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Impact of school and vocational education on smoking behaviour: Results from a large-scale study on adolescents and young adults in Germany

Summary

While level of school education has been related to prevalence of cigarette smoking in a number of studies, less information is available on the role of vocational education and related occupational contexts. This study analyses the relative contribution of different types of educational experience to explaining prevalence and intensity of cigarette smoking in a large sample of female and male vocational trainees in Germany. A standardized questionnaire on smoking behaviour and educational performance was applied in 27 educational centers across the country, covering a total of 20527 respondents (77.3% of the original sample; women: 59.5%, men: 40.5%). Bivariate analysis revealed a high prevalence of current smokers among vocational trainees, both men (51.2%) and women (49.4%). Men were more likely to be heavy smokers, especially with increasing age. In both sexes, prevalence of smoking was particularly high in the following occupational groups: hairdressers, butchers, painters, service personnel (hotels, restaurants), shop assistants/sellers and cooks. Multivariate analysis taking educational level, type of vocational training (occupation), age, sex and urban-rural background into account revealed the highest prevalence odds ratios (POR) of smoking in subjects with the lowest educational level (POR = 5.19 for men and 4.56 for women). Even stronger effects were observed with smoking intensity (≥20 cigarettes/day): in men with the lowest educational level the risk of being a heavy smoker was 8.92, and in women 13.54 compared to subjects with a high-school leaving qualification. Poor school education must be considered the relatively strongest predictor of prevalence and intensity of cigarette smoking in a large sample of female and male vocational trainees. Preventive efforts should be directed at specific target groups such as those identified by this study.

Cigarette smoking is the most common cause of avoidable deaths through diseases such as carcinoma of the lung, coronary heart disease, stroke, and chronic obstructive airways disease. In a recent international comparison Peto et al. estimated that 36% of total mortality in men aged 35–69 is attributable to smoking, and that the percentage of smoking-attributable mortality in women of the same age has reached 31% [1]. It is well documented that smoking behaviour is part of a health-adverse lifestyle which is most often adopted during adolescence and becames habitual throughout adult life[2]. While the percentage of adult smokers has declined over the past ten years in a number of industrialized countries, more in men than in women, rates of smoking initiation in adolescence have often remained unchanged, or even increased slightly[3–5]. There is now clear evidence of a social gradient in smoking behaviour; the lower the socioeconomic status, as measured by income, educational level and/or occupational position, the higher the prevalence of smoking[5,6]. The social gradient of smoking in part explains socio-economically different morbidity and mortality rates in populations both within and between countries[7,8]. In view

of the relevance of smoking for public health it is critically important to advance our understanding of determinants of smoking behaviour, especially among socio-economically less privileged segments of populations.

Several investigations have demonstrated that educational level is the relatively best socio-economic predictor of health-related behaviours[5,9–11]. In adolescents, own educational performance is more strongly correlated with smoking than parent's occupational level[5,12]. This observation points to the importance of the school environment as the prevailing social context of interpersonal exchange processes during adolescence, i.e. during a vulnerable stage of self-regulation[2,13,14]. At present, we lack reliable information on the relative contribution of two different social contexts of education on smoking: the school environment (type and duration of school education), and the social context of vocational education which defines the next (and often final) step in the training career of a substantial proportion of adolescents and young adults.

This study was undertaken to explore the relative contribution of these two types of educational contexts on prevalence and intensity of cigarette smoking in a large cohort of adolescents and young adults in Germany. The case of Germany is particularly instructive as vocational education in this country has a long-standing tradition (the so called dual system of vocational training, combining the acquisition of practical skills and basic knowledge), and attracts a wide range of young people with different educational backgrounds. Therefore, it is possible to stratify the sample according to educational level and to estimate the prevalence odds ratios of smoking according to the two types of education. In a pilot

