65)
Peers				
Peer contacts				
0-4 days per week			1.00	
5 or more days per week			3.00	(2.20-4.09)
Peer contacts				
0-4 days per week			1.00	
5 or more days per week			1.85	(1.29-2.66)
Number of close friends				
0-1 friends			1.00	
2 or more friends			1.81	(1.35-2.43)
Electronic contact				
3 or more days per week			1.00	
rarely/never			0.61	(0.43-0.85)
Nagelkerkes R ²	0.17		0.33	
			0.23	
				0.37

¹ logistic regression models, adjusted for age

² logistic regression models, adjusted for age and all other variables

^a reference group

bold = categories which show significant higher/lower odds ratios compared to the reference group.

Discussion

It is still unclear whether an equalisation of social inequalities in health occurs in adolescence, and if so, for which health outcomes. The underlying mechanisms of these potential processes are rarely studied. The present study intends to make a contribution by studying the relationship between socioeconomic status, peer and school related factors, and smoking among 11- to 15-year-old adolescents. The results revealed several interesting findings. First, we found no socioeconomic differences in regular smoking in boys and only small differences in girls. Second, we identified various social and psychosocial peer and school factors that are closely associated with adolescent smoking. Compared to school factors, peer variables had a stronger effect on smoking among both girls and boys. Especially peer contacts after school and a large number of friends from the opposite sex showed a strong impact on regular smoking. Third, peer and school factors were stronger associated with tobacco use in multivariate models than family affluence. Together, these findings imply the greater importance of influences arising from the peer and school context for adolescent smoking as compared to the wider social structure.

Comparison with previous research

The reported prevalence of regular smoking among 11- to 15-year-olds is in line with other research from Germany (37). Regarding the relatively small socioeconomic differences in smoking, our results support studies that found no or only slight socioeconomic differences for various smoking measures (38-40). However, some studies did show clear socioeconomic differences for tobacco use with comparable age groups and measures (41-44). The reported association between smoking and several psychosocial school (4;18;21;24;45) and peer variables (25;26;35;46;47) is consistent with previous studies. In our multivariate model the effects of the peer and school variables on smoking were very similar for both genders. Only a high number of friends from the opposite sex had a much larger effect on regular smoking in girls than in boys. Other studies have found that girls are more strongly influenced by friends' smoking behaviour than boys (48;49). Gender-specific effects in peer relations might explain this finding. At the age of 11 to 15 years girls are developmentally more advanced than boys, which increases the likelihood of male peer contacts who in turn have a generally higher smoking prevalence. The findings are also consistent with other research, suggesting that school and peer influence show a stronger association with adolescent smoking than parental SES (4;39;46). For example, Bergström et al. found that among 14- and 17-year-old Swedish adolescents smoking was most strongly associated to smoking in peers while in multivariate models parental SES was not significant (50).

The model used here assumes that developmental strain to which adolescents are exposed during the transition from childhood to adulthood weakens or overlaps the effect of parental socioeconomic status on adolescent risk behaviour. Two conditions

of these factors need to be fulfilled in order to contribute to an attenuation of socio-economic differences in health. First, these factors should have an effect on the outcome that is at least as large as the effect of SES, and second, they should not be unequally distributed across socioeconomic groups. Indeed, our results show that the analysed peer and school factors only have a minor contribution to socioeconomic differences in smoking, and also determine tobacco use largely independent of family affluence. In general, tobacco use is more strongly influenced by peer and school factors than by family affluence. These findings underline the idea that psychosocial influences from the peer and school context could result in a homogenising effect on health inequalities. Nevertheless, the findings should be interpreted cautiously because we decided to include all factors, independently of their unequal distribution across FAS groups, in order to adequately take into account the whole sphere of factors as well as reverse associations. However, the stepwise approach of the inclusion of the variables in the models allowed us to control for the effect of family affluence on tobacco use as well as the school and peer variables.

Among boys, the peer and school factors were the only variables that showed a significant association with adolescent smoking. The small effect of family affluence on smoking in girls was not reduced after the inclusion of the contextual factors. This suggests that the covariates do not mediate the relationship between FAS and tobacco use. Because the peer and school factors show a much stronger effect with smoking after adjusting for family affluence, it is likely that such mechanisms could contribute to an equalising effect on SES differences in smoking. Even though it can be expected that the school and peer variables start or continue to differentiate across socioeconomic groups with increasing age (e.g. through an increase in developmental demands or an excess of coping strategies), they are more important predictors of regular tobacco use in this age group than family affluence.

