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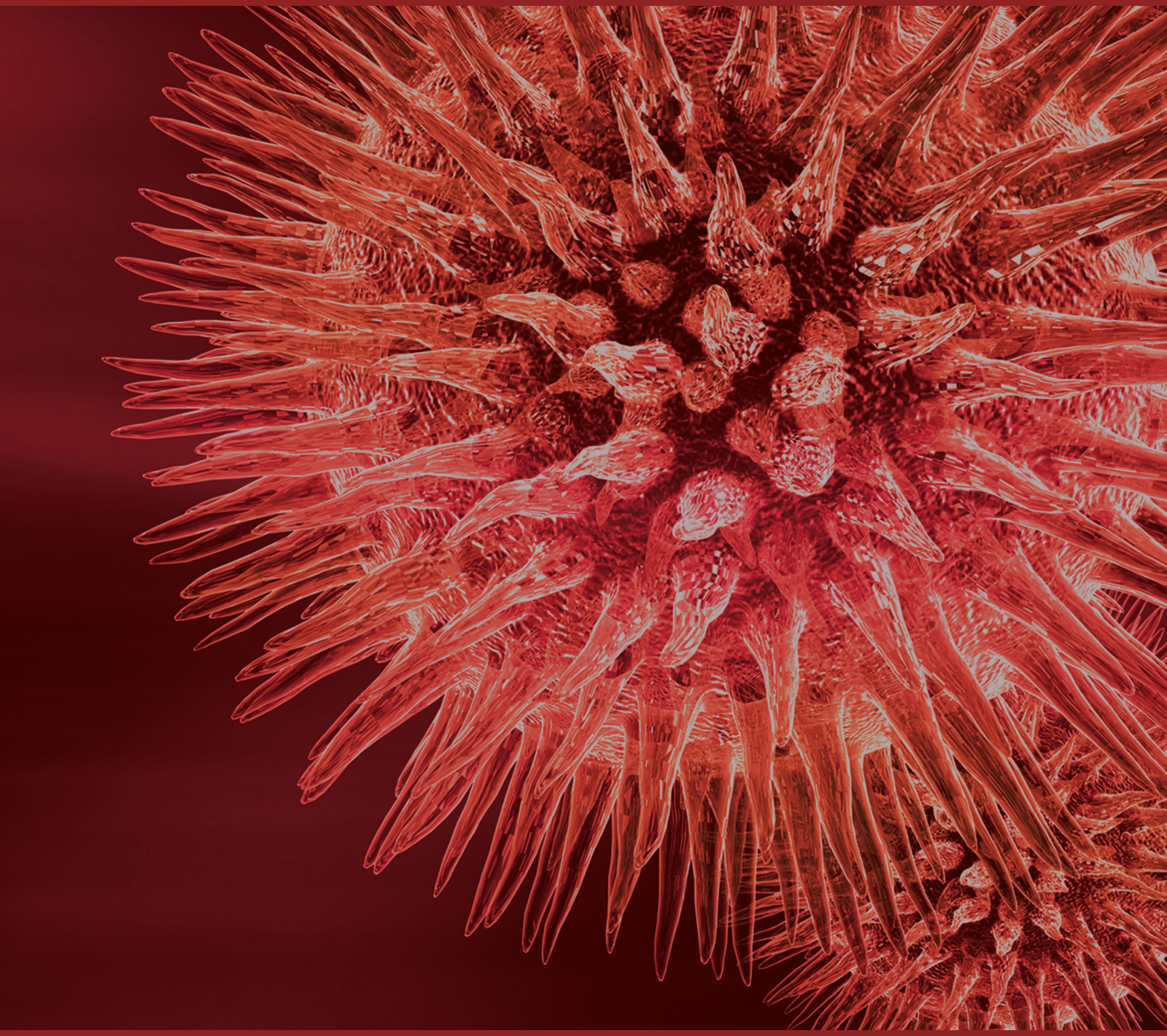
Tobacco Smoking: The Evidence from Prevention and Cessation

Guest Editors: Giuseppe La Torre, Amy Ferketich, and Maria Caterina Grassi



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Editorial

Tobacco Smoking: The Evidence from Prevention and Cessation

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The role of tobacco smoking as a cause of many diseases is now well established from the scientific point of view. It is recognized that tobacco consumption is the leading cause of preventable deaths in the majority of high-income nations and increasingly in low- and middle-income nations.

This special issue presents the latest evidence in the fields of both smoking prevention and cessation.

Prevention. R. Grazuleviciene et al. addressed the important issues of maternal smoking during pregnancy and second-hand tobacco smoke (SHS) exposure. These issues have been recognized as not only a serious threat to public health but also a significant cause of damage to the immune system of the fetuses. They found that both maternal smoking during pregnancy and SHS are risk factors for childhood wheezing and overweight.

China has the largest number of smokers and people exposed to SHS in the world (63.7% of nonsmokers are exposed to STS in their homes). P. Zheng et al. examined the prevalence of and factors associated with smoke-free home policies in Shanghai, as well as reasons for implementing such a policy. They highlight that smoke-free home policies are in place in approximately one-third of households that took part in the survey, and this type of policy was associated with personal smoking behavior and social factors. The findings of their work suggest the need to urgently promote smoke-free home policies through tobacco control programs in the most populated country in the world. In line with this, two factors seem most important to include in a tobacco control program: increasing citizens' knowledge and awareness of tobacco-related problems and encouraging medical doctors to promote smoking cessation among their patients. A. S. Abdullah and colleagues investigated factors associated with SHS exposure from parental smoking in Chinese families. Their interesting results demonstrate that some parents did not know about health consequences of smoking and effects of SHS exposure on children. On the other hand, few parents were asked by pediatricians about the child's exposure to SHS at home, even when the child's illness was related to smoking. The role of medical doctors in promoting healthy behaviours is crucial, and suggestions coming from pediatricians about smoke-free homes and parental quitting would be easily acceptable to parents and other household members.

Moreover, another key issue in this field is the ability of laws to enhance smoking prevention and to promote smoking cessation. M. R. Gualano et al. present data from Italy, where a more restrictive law was introduced in 2005. They found a constant decrease in tobacco consumption in Italy between 2001 and 2013, but no join point related to the introduction of the law banning smoking was present. According to the authors, these findings confirm that tobacco control programs must focus on other intervention activities, such as increasing the price of cigarettes, using graphic warnings on tobacco products [1], and including health promotion activities. In another paper focused on indoor smoking bans, T. Tabuchi et al. present the results of an observational study carried out in Japan that demonstrated that workplace smoking bans could reduce smoking among male workers and the husbands of female workers, compared with a partial smoking ban.

Discouraging smoking initiation and motivating adolescent smokers to quit is a difficult task. Family and school

environments are fundamental settings where these actions could have the highest likelihood of success. However, data coming from the Italian HBSC surveys (2002–2010), while indicating that the prevalence of regular tobacco use remained stable among 15-year-olds, also showed that many adolescents are exposed to SHS smoke, have at least one parent who smokes, and have seen teachers and students smoking at school. Moreover, there is a lot to do in other setting as well, given that the survey indicated that the vast majority of adolescents had no trouble in buying cigarettes, even though the sale of tobacco products to minors is prohibited. In another setting (Georgia), C. J. Berg et al. indicated some interesting issues for tobacco control interventions among youths, underlying some factors that need to be taken into account, such as gender, use of alcohol, and marijuana, but also the lower perceived risk among young people.

There is a lot of evidence to suggest that smoking cessation training for medical students is very important for tackling tobacco smoking among general population. However, there is also evidence that in many countries the prevalence of smokers among health professionals is high [2, 3]. M. C. Grassi et al. demonstrate that even a brief intervention with medical students, via a lecture on nicotine dependence, is useful in the short term to significantly increase knowledge of nicotine and tobacco related issues. However, this intervention needs to be more comprehensive and cover different time periods in the medical student curriculum.

Cessation. Nicotine dependence has a high prevalence among individuals addicted to illicit drugs. The association between methamphetamine (MA) use and cigarette smoking was surveyed by Z. Wang et al. who carried out a study in Beijing and Guangdong, China, and found that most MA users are current smokers. Higher MA dose and ever-use of ketamine or alcohol were associated with a higher probability of high nicotine dependence, and this in turn was associated with significantly higher euphoria and stronger sexual impulse after using MA. This interesting work suggests that factors such as gender, marital status, and use of other psychoactive substances are key factors to be considered in providing health education on tobacco control and smoking cessation among MA users.

Determining the factors associated with smoking cessation success is a key issue in the modern public health arena. This question was addressed by Kaleta et al. who reported their experience in Romania. While they found that both gender and cohabitation with nonsmokers were the strongest predictors of cessation, different patterns of association are present among females and males. In fact, while among men they found an association between long-term quitting smoking and factors such as being economically active, being aged 40 and over, and having an awareness of smoking health consequences, among women cessation was mainly associated with initiating smoking at an older age.

Are there any personality characteristics that are associated with smoking? Positivity (POS), defined as a general disposition conducive to facing experiences with a positive outlook, was studied by Grassi and colleagues as a possible predictor of relapse after quitting smoking among Italian adults. Among people who attended a group counseling program for smoking cessation, POS was significantly and negatively associated with smoking status and with craving to smoke. The authors concluded that a better understanding of the biological correlates of POS could be useful in developing future cessation interventions.

Giuseppe La Torre
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Maria Caterina Grassi

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Research Article

The Impact of Tobacco Smoke Exposure on Wheezing and Overweight in 4–6-Year-Old Children

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Aim. To investigate the association between maternal smoking during pregnancy, second-hand tobacco smoke (STS) exposure, education level, and preschool children's wheezing and overweight. *Methods*. This cohort study used data of the KANC cohort—1,489 4–6-year-old children from Kaunas city, Lithuania. Multivariate logistic regression was employed to study the influence of prenatal and postnatal STS exposure on the prevalence of wheezing and overweight, controlling for potential confounders. *Results*. Children exposed to maternal smoking during pregnancy had a slightly increased prevalence of wheezing and overweight. Postnatal exposure to STS was associated with a statistically significantly increased risk of wheezing and overweight in children born to mothers with lower education levels (OR 2.12; 95% CI 1.04–4.35 and 3.57; 95% CI 1.76–7.21, accordingly). *Conclusions*. The present study findings suggest that both maternal smoking during pregnancy and STS increase the risk of childhood wheezing and overweight, whereas lower maternal education might have a synergetic effect. Targeted interventions must to take this into account and address household smoking.

1. Introduction

Exposure of nonsmoking women to second-hand tobacco smoke (STS) during pregnancy is a serious threat to public health and is a significant cause of damage to the immune system of the fetuses. There is growing evidence that in utero exposure to tobacco smoke adversely affects postnatal lung function and increases the risk of allergic disease [1–6] and also affects infants' physical development and overweight in later life [7–10]. The recent systemic review of wheezing in childhood [11] has suggested that exposure to STS increases the risk of wheezing. Epidemiological studies have revealed that exposure to passive smoke—particularly prenatal or postnatal maternal smoking—is associated with increased risks (from 28% to 70%) of wheeze in children aged 5 to 18 years [12–16]. Some authors reported that maternal smoking increases the risk of allergic sensitization and wheezing only in children with allergic predisposition [16–18] and that interaction of genetic and environmental risk factors has an impact on the incidence and prognosis of wheezing illness during childhood [19–22]. There is evidence that both socioenvironmental factors and tobacco smoke may influence the development of asthma or wheezing [17, 18, 20, 22–24].

