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Sex and gender differences in tobacco smoking among adolescents in French secondary schools

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ABSTRACT: ***Sex and gender differences in tobacco smoking among adolescents in French secondary schools. S. Kalaboka, J.P. Piau, G. King, D. Moreau, M. Choquet, I. Annesi-Maesano.***

Aim. **We investigated the relationship between sex (genetic/biological) and gender (environmental/ cultural) factors in relation to adolescent tobacco smoking.**

Methods. **A representative sample of 11,582 students from French secondary public schools participated in the study by completing a self-administered, standardised questionnaire.**

Results. **Using the WHO classification for smoking in the youth, 15.6% of the adolescents were regular smokers, 7.7% occasional smokers, 17.9% experimental smokers and 4.8% ex-smokers, with no statistically significant gender difference. Taking non-smoking as a reference, puberty had a much greater effect on the likelihood of being a regular smoker [OR=18.0 (95% Confidence Interval: 9.6-32)] than of being an experimental/occasional smoker [OR=3.7 (2.9-4.6)] among girls. For boys, the effect of puberty was not as great [OR=4.7 (3.5-6.5)] for regular vs. [OR=2.1 (1.8-2.5)] for experimental/occasional smokers). Similarly, illicit drug use had a larger effect on the likelihood of being regular smoker vs. non-smoker [OR=15.0 (12.0-20.0) in boys and 12 (8.8-16.0) in girls] than of being experimental/occasional smoker vs. a non-smoker [OR=4.8 (3.7-6.1) and 2.9 (2.1-3.9) respectively]. Other factors related to regular smoking were exposure to passive smoking and regular alcohol consumption. Living with both parents was a protective factor for life and regular smoking in both genders.**

Conclusions. **Our results show that influential factors of sex-related (puberty), gender-specific (environmental tobacco smoking, alcohol consumption, drug abuse) or sex/gender (regular sexual intercourse) are related to the smoking behaviour in French adolescents.**
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Keywords: Adolescence, Gender, Puberty, Sex, Smoking, Smoking behaviour.

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Introduction

Studies have revealed that women who engage in certain risk behaviours at an early age may be more vulnerable to certain illnesses or health outcomes than men who partake in similar behaviours during early adolescence [1, 2]. With respect to tobacco consumption, it has been suggested that women may be at greater risk than men of developing respiratory health problems and susceptibility to lung cancer later in life, as a result of the fact that smoking affects airway development during childhood [3-6]. In addition, studies have found that sex-specific factors may be important etiologic factors in the development of asthma [7, 8], pulmonary diseases [9] and lung cancer [10].

In several European countries the prevalence of smoking among girls and young women is high [11, 12]. A recent publication by the WHO stressed that women smoking and its impact on health constitutes an important public health issue: "*…a rise in tobacco use by young school girls is a danger signal… If the current trend continues, within 15 to 30 years there will be a major explosion in the health cost of smoking among young women…*" [13].

Furthermore, in the aforementioned countries, the daily use of tobacco among adolescents augments also with the age [11]. In France, the proportion of regular smokers rises from 7 to 37 % in boys and from 6 to 34 % in girls between 14 and 18 years [14]; Choquet and colleagues have found that smoking among young girls (12-15 years old) has increased substantially during the last decade [15].

Sex or/and gender differences in relation to adolescent [16-20] and adults [21-23] tobacco smoking behaviour have been described mostly in industrialised countries. Recent statistics published in 2005 by the "Observatoire Français des drogues et des toxicomanies" (OFDT, the French governmental

agency dedicated to the fight against addictions), indicated that the proportion of daily tobacco smokers was decreasing with age for both sexes but was the highest in young adults (25-34 years 40% for men and 30% for women) [24]. Accordingly, in the same report, high dependency to tobacco smoking was shown to increase with age up to 44 years (from 11% for the 18-25 to 23% for the 36-44). These statistics, prompted us to analyse unpublished data collected in '93-'94 for sex and gender differences in relation to tobacco smoking in a representative sample of 14,278 students aged 8 to 25 attending French public secondary schools. To our knowledge, this is the first study to examine these differences in a representative sample of students in French public secondary schools. The need for gender differentiated strategies and campaigns to fight against the tobacco epidemic has been recognised [13, 19, 25, 26]. Our results may have practical implications for tobacco control with respect to the use of sex and gender based factors in intervention programs. This analysis can also be valuable to help in developing intervention strategies for the prevention and cessation of smoking among youth.