Variables	Total n	Prevalence of smoking			Intensity of smoking		
		% non-smoker	% ex-smoker	% smoker	n of smokers	%<20 cig./day	%≥20 cig./day
Age							
14–19 years	14657	37.8	11.1	51.1	7486	90.4	9.6
20–24 years	4898	41.6	10.6	47.8	2341	86.2	13.8
25–30 years	972	35.5	17.2	47.3	460	78.3	21.7
Education							
13 years	2395	49.6	10.8	39.7	950	89.2	10.8
10 years	11062	41.3	11.7	47.0	5195	91.1	8.9
9 years with certificate	6064	31.7	11.2	57.1	3461	88.1	11.9
9 years without certificate	689	25.7	7.5	66.8	460	81.7	18.3
Special school	252	18.7	7.9	73.4	185	60.5	39.5
Gender							
Male	8337	36.9	11.9	51.2	4264	83.9	16.1
Female	12190	39.8	10.8	49.4	6023	92.5	7.5
Living area							
Rural	10740	41.2	10.9	47.9	5143	87.8	12.2
Urban	9787	35.7	11.7	52.6	5144	90.1	9.9
Vocational training							
Butcher	169	17.2	11.2	71.6	121	88.4	11.6
Hairdresser	1546	24.0	9.2	66.8	1031	90.6	9.4
Painter	170	25.3	7.6	67.1	114	84.2	15.8
Cooks	223	26.0	9.4	64.6	144	84.0	16.0
Hotel and catering business	398	27.1	9.3	63.6	253	91.3	8.7
Shop assistants	164	28.7	11.0	60.4	99	92.9	7.1
Other training	17857	40.7	11.5	47.7	8525	88.8	11.2

Table 1. *Factors associated with cigarette smoking (frequencies).*

study, we found evidence of large differences in smoking rates according to type of vocational training[15]. Thus, for the reasons mentioned, it is important to know to what extent they can be attributed to different educational background[4,16].

Methods

A standardized questionnaire on smoking behaviour and educational performance was applied in 27 educational centres across Germany. Questionnaires were distributed and collected between May and July 1994. Originally, 15 urban and 15 rural areas were chosen from a national list of vocational school centres, but for three schools permission could not be obtained from the Governing Board. A total of 26570 vocational trainees from 13 urban and 14 rural schooling centres participated in the survey which was organized as an anonymous and confidential inquiry. Inclusion criteria were: 1) at least 70% of the students of a class participated in this survey, to guarantee a representative sample; 2) a minimum of 50 questionnaires were completed for each type of vocational education, to guarantee sufficient variation of the criterion under study, smoking behaviour; 3) the questionnaires (8 questions only) were completely filled in. On the basis of these criteria, 6043 questionnaires could not be included in the present analysis, leaving a total sample of 20527 (77.3%). The mean age of this group was 18.9 ± 2.5 years, 8337 participants were male (40.5%), 12190 female (59.5%). Most vocational trainees (53.9%) had 10 years of previous schooling.

Information was obtained on age, sex, educational level, and former and current smoking behaviour (duration, number of cigarettes smoked per day, ex-smoker, years of smoking/non smoking). A subject was defined as a "current smoker" if at least one cigarette per day had been consumed during the past six months. "Ex-smokers" status was given if a subject reported continuous previous smoking, but total smoking abstinence for at least the past six months. All data were entered in a personal computer file and were checked for errors (error rate 0.15%). The statistical package SPSS for Windows 6.0 was used. In addition to bivariate analyses, multivariate analysis using logistic regression analysis was performed.

Variable [a]	Men (n = 8162)		Women (n = 12031)	
	multivariate odds-ratio	95% CI	multivariate odds-ratio	95% CI
Age				
14–19 years	1.00		1.00	
20–24 years	1.13	1.01–1.27	1.08	0.98–1.19
25–30 years	0.96	0.81–1.13	1.25	0.99–1.59
Urban residence	1.00	0.90–1.09	1.21	1.12–1.31
Education				
13 years	1.00		1.00	
10 years	1.33	1.14–1.55	1.33	1.17–1.52
9 years with certificate	2.01	1.70–2.37	2.03	1.77–2.34
9 years without certificate	3.64	2.65–5.01	2.78	2.19–3.52
Special school	5.19	3.05–8.82	4.56	3.00–6.94
Vocational training				
Butcher	2.17	1.49–3.16	2.05	0.84–5.05
Hairdresser	2.17	1.33–3.53	2.14	1.90–2.41
Cooks	2.42	1.67–3.51	1.22	0.79–1.90
Hotel and catering business	1.49	0.95–2.35	2.17	1.72–2.75
All other training groups	1.00		1.00	

[a] All variables in model. Each variable adjusted for each other variable.