Now it has been recognized that exposure to passive smoking is an important risk factor for the incidence of wheeze and asthma during childhood. Less frequently reported associations include children's physical development, overweight, and obesity [25, 26]. The studies of childhood overweight have reported far less consistent results [10, 27–29], and causal relations between exposure to smoking in utero and childhood overweight lack evidence.

There is speculation that the effect of intrauterine tobacco exposure on childhood obesity may depend largely on cigarette smoking during the first trimester, whereas the additional impact of smoking throughout pregnancy might

be due to confounding by sociodemographics [8] or residual confounding by genetic and family environmental factors [7, 10]. However, a systematic review of studies reporting on the association between maternal prenatal cigarette smoking and elevated risk for childhood overweight suggested that sociodemographic and behavioral differences between smokers and nonsmokers did not explain the observed association [26]. The review suggested that prenatal smoke exposure led to about 50% increase in the risk of being overweight in childhood. Based on the meta-analysis, the authors' findings showed that children whose mothers smoked during pregnancy were at an elevated risk for overweight (pooled adjusted odds ratio 1.50, 95% CI 1.36–1.65), compared with children whose mothers did not smoke during pregnancy [25, 30, 31]. The findings of a population-based prospective cohort study suggested that direct intrauterine exposure to smoke until late pregnancy leads to different height and weight growth adaptations and an increased risk of overweight and obesity in preschool children [32]. It has been suggested that maternal smoking during pregnancy increases the risk of obesity in the offspring [9, 33]; however, additional studies are needed to assess directly whether smoking in early pregnancy increases long-term risk of obesity-related disorders in children [34]. Only a few studies have explored the impact of sociodemographics factors of STS on preschool children health [5, 35, 36].

In the present study, using individual cohort study data, we investigated the association between STS during pregnancy in nonsmoking and smoking mothers, the individual-level socioeconomic status (SES), and wheezing and overweight in 4–6-year-old children. We hypothesized that the effects would be more apparent in children born to mothers with lower rather than higher level of education.

2. Methods

2.1. Study Population. The data used in these analyses were collected as part of the PHENOTYPE project (Positive Health Effects of the Natural Outdoor Environment in Typical Populations in Different Regions in Europe) funded by the European Commission Seventh Framework Program [37]. We used survey data on women who were recruited to the pregnant women cohort study during 2007–2009. The first interview was completed during the first trimester of pregnancy. Women reported their age at inclusion (less than 30 years or 30 years and older), education level (low—10 or fewer years, medium and high—more than 10 years), social status (worker, student, unemployed—low; housekeeper, officer—medium; manager, company owner—high), marital status (married or not married), smoking (nonsmoker or smokes at least one cigarette per day), maternal body mass index (BMI) (<25, 25–30, or >30 kg/m2), and other variables. Active maternal smoking at enrollment was assessed in the first questionnaire by asking whether the mother smoked during her pregnancy. The second interview was completed just after childbirth (76%) or by telephone within the first month after delivery (24%), and data on residential history, job during pregnancy, health behavior, and other variables were collected. Individual-level SES predictors were education level and occupation type. Postal questionnaires sent in 2013 at children's ages 4–6 years provided information about children's health. Information collected from the mothers included details on the exposure to tobacco smoke. However, because of the relatively small number of smoking mothers in the sample, we chose not to divide this group into smaller categories.

In this study, we investigated the influence of maternal exposure to domestic cigarette smoke during pregnancy on the prevalence of wheezing and being overweight in the children. We separately analyzed mothers who themselves smoked during their pregnancy from those who did not but were exposed to domestic cigarette smoking. The participants were 1,489 children residing in Kaunas city, Lithuania, who in 2013 were 4–6 years of age and whose parents or guardians responded to questionnaire and agreed to participate in the study. The study was approved by the Lithuanian Bioethics Committee, and parental informed consent was obtained from all participants. Questionnaire responses by parents or guardians were used to categorize children's basic information, medical history, family history, personal habits, children's height and weight, and housing and environmental conditions. Responses to the standardized International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire completed by parents were used to identify children with symptoms of wheezing. Wheezing during the last 12 months was identified by an affirmative response to the question: "Has your child experienced wheezing (whistling sounds in the chest) over the last 12 months?" The outcome measure was wheezing during last 12 months and a variety of social and environmental factors were taken into account.

To assess children's overweight, their BMI was calculated as the ratio of weight (in kg)/height (in m2). To define overweight and obese in our study, we used age group and sex-fixed BMI cutoff points recommended for the evaluation of overweight and obesity in children according to the Childhood Obesity Working Group of the International Obesity Taskforce (IOTF) guidelines [38]. BMI classes were evaluated according to the IOTF: underweight (BMI $\leq$ 14 kg/m2); normal weight (BMI > 14 kg/m2 and <18 kg/m2); overweight (BMI $\geq$ 18 kg/m2 and <20 kg/m2); and obesity (BMI $\geq$ 20 kg/m2). Because of the small number of obese children ($N = 36$), overweight and obese groups were merged in the analysis.

2.2. Statistical Analysis. We used chi-square and univariate logistic regression analyses to compare values and frequencies of the baseline characteristics by smoking status of the study subjects. Subsequently, we evaluated the associations among the covariates that are known to be related to an increased risk of wheezing and overweight. Predictor variables whose univariate test showed a statistically significant association ($P < 0.05$) with the outcome—or those that changed the adjusted odds ratios (aOR) by 10% or more—were retained for inclusion in multivariate logistic regression analyses.

Multivariate logistic regressions were used to assess the relationship between the prevalence of wheezing in STS-exposed and nonexposed women's children, adjusting for the mothers' education level, the children's sex, birth weight, and antibiotic use during the first year of life; and for overweight adjusting for the mothers' education level, the children's sex, birth weight, and time spent at the computer. The group of women who had not smoked during their pregnancy and had no STS exposure was used as the reference group. Subsequently, we conducted a stratified analysis where we compared the reference group of children whose mothers were well educated and smoked during pregnancy with children born to mothers with lower education levels. The effect of STS on wheezing and overweight in children was estimated as unadjusted and adjusted odds ratios with 95% confidence intervals (CI). All statistical analyses were performed using SPSS version 18.0 (SPSS Inc. Released 2009. PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc.).

3. Results

The women who participated in the study were highly educated; 73.1% of them had more than 10 years of education and a university degree. As many as 92.4% of the mothers reported never having smoked; however, 35.8% of them had been exposed to STS at home. Maternal smoking during pregnancy was associated with a younger age, lower education level, low socioeconomic status, a lower prevalence of breastfeeding, and postnatal antibiotic usage during the first year. Wheezing during the last 12 months in children was associated with a lower maternal education level, parental asthma, male sex, the number of siblings, and antibiotic use during the first year of life (Table 1). The prevalence of wheezing among children of nonsmoking mothers was 10.9% and among children born to mothers who were smoking during pregnancy was 15.9%. Among lower educated mothers it was 16.9% while in medium or high educated mothers it was 9.8%, crude OR 1.87, 95% CI 1.29–2.71.

The analysis of the distribution of risk factors for overweight showed that lower maternal education level, smoking during pregnancy, male sex, birth weight over 3500 g, and more than one hour per day spent at the computer increased the prevalence of overweight among 4–6-year-old children (Table 2). The prevalence of overweight among children of lower educated mothers was 11.7% while among medium or high educated mothers it was 6.3%, crude OR 2.00, 95% CI 1.30–3.00.

Table 3 shows the results of multivariate logistic regression models analyzing the association between maternal educations, STS, and wheezing among 4–6-year-old children. The multivariate model showed that, with reference to the group of nonsmoking women with a high education level and no STS exposure, STS exposure was found to be a statistically significant risk factor for wheezing in children born to mothers with lower education levels, after adjustment for antibiotic use during the first year of life, low birth weight, and child parity. Among nonsmokers mothers with lower education levels, the presence of household smoking was found to increase the risk of children wheezing to 1.96, 95% CI 1.28–2.98 and among smoking mothers to 2.12, 95% CI 1.04–4.35. The interaction term between lower education level, smoking, and children sex is not statistically significant (OR = 1.89, $P = 0.20$).

Table 4 presents the results of multivariate logistic regression models analyzing the association between maternal education levels, STS, and overweight in 4–6-year-old children. With reference to the group of high educated nonsmoking women with no STS exposure, the presence of STS exposure was found to be a significant risk factor for overweight in children, after adjusting for birth weight and time spent at the computer. The mothers' lower education levels and smoking during pregnancy, as well as STS exposure, increased the odds ratios of overweight in children to 3.57, 95% CI 1.76–7.21.

4. Discussion

This study demonstrated that STS increased the risk of wheeze for 4–6-year-old children who were not exposed (the mother was a nonsmoker) or exposed (the mother was a smoker) to maternal tobacco smoke while in utero; however, a statistically significant effect was evident only for children born to mothers with lower education levels (OR 1.96 and 2.12, accordingly). Using well-educated nonsmoking mothers not exposed to STS as a reference group, we did not find that household STS exposure had any statistically significant effect on the risk of wheezing in children of mothers with higher education levels. The effect of tobacco smoke on overweight was also higher among children of mothers with lower education levels. The odds ratio for overweight associated with tobacco smoke exposure was 3.57.

In this study, maternal smoking status was dichotomized to smoking and nonsmoking. The mothers who smoked during pregnancy tended to be different from nonsmokers in variables that also predicted the risk of child wheezing and overweight. In general, smokers were younger, were less educated, had a lower socioeconomic status, and were less likely to breastfeed, and their children more often used antibiotic during the first year of life. We found that among 4–6-year-old children of these women, maternal smoking status and STS had a relation with both wheezing and overweight, which was independent of maternal educational level, maternal age, and other variables that we adjusted for.

For the interpretation of this study, a few issues should be taken into account. Using individual data, we addressed possible confounding variables in multivariate analyses and estimated the effects of STS exposure on wheezing and overweight separately for the groups of children born to nonsmoking and smoking mothers with higher and lower education levels. Data on wheezing and overweight were obtained from parental reports through a questionnaire; the evaluation of exposure to tobacco smoke was indirect, and thus the possibility of random reporting bias exists. However, in this study, we controlled for the main variables that might confound the association between tobacco smoke exposure and children's wheezing and overweight—education level and first-year postnatal antibiotic use among them which

Table 1: Distribution of variables according to wheezing during the last 12 months among children and unadjusted effects as odds ratios (OR) and 95% confidence intervals (CI).