Although often employed interchangeably, in this study a distinction is made between the terms sex and gender. Sex refers to biological differences between men and women such as genetic, reproductive and hormonal factors that affect variations in development, health and illness in these two groups; whereas gender refers to the meaning that a particular culture attaches to being men or women, such as the socialisation of girls and boys, differential rewards and opportunities, habits concerning sexual activity and contraceptive use. The interaction between sex and gender differences may modulate smoking behaviour and habits among adolescents and these findings could contribute significantly to a broader understanding of adolescent health issues.

Methods

The National Adolescent Health Survey (NAHS) (Etude "Santé de l'Adolescent") is an ongoing survey in France that investigates somatic and psychological health and associated risk factors in adolescents. The present analysis focuses specifically on sex and gender related and influential factors and smoking habits. A three-stage selection procedure was used to obtain a representative sample of students in French public secondary schools from eight metropolitan districts. The obtained sample of 14,278 students was representative in terms of the type of school, age class and geographical zone. Further details about the sample design have been published previously [27].

Students completed a self-administered anonymous, standardised questionnaire during school hours with just a surveyor present. The questionnaire was composed of 11 parts: socio-demography, school attendance, weight and height, health, eating behaviours, consumptions (tobacco, alcohol, smoking,etc.), puberty, social life, family life, hobbies, and perception of risks for a total of 200 principal and chained questions. Each part was based on standardised questions derived by previously published questionnaires. The questionnaire has been tested for acceptability in a pilot study. Approval for the protocol and instrument was granted by the Comité Nationale Consultatif d'Ethique and the Commission Nationale d'Information et Libertés and the questionnaire was administered so as to protect student anonymity. Parents signed an informed consent.

Smoking variables

Smoking status was categorized as never, experimental, former, occasional and regular smoker, according to the WHO classification for youth. Students who had never tried smoking cigarettes were considered to be never smokers. Experimental smokers were defined as those who had tried smoking at least once in their life. Former smokers had stopped smoking for at least 1 year prior to the survey. Occasional smokers consumed cigarettes "every now and then", while regular smokers smoked at least one cigarette every day. For the statistical analyses, two smoking variables were defined as follows:

1) a 2-class variable in order to compare ever smoking (individuals who were former, experimental, occasional or regular smokers at the period of the survey were considered ever smokers) vs. never smoking;
2) a 3-class variable in order to compare regular smoking and experimental or occasional smoking respectively to never smoking.

Socio-demographic factors

The questionnaire included socio-demographic items, sex and gender variables and various adolescent risk behaviours. In this analysis, the demographic variables included age, school type, nationality, country of origin and paternal socio-economic status. Age was categorised into four different groups: ≤13 year-olds, 14-15 years, 16-17 years, and ≥18 year-olds. Educational districts represented regional differences and included Aix-Marseille, Amiens, Bordeaux, Clermont-Ferrand, Créteil, Nice, Rennes and Strasbourg. School type was divided into junior high school, high school, and vocational school. Nationality was French, foreign or dual nationality and country of origin referred to the place of birth and included France, French Overseas Departments and Territories, Southern and Eastern Europe, North Africa, Sub-Saharan Africa and other countries.

The following categories comprised the paternal occupational variable which served as a proxy of socioeconomic status (INSEE classification): 1) farmers/agricultural workers; 2) craft/trade workers; 3) professionals/managers; 4) technicians; 5) clerks; 6) manual workers; 7) retired individuals; and 8) unemployed individuals.

Sex specific factors

For girls, the presence of menarche was considered evidence of puberty, as generally consis-

tent with other criteria for assessing puberty [28, 29]. For boys, the presence of a beard or change in their voice pattern was employed as an indicator of puberty. The age of appearance of these indicators of puberty was used to determine puberty onset. Early puberty was considered to start before the age of 11 years in girls and 12 years in boys. Additional information regarding sex specific factors was obtained from girls and included 1) regular menstrual cycle (i.e., every month); 2) secondary amenorrhea (i.e., absence of menstruation for 6 months or more); and 3) pregnancy. In addition, factors which may modify menstruation were considered such as: 1) the use of birth control pills; and 2) prescribed hormone intake. Girls less than 13 years of age were not asked these questions.