Table 2. *Logistic regression analysis: Factors associated with the prevalence of cigarette smoking.*

Information on the 94 different occupations was condensed in the following way: only those occupational groups with an elevated prevalence of smoking (≥60%) were analyzed separately (6 different occupational groups) whereas the majority of occupational groups, with lower prevalence of smoking, were defined as a reference group. Five categories of educational level were defined, with the highest level (13 years of school as prerequisite of academic training) as the reference group in multivariate analysis. The category "special school" defines educational centres for adolescents with limited mental handicaps. Separate logistic regression models were calculated for men and women and for smoking prevalence (Table 2) and smoking intensity (Table 3). In tables 2 and 3 the multivariate prevalence odds ratios and the 95% confidence intervals (CI) are given from logistic regression analysis. In addition, in figure 1 the expected probabilities of belonging to the group of current smokers are displayed as calculated from the unstandardized regression coefficients in the respective logistic models.

Results

In table 1, the prevalence of smokers, ex-smokers and non-smokers in given according to the variables age, educational level, gender, living area, and vocational training group. The same holds true for intensity of smoking.

As can be seen from table 1, the prevalence of smoking in this sample is rather high in all three age groups, in both men and women. A clear educational gradient of smoking prevalence is obvious with less than 40% of current smokers among those with the highest educational level, and more than 70% of current smokers in the group with the poorest education. Moreover, substantial differences in smoker prevalence are seen in specific occupational groups, such as butchers, hairdressers, painters, cooks, hotel and catering business, and shop assistants. Regional differences (rural versus urban) are not substantial in this sample. Heavy smoking (≥20 cigarettes per day) is more prevalent in older subjects, in men as compared to women, and in those with lower educational level. Occupational groups with the lowest prevalence (<33.3%) of smokers were pharmaceutical technicians (23.9%),

Variable[a]	Male smokers (n = 4133)		Female smokers (n = 5906)	
	multivariate odds-ratio	95% CI	multivariate odds-ratio	95% CI
Age				
14–19 years	1.00		1.00	
20–24 years	1,80	1.46–2.21	1.97	1.57–2.49
25–30 years	2.52	1.87–3.40	3.43	2.10–5.61
Urban residence	0.76	0.64–0.92	1.11	0.90–1.37
Education				
13 years	1.00		1.00	
10 years	0.89	0.66–1.21	1.63	1.08–2.46
9 years with certificate	1.37	0.99–1.88	2.43	1.58–3.73
9 years without certificate	1.94	1.21–3.13	5.98	3.56–10.06
Special school	8.92	5.04–15.75	13.54	7.36–24.58
Vocational training				
Butcher	0.60	0.31–1.13	1.18	0.25–5.55
Hairdresser	2.19	1.18–4.08	1.16	0.89–1.52
Cooks	1.83	1.10–3.07	0.99	0.30–3.25
Hotel and catering business	1.52	0.76–3.05	0.82	0.43–1.58
All other training groups	1.00		1.00	

[a] All variables in model. Each variable adjusted for each other variable.

Table 3. *Logistic regression analysis: Factors associated with the prevalence of heavy cigarette smoking (≥20 cig./day).*

juridicial officials (30.0%), chemical laboratory assistants (30.5%), technicians (32.7%), and bank clerks (33.2%).

Results derived from logistic regression analysis are shown in tables 2 and 3. Painters and shop assistants were removed from multivariate analysis to avoid zero cells due to small numbers (<20) of men (shop assistants) and women (painters) in these vocational training groups. A clearcut educational gradient of smoker prevalence and prevalence of heavy smoking is found, more strongly in men than in women. Smoking prevalence is especially increased in men and women with less than 10 years of schooling (see Table 2).

The prevalence odds-ratios range from 2.01 to 5.19 for men and from 2.03 to 4.56 for women. Heavy smoking is particularly prevalent among those who left school after nine years without any examination and those who attended special schools. Among these less privileged groups, prevalence odds-ratios range from 1.94 to 8.92 in men and from 5.98 to 13.54 in women (see Table 3). It is of interest to note that the odds-ratios related to specific occupations are much lower, with highest ratios of 2.42 in men and 2.17 in women. Moreover, the pattern of occupation-related smoking is less coherent than the pattern of education-related smoking. Only two occupational groups in men exhibit consistently high ratios with respect to smoker prevalence and prevalence of heavy smoking (hairdressers/cooks), and in women, prevalence of heavy smoking heavy smoking is no longer associated with occupational characteristics at all after controlling for educational level. Similarly, no consistent trend is found between urban and rural regions.