Variables	Wheezing yes *N* (%)	Wheezing no *N* (%)	Odds ratios** 95% CI
Mother's age at childbirth (years)			
<30	110 (11.1%)	885 (88.9%)	1
31 and more	58 (11.7%)	436 (88.3%)	1.07 (0.75–1.52)
Maternal education level			
Low (10 or less years)*	52 (16.9%)	255 (83.1%)	1.87 (1.29–2.71)
Medium, high (>10 years)	116 (9.8%)	1066 (90.2%)	1
Socioeconomic status			
Low	50 (12.5%)	351 (87.5%)	1.17 (0.81–1.69)
Moderate, high	118 (10.8%)	970 (89.2%)	1
Maternal smoking during pregnancy			
No	150 (10.9%)	1226 (89.1%)	1
Yes	18 (15.9%)	95 (84.1%)	1.55 (0.88–2.71)
Maternal secondhand smoking			
No	98 (10.3%)	858 (89.7%)	1
Yes	70 (13.1%)	463 (86.9%)	1.32 (0.94–1.86)
Gas cooking			
No	52 (9.7%)	483 (90.3%)	1
Yes	116 (12.2%)	838 (87.8%)	1.29 (0.90–1.84)
Children's sex			
Male*	103 (14.0%)	635 (86.0%)	1.71 (1.22–2.41)
Female	65 (8.7%)	686 (91.3%)	1
Children parity			
1	79 (9.6%)	743 (90.4%)	1
2 and more*	89 (13.3%)	578 (86.7%)	1.45 (1.04–2.02)
Birth weight			
<2500 g	14 (15.4%)	77 (84.6%)	1.47 (0.77–2.74)
2501 g and more	154 (11.0%)	1244 (89.0%)	1
Breastfeeding			
No	16 (16.2%)	83 (83.8%)	1.57 (0.86–2.83)
Yes	152 (10.9%)	1238 (89.1%)	1
Allergy			
No	61 (5.9%)	973 (94.1%)	1
Yes*	107 (23.5%)	348 (76.5%)	4.90 (3.45–6.97)
Eczema			
No	148 (10.7%)	1240 (89.3%)	1
Yes*	20 (19.8%)	81 (80.2%)	2.07 (1.19–3.57)
Paracetamol use during the first year of life			
No	41 (9.1%)	412 (90.9%)	1
Yes	127 (12.3%)	909 (87.7%)	1.40 (0.95–2.07)
Antibiotic use during the first year of life			
No	75 (7.7%)	899 (92.3%)	1
Yes*	93 (18.1%)	422 (81.9%)	2.64 (1.88–3.71)
Asthma in parents			
No	140 (10.1%)	1251 (89.9%)	1
Yes*	28 (28.6%)	70 (71.4%)	3.57 (2.17–5.87)

*$P < 0.05$.
**Unadjusted associations are presented as wheezing odds ratio (OR) with 95% confidence intervals of univariate analysis.

Table 2: Distribution of variables according to children's overweight status and unadjusted effects as odds ratios (OR) and 95% confidence intervals (CI).

Risk factors	Overweight yes *N* (%)	Overweight no *N* (%)	Odds ratios** 95% CI
Mothers' age at childbirth (years)			
<30	79 (7.9%)	916 (92.1%)	1.25 (0.81–1.91)
31 and more	32 (6.5%)	426 (93.5%)	1
Maternal education level			
Low (10 or less years)*	36 (11.7%)	271 (88.3%)	2.00 (1.30–3.00)
Medium, high (>10 years)	75 (6.3%)	1107 (93.7%)	1
Maternal active smoking*			
No	88 (6.8%)	1212 (93.2%)	1
Yes	23 (12.2%)	166 (87.8%)	1.91 (1.17–3.11)
Maternal smoking during pregnancy*			
No	94 (6.8%)	1282 (93.2%)	1
Yes	17 (15.0%)	96 (85.0%)	2.42 (1.38–4.21)
Maternal second-hand smoking			
No	68 (7.1%)	888 (92.9%)	1
Yes	43 (8.1%)	490 (91.9%)	1.15 (0.77–1.71)
Children's sex			
Male*	65 (8.8%)	673 (91.2%)	1.48 (1.00–2.19)
Female	46 (6.1%)	705 (93.9%)	1
Breastfeeding			
No	10 (10.1%)	89 (89.9%)	1.43 (0.72–2.84)
Yes	101 (7.3%)	1289 (92.7%)	1
Paracetamol use during the first year of life			
No	26 (5.7%)	427 (94.3%)	1
Yes	85 (8.2%)	951 (91.8%)	1.47 (0.93–2.31)
Antibiotic use during the first year of life			
No	66 (6.8%)	908 (93.2%)	1
Yes	45 (8.7%)	470 (91.3%)	1.32 (0.89–1.96)
Birth weight*			
<2500 g	6 (6.8)	82 (93.2%)	1.17 (0.48–2.84)
2500–3500 g	43 (5.9%)	688 (94.1%)	1
>3500 g	62 (9.3%)	608 (90.7%)	1.63 (1.09–2.44)
Watching TV			
≤1 h/day	36 (6.1%)	558 (93.9%)	1
>1 h/day	75 (8.4%)	820 (91.6%)	1.42 (0.94–2.14)
Time spent at the computer*			
≤1 h/day	72 (6.3%)	1066 (93.7%)	1
>1 h/day	39 (11.1%)	312 (88.9%)	1.58 (2.84–6.47)

*$P < 0.05$.
**Unadjusted associations are presented as overweight odds ratio (OR) with 95% confidence intervals of univariate analysis.

could attenuate the strengths of the observed associations. Because of the low prevalence of maternal smoking during pregnancy, the sample size was insufficient to obtain statistically significant results during stratified analyses for the some estimation. Our similar estimates for unadjusted and adjusted associations suggest that sociodemographic and other differences between smokers and nonsmokers did not explain the observed association. These data are consistent with those obtained in studies from other countries [8, 31, 39, 40].

The results of our study are in accordance with those from other studies regarding the observed effects of tobacco smoke on the risk of overweight. As in other studies, lower maternal educational level [41, 42] and longer duration of

Table 3: Association of maternal education level, second-hand tobacco smoke (STS), and wheezing in 4–6-year-old children with reference to well-educated nonexposed to tobacco smoke mothers.

Maternal education level and smoking	Wheezing cases *N* (%)	Adjusted risk of wheezing* aOR (95% CI)
Mother nonsmoker		
High and no STS**	72 (8.9%)	1 (reference)
High and STS	37 (11.6%)	1.32 (0.86–2.02)
Low and STS	41 (16.5%)	1.96 (1.28–2.98)
Mother smoker		
High and no STS**	72 (8.9%)	1 (reference)
High and STS	7 (12.7%)	1.26 (0.54–2.93)
Low and STS	11 (19.0%)	2.12 (1.04–4.35)

*Results of multivariate logistic regression models are presented as associations of wheezing odds ratio (OR) with 95% confidence intervals adjusting for first-year postnatal antibiotic use, low birth weight, and child parity. **Reference category is high educated, nonsmokers, and nonexposed to second-hand tobacco smoke (STS) mothers. SES-specific STS effect on children wheezing is presented in nonsmoker mothers and smoker mothers by educational level.

Table 4: Association of maternal education level, second-hand tobacco smoke (STS), and overweight in 4–6-year-old children with reference to well-educated nonexposed to tobacco smoke mothers.

Maternal education level and smoking	Overweight cases *N* (%)	Adjusted risk of overweight* aOR (95% CI)
Mother nonsmoker		
High and no STS**	53 (6.6%)	1 (reference)
High and STS	17 (5.3%)	0.80 (0.46–1.41)
Low and STS	24 (9.6%)	1.40 (0.84–2.34)
Mother smoker		
High and no STS**	53 (6.6%)	1 (reference)
High and STS	5 (9.1%)	1.29 (0.49–3.41)
Low and STS	12 (20.7%)	3.57 (1.76–7.21)

*Results of stratified multivariate logistic regression models are presented as associations of overweight odds ratio (OR) with 95% confidence intervals adjusting for first-year postnatal antibiotic use, low birth weight, and time spent at the computer. **Reference category is high educated, nonsmokers, and nonexposed to second-hand tobacco smoke (STS) mothers. SES-specific STS effect on overweight is presented in nonsmoker mothers and smoker mothers by educational level.

children spent watching television and playing electronic games [43, 44] were associated with risk of being overweight. The observed association between smoking early in pregnancy and childhood obesity could be explained through metabolism disorder produced by tobacco smoke, which can result in reduced blood supply to the fetus because of the constrictive effects of blood vessels on maternal and uteroplacental blood supply [8].

Selection bias within the study population with such a difference in respondents and in nonrespondents groups should not lead to systematic bias because of the absence of a systematic difference in birth outcomes between the two response groups. Although we did adjust our analysis for proxy indicators of wheezing and overweight in children, we cannot exclude that residual noncontrolled confounding variables may affect the observed higher risk for wheezing and overweight in exposed children of mothers with lower education levels because of less healthy lifestyle habits [26]. This study did not include measures linked to genetic factors that are strongly associated with cigarette smoking. Therefore, there may well be residual genetic confounding that links the response to early-life tobacco smoke exposure with allergies and metabolic disorders later in life. The results of our previously published study suggested that smoking, even at low levels, ought to be considered a potential risk factor for adverse birth outcomes and that genetic polymorphism may contribute to individual variation in response to tobacco smoke [45].

A variety of adverse health outcomes are linked to cigarette smoking before and during pregnancy, and there are no speculations about the possible difference in health effects by children's sex. Maternal prenatal cigarette smoke damages the antioxidant system, has a negative impact on both the mother and the fetus on the genetic and cellular levels, and might disturb the development of the immune system in the fetus [1, 46]. Genetic polymorphism associated with airway hyperresponsiveness also has an impact on the expression of asthma symptoms [18, 47].

There is evidence that the impact of tobacco smoke on wheezing and being overweight in individual children is not on a par and that individual genetic predisposition may have an impact on the prognosis of children's health [16, 17, 26, 27]. Previous studies have suggested several plausible explanations for the gene-smoking interaction. Glutathione S-transferase (GST) M1 enzyme product that is involved in detoxification of both reactive tobacco metabolic intermediates and reactive oxygen species (GSTM1) null genotype has been shown to modify the effects of fetal tobacco smoke exposure on childhood asthma and wheezing [20, 48–50]. It has also been shown that maternal smoking during pregnancy is related to changes in DNA methylation [51, 52]. However, whether these changes underlie the associations between tobacco smoke exposure and children's obesity remains vague [32].

In conclusion, the mechanisms by which maternal smoking during pregnancy and STS may program children's postnatal health need to be studied further. Our results suggested that exposure to active maternal smoking during fetal development as well as later STS exposure led to an increased risk for wheezing and obesity in 4–6-year-old children. These results underlined the importance of health care interventions helping to quit smoking prior to conception and that targeted interventions must comprise cessation of household smoking for the prevention of chronicle diseases such as allergies and obesity in their children. Future studies are needed in children to identify the associations and interactions of socioenvironmental factors, tobacco smoke, and genetic predisposition to allergy and metabolic disorders.

Conflict of Interests

The authors declare that there is no conflict of interests.