Gender specific factors

Gender specific or socially influenced factors referred to those risk behaviours that are likely to occur more frequently among boys or girls respectively due to social patterns or cultural determinants, and included exposure to environmental tobacco smoking (ETS), alcohol consumption and drug abuse as risk behaviours that are gender influenced. ETS was defined as being exposed to environmental tobacco smoke of parents or peers. Alcohol consumption was based on yes or no responses to drinking wine, beer or liquor several times per week and drug abuse consisted of having used illegal drugs (i.e., marijuana, cocaine, heroin etc.) more than 10 times in their lifetime. Family structure which can also be modulated by gender was defined as living with both parents or other living situation.

Sex/gender influenced factors

In addition, we assessed sex and gender differences by examining sexual activity, contraceptive use (consistent or not) (i.e., condoms, diaphragm, etc.), body mass index and regular physical activity outside of school. Regular sexual activity was defined as having sexual intercourse on a regular basis and the number of sexual partners was also taken into account. Body Mass Index (BMI) was defined as body weight in kilograms divided by the square of height in meters, and overweight was defined as BMI above or below the 95th percentile, which is consistent with other studies. Physical activity was categorised as extracurricular physical activity less than 15 hours per week vs. 15 or more hours per week for boys, and less than 10 hours a week vs. 10 or more hours per week for girls. However, the type of the exercise was difficult to specify, because in France students at this age practice a variety of sports.

Statistical Analysis

Classical descriptive statistics were used to present variations in the exposure variables. *Chi*-square analysis was used to assess significant differences between qualitative variables. Multiple logistic regression (MLR) analysis was performed to identify factors associated with ever vs. never smoking. Ordinal polychotomous logistic regression (OLR) model was applied to identify factors associated with the 3-class variable, namely with regular smoking, experimental/occasional smoking compared to never smoking. Due to the elevated number of comparisons (often for variables coded in many categories) the Bonferroni correction (p=0.004) was taken into account in the identification of the significant relationships. The BMDP computer software package (MLR and PLR programs) was used to conduct the analysis.

Results

Descriptive Statistics

Out of 14,278 adolescents recruited for the survey, 12,466 completed and returned the questionnaires [27] (response rate 87.3%) and the 11,582 subjects for whom we had complete information were included in the analysis.

The overall prevalence of regular smoking was 15.6% and there was no statistically significant gender difference in smoking (table 1). Similarly, about the same proportion of girls and boys indicated that they were never (53.8 vs. 54.3%) or former smokers (4.8 vs. 4.9%). As expected, smoking status varied significantly ($p < .001$) by age, educational district, type of school, nationality, country of origin and parental socio-economic status (table 1). The lowest proportion of never smokers was found in vocational schools which also had the highest rate of occasional and regular smokers. Students whose parents migrated to France from Southern and Eastern European countries had the highest proportion of regular smokers compared to those whose parents were born in French overseas territories. The majority of students whose fathers were farmers or agricultural workers were never smokers compared to other responders.

Sex Specific Factors

Although the percentage of never smokers was the same among boys and girls who were in puberty (table 2), girls in early puberty had a much lower proportion (43.9%) of never smokers than boys who were similarly classified (67.2%). In addition, a higher proportion of girls compared to boys were regular (26.2 vs. 5.9%) or occasional smokers (10.3 vs. 4.6%) during early puberty. The results also revealed that among girls a high percentage of those who had been pregnant previously or were pregnant at the time of the survey and of those who were using birth control pills or other hormones as medications, were regular smokers (42.9%, 45.7% and 36. 8% respectively).