Figure 1 displays the expected probability of belonging to the group of current smokers for both sexes according to education. As

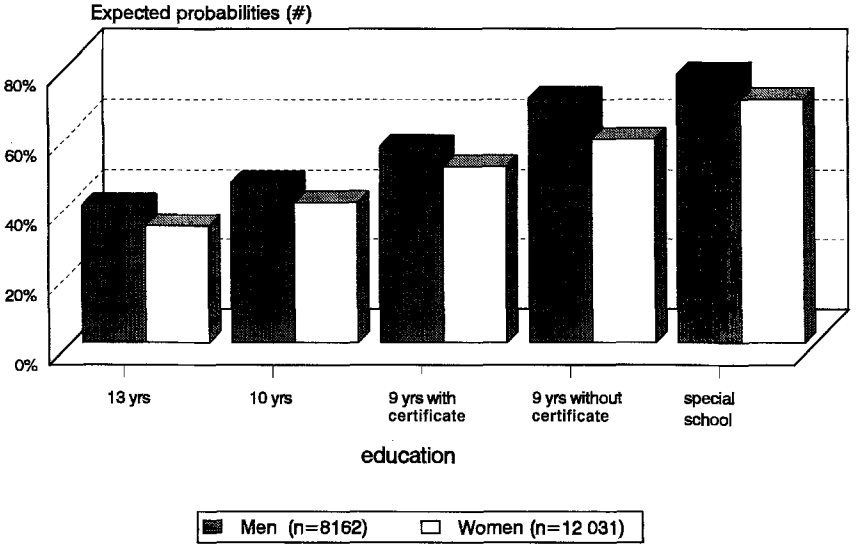

Figure 1. *Logistic regression analysis: expected probabilities of cigarette smoking according to education. # Adjusted for age, region (urban vs. rural area), occupations at risk.*

can be seen, there is an inverse relationship between smoking and education: expected probabilities of being a smoker increase with decreasing education even after adjustment for relevant confounders.

Discussion

This study documents clear evidence for a social gradient of smoking behaviour, as measured by educational attainment, in a large cohort of male and female vocational trainees aged 14 to 30. Although certain types of vocational training are associated with higher prevalence of smokers and heavy smoking (notably male hairdressers and cooks), the most powerful and most consistent effects are observed with regard to education. The high prevalence odds-ratios in men and women who left school after 9 years without a school-leaving certificate, or who attended special schools (about 5% of the total sample) are particularly striking. It should, however, be remembered that the present sample of vocational trainees is not representative of the total German population in this age group, since young adults with higher education with be under-represented.

Results cannot be attributed to the confounding effects of age, of urban-rural differences or other regional differences. The existence of an unknown selection bias is unlikely, as the age-stratified prevalence rates of smoking and of the intensity of smoking are comparable with results from other studies in Germany.[17] Moreover, we have no reason to question the reliability of the information obtained on smoking as data collection took place in an anonymous way under otherwise well controlled conditions. The fact that the proportion of heavy smokers increases with age, mirroring a well-documented association between duration of smoking and amount of nicotine-dependence[18], is further evidence for the reliability of the information. Consistency of reported smoker prevalence in specific occupations with previously reported findings also supports the reliability of current data[19,20]. Unfortun-

ately, no direct validation of smoking information by measuring cotinine levels was possible.

The findings reported from this study are consistent with previous reports as far as the influence of educational attainment on smoking prevalence and intensity is concerned[5,6,9–12]. Several explanations of this result have been suggested, pointing to less favourable psychosocial conditions in young people with lower educational levels, such as poor individual coping resources (e.g. resistance to peer pressure, self-efficacy and internal control of health related behaviours) lack of opportunities for active leisure pursuits (sports, music, other hobbies), or elevated levels of chronic socio-emotional distress (e.g. experience of relative social deprivation)[2,13,14,18,21]. In the context of the present study no information on possible psychosocial determinants of smoking was available. Yet the fact that a severely underprivileged minority of vocational trainees (9 years schooling without a school-leaving certificate or attendance at a special school) exhibited large excess risks, points to a possible synergism of these unfavourable psychosocial circumstances. More detailed studies on motivation to smoke in this particularly vulnerable group is needed.

Finally, in view of the public health impact of smoking, our findings underscore the need for intensified prevention during adolescence. The school environment provides a powerful setting for preventive programs, and remarkably successful behavioural intervention approaches were recently developed and tested in these target populations[22–25]. During vocational training, additional measures should be taken to reinforce preventive efforts, including relapse prevention, as specific occupational contexts further aggravate the risk of becoming a heavy smoker.