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Research Article

Correlates of Smoke-Free Home Policies in Shanghai, China

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Background. Approximately 63.7% of nonsmokers in China are exposed to secondhand smoke (SHS) in their homes. The current study documents the prevalence and correlates of smoke-free home policies in Shanghai, as well as reasons for implementing such a policy and places where smoking is most commonly allowed. *Methods*. We conducted in-person surveys of 500 participants using a multistage proportional random sampling design in an urban and suburban district. *Results*. Overall, 35.3% had a smoke-free home policy. In the logistic regression, having higher income, not having smokers in the home, having children in the home, having fewer friends/relatives who permit smoking at home, and not being a current smoker were correlates of having a smoke-free home policy ($P < 0.05$). Concern about the health impact of SHS was reportedly the most important reason for establishing a smoke-free home. Among participants with no or partial bans, the most common places where smoking was allowed included the living room (64.2%), kitchen (46.1%), and bathroom (33.8%). *Conclusions*. Smoke-free home policies were in place for a minority of households surveyed. Establishing such a policy was influenced by personal smoking behavior and social factors. These findings suggest an urgent need to promote smoke-free home policies through tobacco control programs.

1. Introduction

Exposure to secondhand smoke (SHS) contributes to a range of health problems among nonsmokers and children. Eliminating smoking in indoor settings can fully protect nonsmokers from the health effects of SHS [1, 2]. Having smoke-free policies in public places has positive health effects, encourages smokers to quit, and reduces cigarette consumption [3, 4]. Moreover, implementing smoke-free policies provides an opportunity to educate the public about the harm of SHS and to change social norms related to smoking, which may lead to increased adoption of voluntary smoke-free home policies in homes [2, 3, 5].

China has the most smokers and largest number of people exposed to SHS in the world. It is estimated that 63.7% of nonsmokers are exposed to SHS in their homes [6]. This widespread public health problem has persisted without any decline. According to results of China National Behavior Monitoring from 2002 to 2010 [6], there has been no reduction in the prevalence of SHS exposure over this period.

Most people spend much of their time in their homes, which continue to be a major source of SHS exposure. Despite the negative impact of SHS exposure at home in China, there have been few studies examining the prevalence or correlates of smoke-free home policies in China. In 2006, a study of an urbanized community in Shanghai showed that 26% of respondents reported a total smoke-free home policy [7]. Another study from six counties in China in 2004 indicated that only 6.3% of families completely forbade smoking at home [8]. A population survey in Guangdong Province indicated that 14.2% reported a full ban in the household [9].

Consistent with the trend of global tobacco control and the goals set by the World Health Organization (WHO)

Framework Convention on Tobacco Control (FCTC), China has engaged in establishing and enforcing smoke-free policies in several Chinese cities. In March 2010, the Shanghai Public Places Smoking Control Legislation went into effect as the first provincial-level legislation on tobacco control in China. However, it is only a partial public smoke-free policy in which smoking is only prohibited in 13 types of public settings but exempted in restaurants, hotels, and other workplaces. International experience suggests that legislation mandating smoke-free public places also encourages families to make their homes smoke-free, as knowledge about the harm of SHS increases and social norms are altered [10]. In New Zealand, self-reported SHS exposure at home fell from 20% to 9% after the enforcement of a comprehensive smoke-free policy in the public places and work places [11]. Moreover, recent literature has also considered the harms of third-hand smoke (THS), which is the residual tobacco smoke contamination that remains after the cigarette is extinguished. THS may interfere negatively with household dust and air particles. In fact, previous research has demonstrated that smoking at home is linked to persistently high levels of tobacco toxins, long after active smoking has occurred in a specific setting [12, 13]. Awareness of these health effects may be related to implementation of smoke-free home policies, particularly in homes where nonsmokers and children are present. Perhaps related to these concerns, consistent predictors of smoke-free home policies have included the presence of children and of nonsmoking adults at home and having more friends and family members who smoke [14–17].

Given the gaps in the existing literature and the recent changes in tobacco control in Shanghai, the current study aimed to (1) document the prevalence of smoke-free home policies in Shanghai, (2) identify correlates of having a smoke-free home policy, (3) examine the reasons for establishing smoke-free home policies, and (4) identify locations at home where smoking is most commonly allowed. Doing so will provide a scientific basis for establishing effective interventions to reduce household SHS exposure in Shanghai and China more broadly.

2. Methods

2.1. Setting. There are seventeen districts in Shanghai: nine urban areas and eight suburban areas. Two districts were purposively sampled: Pudong New Area, located in the east of Shanghai and considered as China's financial and commercial hub with a total of 2.81 million people (characterized as urban) and Fengxian District, located in the southern part of Shanghai with a less developed economy level which ranked as the lowest among the 17 districts in Shanghai with 0.53 million residents (characterized as suburban).

2.2. Sampling. In each district, participants were recruited based on a random sampling design. First, 250 households were randomly selected in each district. After that the person (aged ≥18 years) whose birthday was closest to the interview date was invited in each selected household to participate.

From November 2012 to January 2013, 574 participants were invited to this study and 500 completed the questionnaire, yielding a response rate of 87%. The participants were approached by trained students from Fudan University to complete face-to-face interviews using structured questionnaires. These questionnaires were developed in English and then transformed into a Chinese version through translation and back translation. The Institutional Review Board of the Public Health School in Fudan University approved the protocol.

The sample size was calculated by estimating the prevalence of having a home smoke-free policy among the participants. Our previous study in Shanghai estimated that 26% of households had smoke-free home policies in an urbanized community [7]. It was estimated that 399 subjects were needed for each group in order to obtain a level of 5% with statistical power of 95%. However, considering the variation of prevalence of establishing home smoke-free policies among the different communities, we aimed to obtain a sample size of 500 participants.

2.3. Measures. Participants provided information on demographics, current household smoking policies, perceived harmfulness of SHS and THS, composition of household, social influences on smoking, reasons for establishing a smoke-free policy, and locations where smoking most commonly was allowed.

Smoke-free home policies were assessed by asking "which statement best describes the rules about smoking inside your home?" Participants were asked to select one of the following response options: "smoking is not allowed anywhere inside your home; smoking is allowed in some places or at some times; smoking is allowed anywhere inside your home; or there are no rules about smoking inside your home." Participants reporting the first option were considered as having a complete smoke-free home policy [1]. We also asked "In what locations is smoking allowed: family/living room; kitchen; bathroom; your bedroom; other adult bedroom; child's bedroom; balconies; other."

Reasons for establishing a smoke-free home were assessed by asking: which of 11 potential reasons were important reasons for participants to ban smoking at home. Examples of reasons included the following: to protect your family from the harmful effects of secondhand smoke and to discourage children from starting to smoke (listed in Table 2) [18]. Cronbach's alpha in the current study for the scale was 0.877. These were categorized into five topics: health, children, quitting, cleanliness, and other.

To assess perceived harm of SHS, participants were asked to indicate the extent to which they agreed with statements reflecting basic knowledge of SHS. Specifically, we asked participants to indicate their level of agreement on a scale of 1 = strongly disagree to 4 = strongly agree with the following three items: "breathing smoke from other people's cigarettes causes heart disease in adults"; "inhaling smoke from someone else's cigarettes can cause lung cancer in nonsmokers"; and "inhaling smoke from someone else's cigarettes can harm the health of babies and children" [19]. In

addition, participants were asked about their beliefs related to the harm of THS using the same response options. This newly developed scale included the following five items: "being in a room where others previously smoked has no impact on your health"; "as soon as people stop smoking in a room, the room no longer has any trace of dangerous particles present"; "after someone smokes in a room, dangerous particles are left behind in the dust, air, and surfaces in the room"; "there are no health risks associated with being in a room where someone previously smoked"; and "dangerous particles from smoking can remain in a room for days or weeks." Cronbach's alpha for the SHS items, THS items, and all 8 items was 0.85, 0.76, and 0.84, respectively.

Influence of other household members, friends, and relatives on having a smoke-free home policy was measured by respondents' answers to the questions: "how many of your friends and relatives are smokers?" and "how many of your friends and relatives allow smoking in their home?" with response options of "all, most, about half, less than half, a few, or none?" The smoking status of household members was assessed using two questions: "including yourself, how many smokers live in your home?" and "does your spouse or partner currently smoke cigarettes?" We also asked about the number of children at home under the age of 18 years and under the age of 5 years.

Smoking status and history were also assessed. Ever smokers were defined as those who had smoked at least 100 cigarettes in their lifetime [20, 21], and current smokers were defined as those reporting smoking in the past 30 days. The questionnaires also covered smoking related information on average daily cigarette consumption in the past week, age at smoking initiation, and number of previous quitting attempts.

2.4. Statistical Analyses. Fisher's exact tests or χ^2 tests were used to examine group differences among those with and without complete smoke-free policies for categorical variables, and the Student t-test was used to examine differences between groups for continuous variables. Binary logistic regression was used to investigate correlates of having a complete smoke-free home policy. Specifically, all variables that were associated with policy status in bivariate analyses at $P < 0.10$ were entered into the model using forced entry. These variables included gender, average personal income, setting, having a smoker at home, having child(ren) less than 5 years old, number of friends who smoke, number of friends who permit smoking at home, and current smoking status. Alpha was set at 0.05 and SPSS 21.0 was used to conduct the analyses.

3. Results

Table 1 presents participants characteristics and bivariate analyses. Males accounted for 48.2% of the total sample. Participants aged 20–39 years accounted for 45.4%. Overall, 29.0% were current smokers (58.1% among men and 1.9% among women). In our sample, 61.6% of participants had smokers at home. In all, 176 participants (35.2%) had smoke-free home policies. Bivariate results indicated that those with a complete smoke-free home policy were more likely to be female ($P = 0.02$), living in an urban area ($P = 0.049$), and with no smokers at home ($P < 0.001$). In addition, children under the age of 5 years at home ($P = 0.013$), fewer friends who smoke ($P < 0.01$), fewer friends who allow smoking at home ($P < 0.001$), and being a nonsmoker or ex-smoker were associated with having a smoke-free policy ($P < 0.001$).

Table 2 shows the final logistic regression model indicating significant correlates of having a complete smoke-free home policy. Having children less than 5 years old at home was positively associated with the presence of a smoke-free policy ($P = 0.007$). Having smokers at home ($P < 0.001$) and having more friends or relatives who allow smoking at home ($P < 0.001$) were negatively associated with having a complete smoke-free home policy. However, gender, area, and number of friends/relatives who smoke were not significantly associated with the presence of a smoke-free policy.

Health concern was the most important reason for establishing a smoke-free home (2.74 ± 0.64), followed by "other" concerns and concerns about cleanliness (2.38 ± 0.91 and 2.37 ± 0.92, resp.; see Table 3). Participants with complete smoke-free home policies had higher scores related to health concerns, children-related concerns, cleanliness concerns, and "other" concerns, compared to those without a smoke-free policy.

For the participants with no or a partial ban, the most common places where smoking was allowed included the living room (64.2%), the kitchen (46.1%), and the bathroom (33.8%; see Table 4). Significant differences in locations where smoking was allowed were detected between those with a partial ban and those without any restriction. For the participants without any smoke-free policy, 28.1% allowed smoking in a child's room.