Gender Specific Factors

A higher percentage of regular smokers was found among girls exposed to environmental tobacco smoke than among boys. Gender influenced variables such as alcohol and drug consumption were significantly higher for girls who were regular smokers compared to boys. Girls exposed to gender

Table 1. - Percent prevalence of tobacco smoking in relation to individual socio-economic characteristics among 11,582 students in France

	Never	Experimental	Ex	Occasional	Regular	*P*[1]	*Total*
	(%)	(%)	(%)	(%)	(%)		
	54.0	17.9	4.8	7.7	15.6		N=11,582
Female	53.8	17.4	4.8	8.3	15.8		5,886
Male	54.3	18.4	4.9	7.1	15.4		5,696
Age (years)							
≤13	77.5	12.8	3.4	3.6	2.7		3,540
14-15	52.8	20.6	5.5	9.0	12.2		3,226
16-17	40.7	20.9	5.7	10.2	22.5		2,631
≥18	33.8	18.4	5.1	9.6	33.1	$<10^{-4}$	2,185
Educational District							
Aix-Marseille	56.0	16.9	4.1	8.6	14.4		1,532
Amiens	53.8	16.0	5.4	6.5	18.4		1,286
Bordeaux	53.0	17.9	4.5	7.3	17.4		1,694
Clermont	46.4	17.8	5.0	10.3	20.5		838
Créteil	54.7	20.8	5.5	6.3	12.8		2,695
Nice	55.2	18.4	4.0	6.8	15.6		1,120
Rennes	49.4	16.1	4.7	10.9	19.0		1,094
Strasbourg	59.7	15.8	4.7	8.1	11.8	$<10^{-4}$	1,324
Type of School							
Junior high school	64.8	16.8	4.6	6.0	7.9		6,924
High school	41.2	20.4	4.9	9.9	23.7		3,390
Vocational school	29.6	17.1	5.8	11.6	35.9	$<10^{-4}$	1,267
Nationality							
French	53.1	17.8	4.8	8.1	16.3		10,208
Foreign	63.1	18.0	5.2	5.9	7.9		796
Dual Nationality	58.9	19.3	4.7	3.9	13.2	$<10^{-4}$	508
Country of Origin							
France	53.4	17.5	4.8	8.1	16.2		8,807
French overseas areas[2]	53.3	24.7	6.6	7.0	8.5		259
South and East Europe	49.1	21.3	5.8	6.7	17.1		970
North Africa	63.4	16.6	4.2	5.7	10.1		855
Sub-Saharan Africa	60.8	17.8	2.8	6.5	12.2		107
Other	62.0	18.1	4.0	8.0	8.0	$<10^{-4}$	226
Paternal Socio-Economic Status							
Farmers, agricultural Workers	60.6	15.5	4.2	8.3	11.4		264
Craft and trade workers	51.1	17.5	5.3	8.1	18.0		1,129
Professionals and managers	52.8	19.1	4.0	8.6	15.5		1,552
Technicians	52.0	20.1	3.7	8.0	16.2		1,819
Clerks	55.8	17.4	5.1	8.1	13.6		1,580
Manual workers	55.5	17.4	5.5	6.7	15.0		3,175
Retired	55.6	19.4	3.9	7.8	13.3		180
Unemployed	53.4	19.1	5.3	6.0	16.3	$<10^{-4}$	283

[1] Global comparison among smoking behaviours.
[2] French overseas departments and territories.

influenced variables, such as alcohol and drug consumption, were significantly more likely to be current smokers than boys who used alcohol and drugs.

Sex/Gender Influenced Factors

Boys and girls differed considerably regarding smoking behaviour and factors that were socially influenced or mediated. A greater proportion of boys who smoked cigarettes regularly were more likely, compared to girls, to be virgins. Boys who smoked cigarettes regularly were also less likely to have "at least 1 sexual partner" or to engage in regular sexual activity. The pattern however was reversed among never smokers, as boys were less likely to be virgin, more likely to have sex regularly, more likely to use

Table 2. - Percent prevalence of smoking habits according to sex and gender influenced factors among adolescents in France