Zusammenfassung

Der Einfluss von Schul- und Berufsausbildung auf das Rauchverhalten: Ergebnisse einer Studie bei Jugendlichen und jungen Erwachsenen in Deutschland

Während Zigarettenkonsum in zahlreichen Studien zur Schulausbildung in Beziehung gesetzt wurde, gibt es weit weniger Information über den Zusammenhang der Ausbildung von Berufsfachschülern und Rauchen. Die vorliegende Studie untersucht den Einfluss von Schul- und Berufsschulausbildung auf die Rauchprävalenz und die Rauchintensität bei 20527 männlichen (40.5%) und weiblichen (59.5%) Berufsfachschülern (77.3% der Grundgesamtheit). Informationen zu Zigarettenkonsum, Schul- und Berufsausbildung sowie sozio-demographischen Merkmalen wurden mit Hilfe eines standardisierten Fragebogens erhoben. Ergebnisse bivariater Analysen zeigten einen hohen Anteil von Rauchern bei beiden Geschlechtern. Männer, insbesondere in den höheren Altersgruppen, gehörten häufiger zur Gruppe der starken Raucher. Die höchste Rauchprävalenz fand sich bei folgenden Ausbildungsberufen: Friseure, Metzger, Maler, Hotel- und Restaurantpersonal. Die Ergebnisse multivariater logistischer Regressionsanalysen zeigten nach Kontrolle des Ausbildungsberufes, der Region (Stadt/Land), von Alter und Geschlecht die höchsten Prävalenz-Odds Ratios (POR) bei Berufsfachschülern mit der niedrigsten Schulausbildung (POR bei Männern: 5,19, Frauen: POR = 4.56). Noch stärker war der Einfluss der Schulausbildung hinsichtlich der Rauchintensität (≥ 20 Zig./Tag): bei Männern mit der niedrigsten Schulausbildung betrug die POR 8,92, bei Frauen 13,54. Zusammenfassend kann festgehalten werden, dass Schulausbildung der stärkste Einflussfaktor auf das Rauchverhalten bei männlichen und weiblichen Berufsfachschülern ist. Zukünftige präventive Aktivitäten sollten sich daher auf spezifische Zielgruppen, wie den im Rahmen dieser Studie identifizierten, richten.

Résumé

Les effets du éducation scolaire et du formation professionelle au tabagisme: Résultats d'une étude avec des adolescents et des adultes jeunes en Allemagne

Diverses études ont trouvé une association entre le niveau scolaire et la fréquence du tabagisme. Moins d'information existe sur l'influence de ces deux données, du niveau scolaire et de l'environnement du travail, sur le tabagisme dans un groupe de 20527 scolaires (59.5% femmes; 40.5% hommes) recruté dans 27 centres de formation professionelle en Allemagne. Dans ce groupe (77.3% de réponses) un questionnaire standardisé sur l'usage du tabagisme a été appliqué. L'analyse démontre une prévalence élevée de fumeurs chez les hommes (51.2%) et les femmes (49.4%). Les fumeurs sont particulièrement nombreux parmi les personnes plus âgées et dans les professions suivantes: coiffure, boucher, peintre, personnel de service (hôtel, restaurant, personnel de magasin, cuisinier). La régression logistique révèle que la prévalence du tabagisme est la plus haute dans le groupe charactérisé par le niveau scolaire le plus bas (prévalence odds ratio: 5.19 chez les hommes et 4.56 chez les femmes, en ayant controlé les effets de la catégorie professionelle, de l'âge, du sexe et du milieu urbain ou rural). Cet effet est encore plus prononcé en cas de l'intensité du tabagisme: le risque de fumer plus de 20 cigarettes par jour est 9 fois plus élevé parmi les hommes characterisés par le niveau de formation scolaire le plus bas, et plus de 13 fois plus élevé parmi les femmes de cette catégorie d' éducation. En conclusion, un niveau bas de formation scolaire est considéré comme facteur de risque du tabagisme parmi les scolaires professionels. Des efforts de prévention devraient être dirigés vers ces groupes vulnérables.

References

1 *Peto R, Lopez AD, Borcham J, Thun Heath C.* Mortality from smoking in developed countries 1959–2000. Indirect estimates from national vital statistics. Oxford: Oxford University Press, 1994.

2 *Hurrelmann K, Lösel F,* eds. Health hazards in adolescence. Berlin: De Gruyter, 1990.