4. Discussion

Smoke-free home policies may reflect the social norms related to smoking and attitudes about smoking and SHS in environments in which there are no widespread public campaigns promoting smoke-free homes [22]. There is also consistent evidence that smoke-free home policies not only reduce exposure to SHS but also increase cessation rates and decrease cigarette consumption in adult smokers [23]. Also, smoke-free home policies may create and reinforce life-long antismoking behavioral values and norms among youth. The association between having smoke-free home policies and reduced adolescent smoking behaviors has been confirmed in various studies [23, 24]. Given the need to understand the prevalence and correlates of having smoke-free home policies, the current study examined these phenomena among urban and suburban residents in China. Sociodemographics, household composition, social influences, and individual smoking behavior were major factors associated with policy status. In addition, we documented the most important

Table 1: Participant characteristics and bivariate analyses comparing those with a complete smoke-free home policy with those without a complete policy.

Characteristics	Total $N = 500$	Complete policy $n = 176$	No or partial policy $n = 324$	P
Sociodemographics				
Gender				
Male	48.2	40.9	52.2	0.021
Female	51.8	59.1	47.8	
Ethnic				
Han	99.6	99.4	99.7	0.192
Others	0.4	0.6	0.3	
Age				
<20	0.6	0.6	0.6	
20–29	25.0	26.1	24.4	
30–39	20.4	17.6	21.9	0.941
40–49	19.6	20.5	19.1	
50–59	18.2	18.8	17.9	
≥60	16.2	16.5	16.0	
Education				
Less than high school	51.5	46.3	54.4	
High school graduate	19.2	18.9	19.4	0.173
Some college/vo-tech	13.1	14.3	12.5	
College graduate or higher	16.2	20.6	13.8	
Work status				
Employed full-time	59.5	57.9	60.5	
Employed part-time	9.9	8.2	10.7	0.925
Retired	19.0	21.1	17.9	
Homemaker	7.5	7.6	7.5	
Average personal income				
Less than 1000 Yuan	27.1	35.5	30.0	
1001–2000 Yuan	26.4	20.5	24.4	0.092
2001–3000 Yuan	29.6	23.5	27.5	
More than 3000 Yuan	16.9	20.5	18.7	
Marital status				
Married	86.6	87.5	86.1	
Single	10.4	9.7	10.8	0.750
Others	3.0	2.8	3.1	
Setting				
Urban	49.9	39.4	60.6	0.049
Suburban	50.1	30.8	69.2	
Knowledge about smoking				
Knowledge about SHS	9.5 ± 1.7	9.6 ± 2.2	9.4 ± 1.6	0.172
Knowledge about THS	9.1 ± 1.7	9.2 ± 2.0	9.1 ± 1.5	0.550
Social factors				
Have a smoker at home	61.6	43.8	71.3	<0.001
Average smokers at home	0.8 ± 0.8	0.9 ± 0.7	0.6 ± 0.7	<0.001
Have child(ren) under 18 years old	46.8	49.7	45.2	0.353
Have child(ren) under 5 years old	25.5	32.2	21.9	0.013

Table 1: Continued.

Characteristics	Total $N = 500$	Complete policy $n = 176$	No or partial policy $n = 324$	P
Number of friends/relatives who smoke				
≥half	47.6	36.6	53.6	<0.001
<half	52.4	63.7	46.4	
Number of friends/relatives who permit smoking at home				
≥half	45.8	28.5	54.3	<0.001
<half	54.2	71.5	45.7	
Smoking status				
Current smokers	29.0	17.0	35.5	
Nonsmokers	68.0	81.7	61.1	<0.001
Ex-smokers	3.0	2.3	3.4	
Among smokers				
Number of days of smoking, past 30 days	23.6 ± 10.8	21.2 ± 11.2	24.3 ± 10.4	0.133
Number of quitting attempts, past 12 months	1.9 ± 4.0	3.0 ± 7.4	1.6 ± 2.4	0.080

Table 2: Multiple logistic regression model indicating correlates of having a complete smoke-free home policy.

Predictors	Adjusted OR	95% CI
Gender (female versus male)	0.74	0.43–1.26
Average personal income (ref: <1000 RMB per month)		
1001–2000	0.46	0.35–0.98
2001–3000	0.68	0.35–0.96
More than 3000	0.92	0.53–1.59
Setting (suburb versus urban)	0.69	0.44–1.11
Have a smoker in home	0.37	0.23–0.60
Have child(ren) less than 5 years old	2.04	1.26–3.29
Number of friends/relatives who smoke (<half versus ≥half)	1.04	0.64–1.69
Number of friends/relatives who permit smoking at home (<half versus ≥half)	2.65	1.60–4.20
Current smoker	0.46	0.23–0.93

reasons for creating these policies and the places at home most commonly exempt from any rules about smoking.

The current study showed that 35.3% participants had total smoke-free home policies, with 39.4% having them in the New Pudong Area and 30.8% in Fengxian District. These results indicate higher rates than in prior studies in which rates of 6.3%, 14.2%, and 26% were documented in 2006, 2010, and 2009 [7–9]. This may reflect differences in location, such that smoke-free home policies are more common in Shanghai than in other areas in China or may reflect an overall increasing prevalence of smoke-free homes since these earlier studies. The passage of smoke-free policies in the workplaces and public places may be resulting in a shift in social norms and ultimately in more voluntary smoke-free homes [22]. The establishment of smoking control legislation in public places in Shanghai, which had a positive influence on broad social norm changes [25], may account in part for the increased prevalence of smoke-free homes documented here. However, because Shanghai only implemented a partial smoke-free public policy with limited enforcement, positive change on social norms and behavior is not as obvious as in other countries with 100% smoke-free policies. Given the fact that a higher proportion of Chinese adults are exposed to SHS at home than in most other low- and middle-income countries with a high burden of tobacco use [26], there is considerable work yet to be done to promote voluntary smoke-free policies in private spaces in China.

The results of this study showed that social factors were significant correlates of having a smoke-free home policy. Having children less than 5 years of age was an important factor. The one child family planning policy in China promotes the value and status of children at home, which is also a good opportunity to advocate for having a smoke-free home policy in families with children. However, having children under 18 years old was not associated with having a complete smoke-free home policy, which is consistent with other studies [27, 28]. People tend to believe that older children may not be sensitive to SHS. Educational outreach should grasp

Table 3: Reasons for establishing a smoke-free home comparing those with a complete smoke-free home policy with those without a complete policy (%).

Characteristic	Total $N = 500$	Complete policy $n = 176$	No or partial policy $n = 324$	P
Health concerns[a] score, mean ± SD	2.74 ± 0.64	2.83 ± 0.54	2.69 ± 0.65	0.045
To protect your family from the harmful effects of secondhand smoke, %	95.2	95.5	95.1	0.841
To avoid being bothered by tobacco smoke, %	88.1	93.6	85.1	0.005
To show that you care about the health of people you live with, %	90.7	93.7	89.1	0.090
Children concerns[b] score, mean ± SD	1.79 ± 0.47	1.88 ± 0.38	1.75 ± 0.51	0.001
To discourage children from starting to smoke, %	91.8	93.7	90.7	0.265
To keep children from getting sick and missing school, %	87.5	94.3	83.8	0.001
Quitting concerns[c], score, mean ± SD	1.80 ± 0.55	1.84 ± 0.51	1.78 ± 0.57	0.227
To encourage yourself/smokers you live with to smoke less, %	91.2	92.6	90.4	0.413
To encourage yourself/smokers you live with to quit smoking, %	89.0	91.5	87.7	0.192
Cleanliness concerns[d], score, mean ± SD	2.37 ± 0.92	2.54 ± 0.75	2.28 ± 0.99	0.001
To avoid unpleasant odors	88.6	91.4	87.0	0.142
To make the home easier to clean, %	84.9	92.5	80.7	<0.001
To make the home easier to sell or rent, %	63.9	70.1	60.5	0.030
Other concerns[e], score, mean ± SD	2.38 ± 0.91	2.60 ± 0.75	2.27 ± 0.96	<0.001
To avoid annoying others, %	85.3	91.3	82.0	0.005
To reduce the chance of having a house fire, %	82.6	90.8	78.2	<0.001
To protect the health of pets, %	62.1	73.8	55.8	<0.001

[a]Health concerns = sum score of three items (0 = no, 1 = yes).
[b]Kids concerns = sum score of two items (0 = no, 1 = yes).
[c]Quit concerns = sum score of two items (0 = no, 1 = yes).
[d]Cleanliness concerns = sum score of three items (0 = no, 1 = yes).
[e]Other concerns = sum score of three items (0 = no, 1 = yes).

Table 4: Places where smoking is allowed among participants with a partial policy versus those with no policy (%).

Characteristic	Total $N = 324$	Partial smoke-free policy $n = 182$	No smoke-free policy $n = 142$	P
Family/living room	64.2	60.9	68.8	<0.001
Kitchen	46.1	39.8	54.3	<0.001
Bathroom(s)	33.8	23.3	47.4	<0.001
Your bedroom	23.5	8.3	44.2	<0.001
Other adult's bedroom(s)	22.2	11.2	37.2	<0.001
Children's bedroom(s)	17.1	9.0	28.1	<0.001

these opportunities and focus on the information that SHS is dangerous to all nonsmokers of all ages, including older children and adolescents.

Having smokers at home was also an important factor related to establishing a smoke-free home. The realities of smoke-free home policies are different in families with smokers or without smokers. For the nonsmoking family, these policies are mainly established for visitors; for the smoking family, these policies are set up for both residents and visitors. As presented in other studies, participants without smokers at home report higher prevalence of smoke-free policies compared to those with household members that smoke [22]. Smokers who live in a smoke-free home have been shown to be more likely to have made a quitting attempt and maintain abstinence compared to smokers without a smoke-free home, indicating that smoke-free home policies act as a part of effective cessation support systems. For families without smokers, establishing a smoke-free home policy is also important not

only to protect the health of families, but also to reduce the risk for adolescents initiating smoking. Studies suggested that the lack of smoke-free home policies, even in homes without smoking parents, may weaken communication of parental antismoking values [29]. Therefore, the concept of a smoke-free policy should be advocated in all households, regardless of household composition and smoking status. Moreover, we documented a negative association between the perceived proportion of relatives or friends who allow smoking at home and having a smoke-free home. This suggests that smoking bans among their friends and relatives may also work as an interpersonal stimulus or reinforcement to establish household smoking bans.

Health concern was the most important reason for implementing a smoke-free policy, indicating an understanding of the health effects of SHS and potentially THS. Still some people allowed smoking in certain rooms instead of going totally smoke-free. Roughly 64% of participants reported that smoking was allowed in the living room and roughly 45% reported smoking was allowed in the kitchen. Studies have confirmed that a complete smoke-free home versus a home with some level of restrictions is more effective in reducing the likelihood of adolescents smoking and increasing the likelihood of quitting attempts among the smokers [22–24]. The fact that the current Shanghai smoking control legislation permits smoking rooms in some public places may contribute to a misconception among individuals that these partial restrictions are sufficient.

Compared to participants with low average income (less than 1000 RMB per month), participants with middle average income (1001–3000 RMB per month) were less likely to report smoke-free home policies. Similar association was found in other studies [15, 16, 28]. The importance of establishing a smoke-free home has not been completely understood by the general public in China based on our findings indicating where smoking is most commonly allowed among those without a smoke-free home.

It is clearly stated in "the Twelfth Five-Year Plan for Economic and Social Development of China" that smoking should be prohibited in public places [30]. International experience in tobacco control showed that increases in smoke-free homes often follow smoke-free workplace and public place legislation; therefore, it is expected that there would be more households going smoke-free in the future in China as tobacco control is strengthened. Establishing smoke-free home policies is not a separate part of tobacco control, rather, it should be integrated into a comprehensive tobacco control strategy.