	Never	Experimental	Ex	Occasional	Regular	*P*[1]	Total
	(%)	(%)	(%)	(%)	(%)		
	54.0	17.9	4.8	7.7	15.6		N=11,582
Sex-Specific							
Puberty							
Boys	46.8	20.1	5.3	8.4	19.3		4,195
Girls	45.3	19.6	5.7	9.9	19.5	NS	4,692
Early Puberty							
Boys	67.2	19.3	3.1	4.6	5.9		591
Girls	43.9	15.0	4.7	10.3	26.2	$<10^{-3}$	214
Regular menstrual cycle (girls)	42.1	20.0	5.6	10.8	21.6		3,391
Pregnancy (girls)	19.1	17.5	12.7	7.9	42.9		63
Dysmenorrhea (girls)	60.0	14.3	8.6	5.7	11.4		35
Hormone intake (girls)	34.2	17.5	5.3	6.1	36.8		114
Birth control pill intake (girls)	22.2	13.4	8.4	10.3	45.7		775
Gender-Influenced							
Exposed to ETS							
Boys	17.7	14.2	6.0	14.0	48.1		401
Girls	14.0	9.7	8.7	12.7	55.0	<0.10	300
Alcohol consumption							
Boys	17.9	14.9	6.2	15.4	45.6		630
Girls	11.5	13.7	9.8	10.4	54.6	<0.05	183
Drug Abuse							
Boys	10.5	18.9	6.0	15.1	49.5		1,032
Girls	8.8	11.4	7.6	13.6	58.8	$<10^{-3}$	686
Lives with both parents							
Boys	56.4	18.2	4.8	6.7	13.9		1,126
Girls	56.9	17.4	4.3	7.9	13.5	NS	4,547
Other living situation							
Boys	45.6	19.3	5.1	8.9	21.2		4,560
Girls	42.9	17.6	6.2	9.6	23.7	<0.10	1,332
Sex/Gender-Influenced							
Sexual intercourse							
At least 1 partner							
Boys	31.2	20.4	7.0	10.5	30.9		2,162
Girls	20.4	14.9	7.9	12.2	44.5	$<10^{-3}$	1,356
Regular sexual activity							
Boys	27.1	16.1	6.1	9.8	40.9		726
Girls	20.0	11.9	7.7	11.5	48.9	$<10^{-3}$	689
Consistent contraceptive use							
Boys	27.4	20.2	5.1	11.5	35.8		1,227
Girls	19.2	14.2	8.0	12.1	46.5	$<10^{-3}$	974
Any contraceptive use							
Boys	27.2	19.3	5.9	11.1	36.5		1,548
Girls	18.6	14.5	7.9	12.3	46.7	$<10^{-3}$	1,137
Overweight							
Boys	51.8	19.9	5.0	6.4	17.0		282
Girls	56.4	15.9	6.6	7.6	13.5	NS	289
≥15 hours physical activity/week							
Boys	49.1	18.2	5.5	9.1	18.2		55
Girls	60.5	13.2	5.3	13.2	7.9	NS	38

NS: not statistically significant.
[1] Comparison between boys and girls.

contraceptives. Boys who were experimenters were also slightly more likely than girls to follow this pattern. Differences among former or occasional smokers were less pronounced with respect to sexual activity and contraceptive use.

Proportional differences regarding BMI were evident among boys and girls according to smoker status. Boys who were never smokers had a lower percentage than girls in the same category (51.8% vs. 56.4%) who were within the upper 95th per-

centile of BMI. However, among regular smokers the reverse pattern was found (17.0% in boys vs., 13.5% in girls). Physical activity was more intense among girls who never smoked but, among regular smokers, boys engaged more in extracurricular physical activity.

Multivariate Analysis

Among boys, MLR analysis adjusted for paternal SES, educational district and nationality, revealed that age, puberty, exposure to environmental tobacco smoke, alcohol, drug use and regular sexual activity, although in a lesser extent, were positively associated with an increased likelihood of being a life smoker (table 3). Overweight and physical exercise were not found to be significantly related to the increasing likelihood of being a life smoker. Individuals who lived with both parents as opposed to those who did not live with both parents were less likely to be life smokers. Similar results were found among girls (table 3). Once again, living with both parents decreased the likelihood of being a smoker compared to students who did not live with both parents. Father's employment status, overweight, and physical activity were not statistically significant predictors.

In the polychotomous logistic model, puberty had a much greater effect on the likelihood of being a regular smoker (OR=18.0, CI=9.6-32) than of being an experimental/occasional smoker (OR=3.7, CI=2.9-4.6) among girls. This was also the case for exposure to ETS, regular alcohol consumption, drug use and living with parents. For boys, however, the effect of puberty was not as large (OR= 2.1 for experimenters and OR=4.7 for regular smokers). Illicit drug use had a larger effect on the likelihood of boys being a regular smoker vs. a non-smoker (OR=15.0, CI=12.0-20.0) than an experimental/occasional smoker vs. a non-smoker (OR=4.8, CI=3.7-6.1), than in girls. Other significant co-variants included exposure to environmental tobacco smoking, regular alcohol consumption, and living with parents.