When reviewing the presented results, the further life course should be taken into account. Studies showed that the relationship between tobacco use and SES increases with age (39;51), indicating an “adolescent emergent pattern” of socio-economic differences (2). Data from Germany, for example, found that 18- to 29-year-old men and women with low socioeconomic status smoke about three times more often than their high SES peers (52). The increasing inequalities in smoking from adolescence to young adulthood could be due to several processes. First, smoking as a temporary, experimenting behaviour might be typical for low as well as high SES adolescents. We can assume that at the age of 11 to 15 years smoking - even if regular - still represents an experimental behaviour. This vaguely established behaviour could be primarily determined by school and peer influences, which are largely independent of socioeconomic status. Low SES students might maintain their smoking behaviour with increasing age because smoking is more frequent, more tolerated and more encouraged in their family environment (46).

Second, the widening inequalities in smoking could be interpreted in regard to specific demands and tasks arising in the life course (40). After completion of school education, young people face the need to make choices regarding their future careers, e.g. organise their further education, and to establish themselves on the job market, and must also develop their own life perspective (e.g. managing their own household and/or even establishing their own families). The means which these demands and burdens are dealt with depends on attitudes, cognitions, and judgements, which are often established at an early age and are likely to be influenced by the socioeconomic background. This might explain why persons who stop smoking in young adulthood largely belong to higher socioeconomic groups. These processes could contribute to an explanation of increasing inequalities in smoking with increasing age.

Limitations

The strengths of the study lie in the use of a large representative dataset and the availability of various widely used and internationally tested measures of peer and school variables. One limitation is the cross-sectional design of the study. Therefore, the findings cannot be assumed to be causal. Even though a direct analysis of possible homogenising effects of peer and school factors is only possible using longitudinal data, our findings underscore the powerful impact these socialising agents have on adolescent smoking behaviour.

Another limitation might be that we only included one SES indicator (family affluence) in the analyses. We decided to use family affluence, as the number of missing values is much smaller than for parental occupation. In addition, the family affluence scale is a validated instrument that has been proved to have a profound effect on various measures of health and health behaviours (11;12;53). Nonetheless, we reran the analyses using parental occupation (i.e. highest occupational status of either parent) as SES indicator (results not shown). The results on socioeconomic differences as well as on the contribution of peer and school factors, were very similar to the findings reported here. Therefore, it is unlikely that the results are biased by the use of family affluence as a parental SES indicator.

Unfortunately, it was not possible to use a multilevel model that takes into account the school and class level as the German HBSC survey in 2002 does not have full information on school and class identifiers due to data restrictions. However, we reran the analyses and calculated robust standard errors instead of crude ones. The crude and robust standard errors differed only slightly, suggesting that a strong bias due to non-independence of observations is rather unlikely.

Further, it should be mentioned that the HBSC survey is a rather broad study on health and health behaviour. Thus, only a limited number of self-report items could be included in the survey. In addition, some of the independent variables were based

on rather crude measures. Due to the inaccuracy of the measurement respectively the categorisation of the individual factors, it can be expected that the contribution of school and peer variables is underestimated, which in turn emphasises the importance of these factors for the prediction of tobacco use. This particular study also did not examine the role of parental factors and their relation to adolescent smoking. These factors could mediate or moderate the relationship between SES, peer and school factors and smoking and, therefore, should be explored in future studies.

Conclusion

Despite these methodological restrictions, this study provides important information about how various social contexts relate to regular smoking among adolescents. Our findings show that the influence of school and peer context needs to be considered when analysing health inequalities in adolescence. Further investigations need to assess to what extent these factors, which are distinctive for adolescents, influence or weaken the effect of family background. From a public health perspective, our results are important as they show that socioeconomic differences in smoking are not fully developed in adolescence and are exposed to change. With respect to preventive strategies, the results suggest that interventions need to be further implemented in the context of schools and need to take the relationship to peers into account. Furthermore, they should not only focus on passing on knowledge about the harmfulness of smoking, but instead should focus on the psychosocial school climate as well as strengthening personal and social resources of adolescents in order to handle peer pressure.

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