Several limitations in this study need to be addressed. This survey relied on self-report by participants, which may lead to some recall and social desirability bias. As a cross-sectional study, when exploring the factors associated with having a smoke-free home policy, there is uncertainty regarding the temporal sequence between establishing a smoke-free home and social factors related to rules about smoking at home. In addition, information about smoking behaviors and quitting intentions of smokers in the household were not collected if the respondent was not a smoker. Also, our sample size of 500 participants, while reasonably large and well powered, does not allow us to further stratify analyses. Furthermore, there may be some significant difference in attitudes towards smoke-free home policies between those who agreed to participate in this study and those who refused to participate. Despite the limitations, this study provides empirical evidence for the need to promote smoke-free home policies in Shanghai and, more generally, in China.

5. Conclusions

In conclusion, this study documented the prevalence of smoke-free home policies and factors associated with having such a policy in Shanghai. In addition, it examined the most common reasons for going smoke-free and documented places most commonly exempted from any restrictions at home. These findings have important implications for informing tobacco control efforts aimed at decreasing SHS exposure and altering social norms regarding smoking in China.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Research Article

An Investigation of Cigarettes Smoking Behavior and Nicotine Dependence among Chinese Methamphetamine Users in Two Provinces

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Objective. To survey cigarette behaviors and nicotine dependence among Chinese MA users, explore risk factors for high nicotine dependence, and analyze the relationship between nicotine dependence and MA-related euphoria and sexual impulse. *Methods*. A cross-sectional study, applying a self-designed questionnaire with the Fagerström Test for Nicotine Dependence (FTND) and Visual Analog Scale (VAS), was performed among 391 MA users in Beijing and Guangdong, China. *Results*. Most MA users were smokers, including 159 having high dependence on nicotine (HD users, FTND > 5) and 197 low or medium dependent (LMD users, FTND ≤ 5). Men or married users were more likely to be highly dependent than women or unmarried users. Higher MA dose and ever-use of ketamine or alcohol were associated with higher likelihood of high nicotine dependence. HD users reported significantly higher euphoria and stronger sexual impulse after using MA, indicated by higher VAS scores. *Conclusions*. Potential risk factors for high nicotine dependence among MA users may include male gender, being married, higher MA dosage, and ever-use of ketamine or alcohol, which should be taken into consideration in individualized health promotion on smoking cessation. Severe nicotine dependence was associated with stronger MA-related euphoria and sexual impulse and it should be confirmed by further studies.

1. Introduction

Methamphetamine (MA), with street names of "glass," "ice," and "meth," is one of amphetamine-type stimulants (ATS) with significant abuse potential and neurotoxic effects and it causes the release of central and peripheral monoamines, resulting in both physical and psychological alterations [1, 2]. MA can result in ATS-related disorders, including use disorder (characteristic of craving, recurrent stimulant use, tolerance, withdrawal, impact on social, occupational, or recreational activities, etc.), intoxication (e.g., significant problematic behavioral or psychological changes, tachycardia or bradycardia, pupillary dilation, elevated or lowered blood pressure, perspiration, or chills), and withdrawal (e.g., dysphoric mood and two or more of physiological changes like fatigue, vivid, unpleasant dreams, insomnia, or hypersomnia) [3].

According to World Drug Report 2013 published by United Nations Office on Drugs and Crime, ATS (excluding "ecstasy") use remains widespread globally, with an estimated 33.8 million users (0.7 per cent of the global population aged 15–64) in 2011 [4]. In China, synthetic drugs (mainly ATS) users accounted for 38 percent of all registered users in 2012, higher than that in 2010 (28%) [4]. MA is the most commonly abused ATS, and data about seizures of ATS is mainly composed of MA in North America and East and South-East Asia [1, 4]. In 2010, MA seizures were more than double the amount in 2008, partly resulting from seizures increase in Central America and East and South-East Asia [5].

Cigarettes are commonly coused by MA users, and the prevalence of smoking in this population even exceeds 90% in some studies [6, 7]. Several studies show that nicotine may play an important role in MA use and the health effects on MA users [8, 9]. Smoking may be one important stage or inducing factor for using illicit drugs and early exposure to nicotine may precipitate the development of stimulant addiction [8–11]. Severe nicotine dependence may increase the risk of ATS users for depression with OR = 4.02 [12]. One animal study showed that nicotine may be acting through a nonassociative mechanism (at least in part) to reinstate MA-seeking behavior in rats [13].

As nicotine and MA have similar neurobiological basis in drug dependence-dopamine mediated rewarding system [14], MA and nicotine may have some interaction suggested by some studies [15, 16]. One animal study showed that the expression of immediate early genes (IEGs) in dopaminergic projection areas caused by nicotine and MA, when given in combination, was different from those elicited by each drug alone [15]. Another animal study found that nicotine and MA shared discriminative stimulus effects in some subjects and produced their interaction indirectly [16]. Moreover, previous studies have shown a correlation between psychostimulant-induced increase of extracellular dopamine in the striatum and self-reported measures of liking and "high" (euphoria) [17]; therefore, we hypothesized that the interaction between nicotine and MA might be reflected in the association between nicotine dependence and MA-related subjective effects (e.g., euphoria and sexual impulse), which play important roles in MA dependence.

Comprehensive knowledge of nicotine dependence and its relationship with MA-related subjective effects among MA users would be helpful for researchers and medical personnel deepen the understanding of the characteristics of MA, especially those tobacco cousers. However, there is no sufficient data to assist us in getting fully acquainted with the characteristics of nicotine dependence among MA users, especially in China. The purpose of this paper was (1) to investigate the cigarette behaviors and nicotine dependence among Chinese MA users and (2) to analyze risk factors in social-demographic characteristic and MA use pattern associated with high nicotine dependence and explore the relationship between nicotine dependence and MA-related subjective effects (euphoria and sexual impulse).

2. Materials and Methods

2.1. Sample. A cross-sectional study among ATS users was performed in compulsory and voluntary drug detoxification and rehabilitation centers in Beijing and Guangdong provinces, China, in 2010. Beijing lies in the north, while Guangdong province is located in the south. Both Beijing and Guangdong are economically developed and have large proportions of floating population [18, 19]. Estimation of the size of synthetic drug (MA, MDMA, and ketamine) users by Delphi methods was 30,000 (Beijing) in 2005 and 420,000 (Guangdong) in 2006 [20].

Participants should satisfy the following inclusion criteria [12]: (1) over 18 years old, (2) urine test positive for ATS drugs, (3) the criteria for ATS abuse or dependence in Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association), and (4) consented to participate. Participants, with serious physical illnesses such as severe cardiovascular disease, were excluded. Finally, a total of 391 patients who mainly abused MA were enrolled, among whom 356 were cigarette smokers (91.0%) and selected in the statistical analysis.

2.2. Measures. A self-designed questionnaire was applied in the study, and information (including social-demographic characteristics, pattern of drug use, attitudes and motivators towards ATS, subjective effects, impact on physiological function and behaviors after using MA, and smoking and drinking behaviors) was obtained from face-to-face interviews. In this paper, ever-use denotes the participant had ever used the substance before our survey started, but not necessarily concurrent with MA. Visual Analog Scale (VAS) was employed to depict subjective effects (euphoria and sexual impulse), with zero standing for no euphoria or sexual impulse and ten for the strongest feelings. Participants were asked to draw a fork in the straight line to represent their euphoria and sexual impulse after using MA.

The Fagerström Test for Nicotine Dependence (FTND) is a revision of the 8-item scale Fagerström Tolerance Questionnaire (FTQ, published in 1978) by removing item two (nicotine content of cigarettes) and item three (Do you inhale?), because they were found to be unrelated to biochemical measures of smoking dependence [21–24]. FTND has been widely utilized in public health researches to evaluate nicotine dependence. In FTND, the first and the fourth items are scored in a four-point system (0–3 points), while the rest four items scored in two-point system (0-1) [21]. As shown in Table 1, nicotine dependence was divided into low or medium nicotine dependence (0–5 scores, LMD) and high nicotine dependence (6–10 scores, HD) in our study, according to the total scores of FTND.

2.3. Statistical Analysis. Data entry was conducted twice with Epi Data software, version 3.1. Statistical analysis was performed with IBM SPSS Statistics software, version 20. Categorical variables (e.g., gender or education) were reported as percentage (%), while numerical data, including age and age at onset use, were presented as mean ± SD. Euphoria and sexual impulse were indicated in the form of median of VAS scores. Pearson chi-square test was utilized to analyze the association between demographic characteristics or drug use pattern and nicotine dependence, and Fisher's exact test was done if necessary [25]. Two-independent samples t test and nonparametric test model (Mann-Whitney U test) were employed to assess the ages and subjective effects (euphoria and sexual impulse), respectively. The binary logistic model was applied in the assessment of the association between nicotine dependence and potential risk factors identified significant in univariate analysis. Statistically significant findings were judged with a 2-tailed P value of 0.05.

2.4. Ethics Statement. This research protocol was approved by the Institutional Review Board of Peking University

Table 1: Scoring system of Fagerström Test for Nicotine Dependence.

Item[a]	Answers	Points	Response	
			Number	%
(1) How soon after you woke up did you smoke your first cigarette?	Within 5 min	3	127	35.7
	6–30 min	2	140	39.3
	31–60 min	1	41	11.5
	After 60 min	0	48	13.5
(2) Did you find it difficult to refrain from smoking in places where it is forbidden?	Yes	1	154	43.3
	No	0	202	56.7
(3) Which cigarette would you most hate to give up?	The first one in the morning	1	188	52.8
	Any other	0	168	47.2
(4) How many cigarettes per day did you smoke?	10 or less	0	73	20.5
	11–20	1	163	45.8
	21–30	2	56	15.7
	31 or more	3	64	18.0
(5) Did you smoke cigarette more frequently during the first hours after awakening than during the rest of the day?	Yes	1	120	33.7
	No	0	236	66.3
(6) Did you smoke cigarettes even if you were ill in bed much of the day?	Yes	1	207	58.1
	No	0	149	41.9
Total scores	Low or medium (LMD)	0–2	59	16.6
		3-4	91	25.6
		5	47	13.2
	Severe or high (HD)	6-7	78	21.9
		8–10	81	22.8

[a] All the 6 questions were answered according to their cigarette smoking behaviors after participants began using MA usually.

Health Center. Trained interviewers clearly explained the significance, aims, and content of the survey to the potential participants at the beginning of each survey and guaranteed that participants' private information would be kept secret. The face-to-face interviews were then conducted if the participants signed informed consent.

3. Results

3.1. Nicotine Dependence and Smoking Behaviors among MA Users. As shown in Table 1, of the 356 smokers, 197 (55.4%) were low or medium dependent on nicotine, and 159 were high nicotine dependent. Seventy-five percent of smokers often smoked the first cigarette within half an hour after waking up, and 66.3% smoked 1–20 cigarettes per day. 154 (43.3%) smokers found it difficult to refrain from smoking, and 207 (58.1%) still smoked even when they were ill in bed, while 188 (52.8%) thought they were reluctant to give up the first cigarette in the morning.