Discussion

The important strength of this work is the idea of studying the interactions of sex and gender differences as factors in relation to adolescent smoking behaviour. The study group consists of a large representative sample of the French adolescent general population. The questions were standardised and validated in a manner that leaves little ground for misclassification. The use of the polychotomous model and the adjustments made for possible confounders give consistent findings. Factors that play different roles in tobacco use according with sex and gender and window of exposure were identified. As with other studies, the same factors were found to be significantly related to being smokers in both boys and girls, but to a different extent [1, 2, 30]. For instance, the risk of being a regular smoker, with respect to puberty, was 4 times higher in girls than in boys, but conversely, it was more strongly linked with illicit drug use among boys than girls. The considered factors ranked differently between boys and girls. In girls, puberty ranked first followed by illicit drug use, ETS, regular alcohol consumption and regular sexual activity; whereas in boys, illicit drug use was followed by puberty, regular alcohol consumption, ETS and regular sexual activity. Pubertal stage has been shown to be associated with higher rates of substance use and abuse independently of age and school grade level [31]. To our knowledge, this is the first study which considers simultaneously various sex and gender factors and influences on smoking behaviour in adolescents from French secondary schools.

Our findings are consistent with previous research suggesting gender is relevant to the risk of becoming a smoker [32]. Boys and girls differed considerably regarding smoking behaviour and factors that were socially influenced or mediated. A greater proportion of boys regular smoker, compared to girls, were more likely to be virgin. They were also less likely to have "at least 1 sexual partner" or to engage in regular sexual activity. These patterns however were reversed among never smokers. Smoking is related to teenagers' work identity and gender identities and with their complex and conflicting ideas about the risk of tobacco use; rejection of conventional values and acceptance of deviance and non-traditional attitudes toward sex is related to attitudes about smoking [33].

A number of various risk factors have been studied recently and associated with risky behaviour of adolescents, including smoking [2, 22, 30, 34]. Parental marital status and family relationship, parental alcohol or drug addiction, socioeconomic status, school performance, early school leaving, peer group and being a member of a gang, were identified as significant sociological variables [34, 35]. In our population, living with both parents was protective for both gender groups. Previous studies have shown a reduced likelihood of smoking among adolescents who exercised [36]. However, no relationship was found between extracurricular sports and smoking in our study.

Some limitations of the study and in the interpretation of the data exist. 'Sex' characteristics were based on indirect (self-reported) information and therefore considered as a proxy of sex factors potentially influencing smoking behaviours. The reliability of gynaecological history has been proven at the population level. However, due to retrospective assessment, it was certainly difficult for both boys and girls to remember or to appreciate the time of the onset of their puberty. In our study, the proportions of early puberty were around 10.4% for boys and only 3.6% for girls; whereas proportions similar for both boys and girls were found by others [30, 37, 38]. Gender may act through social factors, as different patterns of tobacco consumption among adolescents and suggests the effect of varying social and cultural influences [20, 32, 33, 39]. Social anxiety has been found to be significantly associated with nicotine dependence and social fears could lead to smoking

Table 3. - Relationship between life smoking* and sex and gender influenced factors among adolescents in France