3 *Franceschi S, Naett C.* Trends in smoking in Europe. Eur J Cancer Prev 1995; *4*:271–284.

4 *Nelson DE, Egmont SL, Brackbill RM.* Cigarette smoking prevalence by occupation in the United States. A comparison between 1978 to 1980 and 1987 to 1990. J Occup Med 1994; *36*:516–525.

5 *Escobedo LG, Ando RF, Smith PF, Remington PL, Must EE.* Socio-demographic characteristics of cigarette smoking initiation in the United States. JAMA 1990; *264*: 1550–1555.

6 *Kaplan GA, Keil JE.* Socio-economic factors and cardiovascular disease: A review of the literature. Circulation 1993; *88*:1973–1997.

7 *Bobak M, Marmot M.* East-west mortality divide and its potential explanations: proposed research agenda. Br Med J 1996; *312*: 421–425.

8 *Lynch JW, Kaplan GA, Salonen R, Cohen RD, Tuomilehto J, Salonen JT.* Do cardiovascular risk factors explain the relation between socio-economic status, risk of all-cause mortality, cardiovascular mortality, and acute myocardial infarction? Am J Epidemiol 1996; *144*:934–942.

9 *Helmert U, Shea S, Herman G.* Relationship of social class characteristics and risk factors for coronary heart disease in West Germany. Public Health 1990; *104*:399–416.

10 *Jacobson BK, Thellep S.* Risk factors for coronary heart disease and level of education: The Tromso heart study. Am J Epidemiol 1988; *127*:923–932.

11 *Winkelby MA, Jatulis D, Frank E.* Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease. Am J Public Health 1992; *82*:816–820.

12 *Pierce JP, Fiore MC, Novotny TE, Hatzinadreu EJ, Davis RM.* Trends in cigarette smoking in the United States. Eductional differences are increasing. JAMA 1989; *261*: 56–60.

13 *Srole L, Fisher AK.* The social epidemiology of smoking behavior. Soc Sci Med 1977; *7*:341–349.

14 *Siegrist J.* Models of health behaviour. Eur Heart J 1988; *9*:709–714.

15 *Hort W, Setter C.* Zigarettenrauchen von Berufsschülerinnen und Berufsschülern in einigen deutschen Gross- und Kleinstädten. Med Welt 1996; *47*:342–345.

16 *Stellman ST, Bofetta P, Garfinkel L.* Smoking habits of 80,000 American men and women in relation to their occupation. Am J Ind Med 1988; *13*:43–58.

17 *Stumpfe KD.* Jugend und Rauchen – die Raucherkarriere. Öff Gesundheitswesen 1989; *51*:7–11.

18 *Wetter A, von Troschke J.* Smoker motivation. Berlin: Springer, 1986.

19 *Holme I, Helgeland A, Hjermann I.* Coronary risk factors in various occupational groups. The Oslo study. Br J Prev Soc Med 1977; *31*:96–100.

20 *Bräunlich A, Enderlein G, Heuchert G.* Fahndung nach betriebsärztlichen Möglichkeiten zur Prävention chronisch obstruktiver Lungenkrankheiten – Alters- und Geschlechtsspezifik bei Beschäftigten mit Atemtraktbelastungen. Zentralblatt f Arbeitsmedizin 1993; *43*:5–12.

21 *Fergusson DM, Lynskey MT, Horwood LJ.* The role of peer affiliations, social, and family and individual factors in continuities in cigarette smoking between childhood and adolescence. Addiction 1995; *90*:647–659.

22 *Hynes MM.* A school-based smoking prevention program for adolescent girls in New York City. Public Health Rep 1989; *104*:83–87.

23 *Gohlke H, Gohlke-Bärwolf C, Peters K,* et al. Prävention des Zigarettenrauchens in der Schule. Eine prospektive kontrollierte Studie. Dtsch Med Wochenschr 1989; *144*:1780–1783.

24 *Hort W, Hort H, Willers R.* Interventionsstudie gegen das Zigarettenrauchen von Düsseldorfer Hauptschülern 1992–1994. Z Kardiol 1995; *84*:700–711.

25 *Kok G, Hospers HJ, Den Boer D, De Vries H.* Health education at the individual level. In: Orth-Gomer K, Schneiderman N eds. Behavioral medicine approaches to cardiovascular disease prevention. Mawah, NJ: Lawrence Erlbaum Assoc Inc, 1996: 185–202.

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