3.2. Social-Demographic Characteristics and Nicotine Dependence among MA Users. Most participants were male (76.1%) and Han people (88.6%) in our study (Table 2). 227 subjects (64.9%) had an education level lower than senior high school and approximately 10 percent finished their education in college or university. 235 subjects were unmarried (single or ever married but divorced or separated) when enrolled in our investigation. 145 smokers were unemployed (40.7%) and 112 were engaged in their private business (31.5%).

No significant difference was observed in education, ethnicity, occupation, age, and age of initial use of MA between LMD and HD users. HD users were elderly and tended to begin MA use later (with an average age of 28.9) than low-dependent ones (LMD), but not statistically different. However, there were significant disparities in gender and marriage status between LMD and HD users. Men (49.4%) were more likely to be highly dependent on nicotine than women users (28.9%), with a P value of 0.001. Lower proportions of HD users (32.3%) were observed in those unmarried (single and divorced or separated).

3.3. Association of Drug Use and Nicotine Dependence among MA Users. As shown in Table 3, 128 users had been in detoxification treatment before, occupying 36 percent of the whole subjects. Most MA users chose smoking as their main route of drug administration. The median MA dose of the whole subjects was 0.2 gram, and 166 users (47.3%) usually abused more than 0.2 gram per time. In our study, 20.7% of MA users ever used heroin and 19.2% ever used MDMA, 21.4% ketamine, and 53.3% alcohol.

Before this entry into treatment, participants had used MA for 8 months in median and the difference of cumulative use time between LMD and HD users was not significant ($P = 0.522$). Furthermore, in contrast with greater-MA-dose smokers, those in the smaller dose group (≤0.2 g) had less likelihood of becoming highly dependent on nicotine (36.8% versus 54.2%), with a P value of 0.001. Significant difference was observed between LMD and HD users in terms of other psychoactive substances. By comparison with that of those not using ketamine, the proportion of HD users was higher in those using ketamine (55.3 versus 41.9%). Higher percentage of HD users (59.4% versus 40.9%, 60.3% versus

Table 2: Association between social-demographic characteristics and nicotine dependence among MA users.

	FTND					
	LMD (≤5)		HD (>5)		χ^2	P
	n	%	n	%		
Gender					10.838	0.001
Male	137	50.6	134	49.4		
Female	59	71.1	24	28.9		
Education					0.076	0.995
Primary school or illiterate	28	56.0	22	44.0		
Junior high school	98	55.4	79	44.6		
Senior high school	48	54.5	40	45.5		
College or above	20	57.1	15	42.9		
Ethnicity					0.017	0.895
Han	169	53.5	147	46.5		
Other	11	55.0	9	45.0		
Marriage status[a]					11.334	0.001
Unmarried	145	61.7	90	38.3		
Married	52	43.0	69	57.0		
Occupation					4.489	0.106
Unemployed	90	62.1	55	37.9		
Private businessmen	57	50.9	55	49.1		
Other	50	50.5	49	49.5		
Age (years)	30.7 ± 7.5		31.9 ± 7.6		−1.560	0.120
Age of initial use (years)	27.8 ± 7.6		28.9 ± 7.9		−1.403	0.162

[a]Unmarried refers to being single or ever married but divorced or separated.

41.1%, resp.) was also observed among those ever using heroin and MDMA. 53.3% of subjects had experiences of drinking, 50.5% of whom were HD users.

3.4. Multivariate Analysis of Risk Factors for Severe Nicotine Dependence. Significant factors identified by univariate analysis as shown in Tables 2 and 3 were included in a binary logistic regression model for nicotine dependence, but ever use of MDMA ("Ecstasy") and heroin was excluded from the final version of equation as their P values were greater than 0.05.

The logistic regression analysis (Table 4) showed that gender (OR = 2.615) and marriage status (OR = 1.938) were associated with nicotine dependence. Those who usually used MA more than 0.2 g per time and those ever using ketamine or alcohol besides MA had higher likelihood of becoming highly dependent on nicotine, with ORs of 1.659, 2.044, and 1.699, respectively.

3.5. Nicotine Dependence and Subjective Effects (Euphoria and Sexual Impulse). In Table 5, univariate analysis showed that, compared with LMD users, HD MA users reported significantly stronger euphoria after usual MA use or use for the first time, with higher VAS scores (5.20 versus 3.65 and 6.70 versus 3.00). Similarly, HD users reported stronger sexual impulse after using MA (7.60 versus 5.90).

In subgroup analysis with gender, HD users still reported significantly higher euphoria after onset and usual use of MA than LMD users, no matter male or female, with all P values smaller than 0.01. However, female HD users reported similar sexual impulse than female LMD ones ($P > 0.05$). Taking dose of MA into consideration, there still was difference between HD and LMD users in terms of euphoria of onset use and sexual impulse. But no significant difference was observed in self-reported euphoria after using MA usually among those using MA more than 0.2 g, $P = 0.050$.

4. Discussion

In our study, the prevalence of smoking among MA users was 91%, which was similar to previous studies among heroin users (99.4%) [26] and ATS users in Taiwan (91.5%) [6] and Zhejiang province (98.9%) [7], but much higher than that of general Chinese adult population (23%, estimated by WHO) in 2011 [27]. We did not retrieve any literature done to explore risk factors of nicotine dependence for MA users in China and our results illustrate that MA users who are male, married, using MA more than 0.2 g, and ever using ketamine and alcohol may be at higher risks of severe dependence on nicotine.

4.1. Nicotine Dependence and Smoking Behaviors among MA Users. Bao et al. reported that 67.2% of Chinese opiate addicts were highly dependent on nicotine (FTND score ≥7.0), with a similar range of age (30.4 ± 6.0) and a similar gender ratio (80.5% of male) to MA users in our research [26]. In our study, 55.4% of MA users had a FTND score of 5 or less and only 22.8% over 7, suggesting a lower dependence of MA users on nicotine compared with heroin users. In terms of cigarettes quantity, heroin addicts smoked 34.9 cigarettes per day on average during the phase of addiction [26], but only 18.0% of MA users smoked 31 or more cigarettes per day in our study.

Table 3: Association between drug-use pattern and nicotine dependence among MA users.

	FTND					
	LMD (≤5)		HD (>5)		χ^2	P
	n	%	n	%		
Treatment times					0.725	0.395
First entry	130	57.0	98	43.0		
More than once	67	52.3	61	47.7		
Cumulative use time					0.410	0.522
≤8 months	102	56.7	78	43.3		
>8 months	90	53.3	79	46.7		
Administration route of MA						
Smoking	193	55.1	157	44.9		0.696
Intravenous injection	2	100.0	0	0		0.504
Usual dose of MA					10.776	0.001
≤0.2 g	117	63.2	68	36.8		
>0.2 g	76	45.8	90	54.2		
Ever-use of heroin[a]					7.582	0.006
No	156	59.1	108	40.9		
Yes	28	40.6	41	59.4		
Ever-use of MDMA ("Ecstasy")[a]					8.178	0.004
No	169	58.9	118	41.1		
Yes	27	39.7	41	60.3		
Ever-use of marijuana[a]					2.396	0.122
No	181	56.60	139	43.40		
Yes	15	42.90	20	57.10		
Ever-use of ketamine[a]					4.290	0.038
No	162	58.1	117	41.9		
Yes	34	44.7	42	55.3		
Ever-use of alcohol[a]					6.729	0.009
No	102	63.4	59	36.6		
Yes	91	49.5	93	50.5		

[a]Ever-use means the participant had ever used the substance before the survey started, but not necessarily concurrent with MA.

Compared with studies among general population [28], the mean FTND score and proportion of severe nicotine dependence (FTND score >5) were much higher in our study. In a study of 1477 male smokers and 115 female smokers among Chinese dwellers [28], the average FTND score was 2.89 and only 27.1% were considered dependent (FTND ≥4). In our study, the percentages of participants smoked the first cigarette within 30 minutes after they woke up (75%) and participants reluctant to give up the first cigarette in the morning (52.8%) were also higher than those of the general population, implying a severe nicotine withdrawal among MA users [22, 28].

Moreover, MA dose was also found to be an independent risk factor for severe nicotine dependence in our study and those using MA more than 0.2 g/time had higher possibility to be HD users. In contrast, a previous study regarding heroin addicts found heroin dosage to be not significantly relevant with nicotine dependence, with OR = 1.02 (95% CI: 0.62–1.58) [26].

Our study suggests that MA may increase the cigarettes smoking and deepen nicotine dependence, which is consistent with some previous studies. One study [29] showed that *d*-amphetamine dose-dependently decreased the average duration of intervals between successive cigarettes smoked and increased the overall rate of smoking and preference for cigarette smoking over monetary reinforcement as well. Both 10 and 20 mg doses of amphetamine increased the number of cigarettes (1.4 ± 0.7, 1.8 ± 0.8, resp.) than during the placebo session [30]. Another study [31] revealed that methylphenidate (Ritalin, another kind of ATS) increased the total number of cigarettes smoked, number of puffs, and carbon monoxide levels as an orderly function of dose. In addition, among users of another stimulant-cocaine, cigarette smokers responded most strongly that using cocaine increased both the urge to smoke (78.8 ± 2.3, with 100 the strongest) and cigarette quantity (81.0 ± 2.3, with 100 the strongest) [32].

4.2. Analysis of Factors for Severe Nicotine Dependence. Some researchers [33–35] have found that males are more likely to be hardcore smokers (daily smokers with high nicotine dependence) than women. Consistent with those studies in general population, our study also showed that males have greater likelihood to be highly dependent on nicotine than females. Gender difference was also observed in tobacco smokers who used that and men had higher FTND scores and smoked more cigarettes [36].

Table 4: Binary logistic regression of risk factors for severe nicotine dependence (FTND > 5).

Risk factors	*n*	OR	95% CI of OR
Gender			
Male	271	2.615	1.345–5.086
Female	83	1	
Marriage			
Unmarried[a]	235	1	
Married	121	1.938	1.159–3.239
Ever-use of ketamine[b]			
No	279	1	
Yes	76	2.044	1.074–3.890
Ever-use of alcohol[b]			
Yes	184	1.699	1.057–2.732
No	161	1	
Usual dose of MA			
≤0.2 g	185	1	
>0.2 g	166	1.659	1.015–2.712

[a]Unmarried refers to being single or ever married but divorced or separated.
[b]Ever-use means the participant had ever used the substance but not necessarily concurrent with MA before the survey started.

In the study on heroin population [26], the number of times of relapse to heroin was positively related to nicotine dependence and those having relapsed to heroin 3 or more times had higher possibility to report severe nicotine dependence (OR = 1.89). However, in our study precise information of the relapse was not included in the questionnaire and only information on treatment times to detoxification center was collected. Our results displayed that 47.7% of MA users who had been treated more than once in detoxification center were highly dependent on nicotine, but this proportion was not significantly greater than that of those treating for the first time (43.0%).