	N	Crude OR†	95% CI	Adjusted OR	95% CI
MALES					
Age					
≤13 yrs	1,697	1		1	
14-15 yrs	1,615	1.73	1.43-2.10	1.76	1.43-2.15
16-17 yrs	1,322	2.10	1.71-2.58	2.19	1.76-2.72
≥18 yrs	1,139	2.36	1.88-2.96	2.53	1.99-3.20
Puberty					
No	1,547	1		1	
Yes	4,246	1.69	1.41-2.03	1.65	1.36-2.01
Exposure to ETS					
No	5,203	1		1	
Yes	404	2.35	1.75-3.15	2.20	1.62-2.99
Alcohol consumption					
No	5,002	1		1	
Yes	634	2.29	1.82-2.88	2.12	1.67-2.70
Drug use					
No	4,605	1		1	
Yes	1,042	6.21	5.09-7.58	6.17	5.00-7.60
Living with parents					
No	1,142	1		1	
Yes	4,621	0.63	0.53-0.75	0.64	0.53-0.78
Overweight					
No	5,488	1		1	
Yes	285	1.06	0.78-1.43	1.01	0.73-1.39
Regular sexual activity					
No	2,957	1		1	
Yes	732	1.42	1.14-1.77	1.52	1.20-1.93
≥15 hrs of physical activity/wk					
No	5,483	1		1	
Yes	290	0.97	0.72-1.30	1.02	0.75-1.40
FEMALES					
Age					
≤13 yrs	1,892	1		1	
14-15 yrs	1,651	2.16	1.79-2.61	2.00	1.64-2.44
16-17 yrs	1,333	2.55	2.08-3.13	2.50	2.02-3.11
≥18 yrs	1,059	2.38	1.88-3.00	2.34	1.82-3.00
Puberty					
No	1,210	1		1	
Yes	4,725	2.98	2.36-3.77	3.19	2.48-4.10
Birth control pill use					
No	5,158	1		1	
Yes	777	1.41	1.10-1.80	1.30	1.00-1.68
Exposure to ETS					
No	5,542	1		1	
Yes	303	2.76	1.98-3.86	2.83	1.98-4.04
Alcohol consumption					
No	5,641	1		1	
Yes	183	2.71	1.78-4.12	2.84	1.80-4.47
Drug Use					
No	5,122	1		1	
Yes	688	4.97	3.92-6.30	5.38	4.17-6.95
Living with parents					
No	1,345	1		1	
Yes	4,583	0.70	0.59-0.82	0.68	0.57-0.81
Overweight					
No	5,643	1		1	
Yes	292	0.76	0.57-1.02	0.86	0.63-1.17
Regular sexual activity					
No	5,189	1		1	
Yes	691	1.45	1.12-1.89	1.39	1.06-1.83
≥10 hrs of physical activity/wk					
No	5,704	1		1	
Yes	231	0.95	0.68-1.31	1.02	0.72-1.46

* life smoking defined as former, experimental, occasional or regular smoking at the period of the survey.
† Odds-ratio of ever smoking vs. never smoking adjusted for age, paternal socioeconomic status (SES), educational district and nationality.

Table 4. - Relationship of different smoking habits* to sex and gender specific factors among adolescents in France

	OR† for experimental or occasional smokers vs never smokers	95% CI†	OR* for regular smokers vs. never smokers	95% CI
Males				
Puberty	2.1	1.8-2.5	4.7	3.5-6.5
Exposure to ETS	2.0	1.4-2.8	3.3	2.3-4.8
Regular alcohol consumption	1.7	1.3-2.3	2.9	2.1-3.9
Drug use	4.8	3.7-6.1	15.0	12.0-20.0
Living with parents	0.75	0.60-0.94	0.61	0.46-0.81
Regular sexual activity	1.1	0.82-1.4	2.3	1.7-3.1
Females				
Puberty	3.7	2.9-4.6	18.0	9.6-32
Birth control pill use	1.1	.79-1.5	2.5	1.8-3.6
Exposure to ETS	1.9	1.2-2.8	4.8	3.2-7.2
Regular alcohol consumption	1.8	1.1-3.2	4.6	2.7-7.9
Drug use	2.9	2.1-3.9	12.0	8.8-16.0
Living with parents	0.80	0.65-0.99	0.62	0.48-0.79
Regular sexual activity	1.1	0.79-1.5	2.5	1.8-3.6

***** Regular smoking, experimental or occasional smoking, never smoking respectively.
† Odds ratio of regular smoking and experimental/occasional smoking respectively vs. never smoking adjusted for age, paternal socioeconomic status (SES), educational district and nationality in a polychotomous model.

as a socially acceptable behaviour to relieve anxiety in social situations [40]. It is possible that our findings reflect the influence of social stereotypes. Whether the negative cultural stereotype that existed in the past, still operates in contemporary society, portraying smoking as a male behaviour, an "unfeminine" action [32, 41], cannot be assessed in our study. In order to understand better the role that smoking plays as a "marker" of gender identity among youth populations, social constructions of adolescence as well as feminity/masculinity have to be more specifically examined [39].

From a more general point of view, as underlined by K. Slama, smoking is not simply a bad choice that information will turn around, nor is it a simple biological addiction than can be cured; the social environment and the individual's cognitions are key factors in starting and successfully stopping smoking [42]. Smoking is a complex behaviour influenced by modifiable and non-modifiable determinants. Tobacco use is a global endemic and in most industrialised countries, in adults, it has been decreasing, but it remains at a higher level in adolescents and young adults and seems to be still increasing among girls [12, 21, 22, 43]. The exact timing, duration and magnitude of the smoking epidemic might vary significantly from one country to another and from male to female [44]. The tobacco industry recruits and retains smokers by associating its products with excitement, independence, sexuality and a "cool" style [33, 45]. The symbolic value of smoking, representing adolescent freedom and independence, is reinforced through tobacco advertising [32, 46, 47]; the harm to children and adolescents has become apparent [45]. A recent WHO report has revealed how commercial companies have successfully marketed cigarettes designed specifically for women [13, 48] and direct advertising devoted to the female population [19].

Addiction to smoking typically begins during childhood [17]. Recent studies raised questions about the model on the natural course of onset of cigarette use [49]. Up to now it had been conceptualised as a progressing sequential process through successive stages. Progression from first try to daily use was supposed to take 2 to 3 years and progression to nicotine dependence even more [50]. Nevertheless, symptoms of nicotine dependence have been shown to occur early after smoking onset [45, 51, 52]. Such elements certainly contribute to explain at least in part the lack of sustained impact of tobacco programmes for youths. Thus it is relevant to focus on early phases of smoking onset and it is important to understand which factors contribute to smoking initiation in adolescence, trajectories of use, expressions of dependence and quitting attempt both in girls and boys [31, 53]. Advances in medicine have made physicians more able to help young (and older) people quit smoking, but the consequences on health, the energy and cost involved in tobacco consumption control or in elaboration of legislative and regulatory measures to protect the population and to limit tobacco industry marketing tactics, should encourage public health authorities and governments to prevent children and youth from starting to smoke and to protect them from smoking exposure, either in the form of second hand or promotion exposure.

The question might be raised about the usefulness and relevance to analyse, (unpublished) data on French adolescent smoking behaviour (aged 8 to 25 years) collected in 1994, from the point of view of sex and gender. First, recent data has shown that there have not been structural changes

since the period of the survey. Up to 34% of adolescents were still regular smokers in France in 2005 (ESCAPAD data). Illicit drug use and alcohol consumption has not declined. Lastly, sexual behaviours in adolescents remain stable. More importantly, our results contribute towards strengthening the idea that specific tobacco control campaigns aimed at girls and young women are needed. The young adults who were aged 8 to 25 in 1994 are now 25 to 38 years old; several of them are parents of preteens and teenagers at risk of initial experimentation or uptake of tobacco. A better understanding and awareness of factors that influenced their own behaviour towards smoking might help these young adults to be more cautious about the teenager's susceptibility to adults and parental attitudes and to be more proactive in preventing them from smoking. These factors taken together might provide useful guidelines in designing public health interventions or tobacco control interventions, as part of school-based but also as family and general tobacco control programmes.

To conclude, our results evidence the fact that sex-related (puberty), gender-specific (environmental tobacco smoking, alcohol consumption, drug abuse) or sex/gender (regular sexual intercourse) are influential in relation to smoking behaviour in French adolescents. Due to the previous considerations, additional investigations and confirmation would prove useful.

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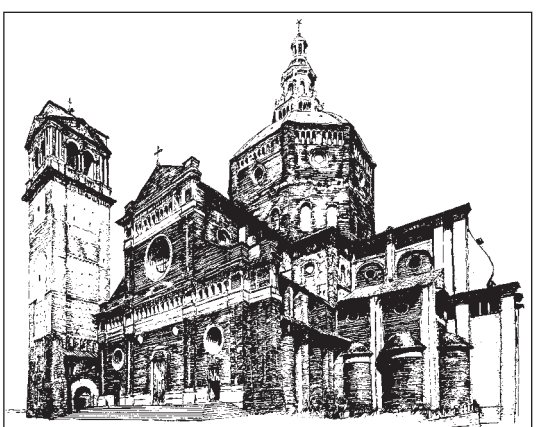

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