Polydrug use was reported to be an independent risk factor (OR = 3.66, 95% CI = 2.08–6.45) associated with severe nicotine dependence among Chinese opiate addicts [26]. In our study, ever use of ketamine was proved to be associated with high nicotine dependence, with OR = 2.044. In one animal experiment, application of psychotomimetic ketamine concentrations to striatal slices augmented nicotine-evoked [^{3}H] overflow and hyperactivity was observed after receiving ketamine injections for 30 days, which indicates that function of nicotinic acetylcholine receptors that mediate dopamine release is altered by ketamine [37]. More studies are still necessary to investigate the influence of ketamine on nicotine dependence.

Higher risks for severe nicotine dependence existed in those ever-use of alcohol, with OR = 1.699. A similar finding was reported in a case-control study, which found that 83 percent of alcoholics were smokers but only 34% among the nonalcoholic subjects [38]. In a cross-sectional epidemiological study [39] among Singapore residents, a positive association of alcohol abuse with nicotine dependence was significant with OR = 3.1. Another study revealed that alcohol significantly increased tobacco craving and tended to decrease the latency to start smoking [40].

Consistent with our results, some studies show that [28, 41] marriage is associated with nicotine dependence and tobacco consumption. Women above 30 years of age, being married, and living in a joint family were more likely to consume tobacco [42]. One study among heroin and cocaine users also suggests that regular and heavy cigarette smokers were more likely to have a history of a prior marriage [43]. Several factors, including smoking behaviors of the family members (especially their spouses) of the MA users and marital conflict, may serve as interpretation of potential influence of marriage on nicotine dependence, yet more studies are necessary to offer more information. Several studies suggest that spouse plays an important role in one's change of smoking behaviors [44, 45]. One study found that marital conflict was related to nicotine dependence among women and marital satisfaction was also found to be different between nicotine-dependent and nondependent women participants in the US naval services [41].

4.3. Relationship of Nicotine Dependence and MA-Related Subjective Effects (Euphoria and Sexual Impulse). Although the difference in some subgroups according to gender and dose of MA was not significant, higher nicotine dependence was generally found to be associated with self-reported stronger euphoria and sexual impulse in our study, which suggested that nicotine might enhance the subjective and physiological effects of MA. Similar findings were detected among cocaine users in several previous studies. In a study [32] on cocaine users, participants were asked "Does nicotine affect the HIGH that you experience from cocaine?" and "Does nicotine affect your desire for cocaine?" (−5, reduces effect; 0, no change; +5, increases effect), and the average scores were 1.3 ± 0.2 and 0.8 ± 0.2, respectively. This suggested that nicotine would produce a small increase in the high experienced when using cocaine and a small increase in the desire to use cocaine [32].

Methamphetamine (MA), like other stimulants, primarily produces its reinforcing and psychostimulant actions through the brain reward circuit, whose main components are thought to include the mesocorticolimbic dopamine system [10]. Dopamine release mediates the rewarding effects of stimulants, either facilitating release (e.g., amphetamines) or blocking uptake (e.g., cocaine) of dopamine [10, 46, 47]. MA produces its acute effects of modulating dopamine release by acting at the vesicular monoamine transporter-2 and the plasmalemmal dopamine transporter, and acute exposure to MA typically results in large increases in dopamine levels in the dorsal striatum [2]. Meanwhile, nicotine seems to produce its reinforcing and psychostimulant effects by enhancing dopaminergic activity through blockade of dopamine reuptake and increasing synaptic dopamine release [48].

One animal experiment found that 5-time nicotine administrations at 3-day intervals developed a significant locomotor stimulant effect and caused an enhanced sensitivity (cross-sensitization) to MA, although nicotine had no effect at first administration [49]. Another animal studyusing

Table 5: MA-related subjective effects (VAS score) between two nicotine-dependent groups.

Subjective feelings	Subgroup factors	FTND		Z	P
		LMD (≤5)	HD (>5)		
Euphoria of onset use		3.00	6.70	−7.613	<0.001
Gender	Male	3.50	7.10	−6.214	<0.001
	Female	1.40	4.10	−2.453	0.014
Dose of MA	≤0.2 g	2.50	6.00	−5.127	<0.001
	>0.2 g	4.65	7.10	−3.814	<0.001
Euphoria of usual use		3.65	5.20	−5.000	<0.001
Gender	Male	4.50	5.20	−3.062	0.002
	Female	2.10	4.70	−4.004	<0.001
Dose of MA	≤0.2 g	2.70	5.15	−3.796	<0.001
	>0.2 g	4.70	5.50	−1.956	0.050
Sexual impulse after using MA		5.90	7.60	−5.870	<0.001
Gender	Male	6.30	7.70	−5.655	<0.001
	Female	3.50	5.35	−1.783	0.075
Dose of MA	≤0.2 g	5.30	8.40	−5.689	<0.001
	>0.2 g	6.45	7.15	−2.186	0.029

guinea pig brain slices shows that nicotine acts directly in striatum where it enhances dopamine release during phasic but not tonic activity, which may serve as a mechanism for nicotine facilitation of reward-related dopamine signals [50].

4.4. Limitations. Due to the cross-sectional study design, our research cannot confirm that nicotine directly reinforces the subjective effects of MA and MA does increase the dependence on nicotine. Moreover, detailed information on smoking, such as the reason for smoking cigarettes and the initial age of smoking, was not included in our research plan. Thirdly, reporting bias and recall bias were possible in our study, which may result in inaccurate assessment of the MA use pattern. Finally, our study conducted in Beijing and Guangdong can provide some useful clues of characteristics of Chinese MA users, but we did not obtain information on household registration in our study so we did not discuss the difference between the two provincial regions. Studies covering bigger geographical areas with larger sample size would provide more information on cigarette smoking behaviors and nicotine dependence among MA users and difference between different areas can be further analyzed as well.

5. Conclusions

Our findings suggest that difference in social-demographical characteristics (gender and marriage) and MA use pattern (MA dosage and ever-use of other psychoactive substances) may result in disparities in nicotine dependence among MA users. Understanding of the status of nicotine dependence would help us better comprehend MA-related subjective feelings as MA users with severe nicotine dependence might experience stronger euphoria and sexual impulse after MA administration. Prospective studies and animal experiments are required to provide more confirmation of potential risk factors for nicotine dependence and to explore its association with MA-related subjective effects. Our findings suggest that we should consider gender, marital status, and use of other psychoactive substances when providing health education on tobacco control and smoking cessation among MA users, which may be beneficial to improve individualized health promotion.

Conflict of Interests

The authors declare that no conflict of interests exists regarding the publication of this paper.

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Research Article

Correlates of Cessation Success among Romanian Adults

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Background. Tobacco smoking and its consequences are a serious public health problem in Romania. Evidence-based data on factors associated with successful smoking cessation are crucial to optimize tobacco control. The aim of the study was to determine the sociodemographic and other factors associated with smoking cessation success among adults. *Materials and Methods*. Data was from a sample of 4,517 individuals derived from the Global Adult Tobacco Survey (GATS). GATS is a cross-sectional, nationally representative household survey implemented in Romania in 2011. Data was analyzed with logistic regression. *Results*. Among females, the quit rate was 26.3% compared with 33.1% in males ($P < 0.02$). We found disparities in cessation success among the analyzed groups of respondents. Being economically active, being aged 40 and above, and having an awareness of smoking health consequences were associated with long-term quitting smoking among men, while initiating smoking at a later age increased the odds of quitting smoking among women. However, cohabitation with nonsmokers was the strongest predictor of successful cessation among both genders. *Conclusion*. Programs increasing quit rates and encourage cessation among groups less likely to quit, adopting voluntary smoke-free homes, and increasing the awareness of smoking and tobacco pollution risks are needed.

1. Introduction

Tobacco smoking and its adverse consequences are a serious public health problem in Romania. Smoking prevalence in 2011 was 37.4% and 16.6% among adult men and women, respectively [1]. According to the World Health Organization, in Romania, tobacco was responsible for 16% of all noncommunicable diseases (NCDs) compared with 20% of all communicable diseases [2]. The proportion of deaths attributable to tobacco was approximately 24% for men and 6% for women. Among those who died prematurely, almost one in every 4 deaths (population aged 30–44) and one in 3 deaths (population aged 45–59 years) were attributable to tobacco use.

Peto et al. estimate that smokers who die as a result of their tobacco consumption die 14 years earlier than people who never smoked [3]. Expressed in life years, it was calculated that in 2010, about 9.94 million years were lost prematurely. The estimated loss to society caused by premature deaths associated with smoking amounts to a monetized value of 517 bEUR for the EU, which corresponds to about 4.7% of the gross domestic product (GDP) [3]. Romania was hugely affected with an estimated loss of 26,611 mEUR, which corresponds to about 11.2% of the GDP. However, the losses caused by tobacco extend beyond the costs of premature deaths and also affect other aspects of society functions.

To decrease the burden of smoking-induced disease as well as related society costs, there is a need to reduce smoking. Increasing the cessation rate is considered the only high-impact strategy that can determine a significant improvement in a relatively short term [4]. There are many approaches and interventions at individual as well as population levels that have been assessed and implemented, and their effective results could serve as an example [4–9].

In regard to the above, the purpose of this study was to determine the sociodemographic and other factors (including risk awareness of smoking and environmental tobacco

smoke harm or cohabitation with a smoker) associated with successful smoking cessation among Romanian adults in order to provide evidence-based data to develop well-tailored, effective tobacco control strategies.

2. Material and Methods

Data on smoking status, sociodemographic and other characteristics of respondents were derived from the Global Adult Tobacco Survey (GATS). Detailed methodology of the survey was described elsewhere [1, 10, 11]. Romania belongs to the EURO World Health Organization countries and it is also one of the GATS family countries that implemented survey in years 2009–2011, alongside the Russian Federation, Poland, and Ukraine. Global Adult Tobacco Survey is a cross-sectional, nationally representative household survey [11]. GATS data were collected electronically by trained pollsters during in-person interviews. The target population was non-institutional residents aged 15 years and older. According to the GATS sample selection requirements, a two-phase sampling for GATS Romania was conducted in which a subsample of primary sampling units (PSUs) was selected from the master sample EMZOT (Multifunctional Sample on Territorial Areas) [1]. The final probability selection of the sample units was equivalent to those being selected under three-stage stratified-cluster sampling, which were selected in order to produce key indicators for the whole country, also classified by residence (urban or rural) and by gender. Of the 5,629 sampled households, 4,601 were completely filled in the household interview, and the computed household response rate was 89.9%. The household response rate was higher in rural areas than in urban areas (95.8% and 85.6%, resp.). Among individuals selected from the completely screened households, 4,517 completed the individual interview, and the computed person-level response rate was 98.4%. The total response rate was 88.5%.

Data used for current analysis is publicly available from the Global Tobacco Surveillance System (GTSS).

3. Study Variables

The outcome variable was successful smoking cessation for one year or longer among adults in Romania. A successful quitter was defined as regular smoker (consuming at least one cigarette per day) who had stopped smoking for at least one year prior to the interview. Those respondents who had quit smoking more recently were considered recent quitters. A current smoker was defined as someone who had smoked more than an average of one cigarette per day on a regular basis for at least one year. The ever smokers group include all the above-mentioned categories including respondents who were current, former smokers and recent quitters. Overall lifetime cessation rates or "quit rates" were calculated, as the number of former smokers divided by the number of ever smokers and multiplied by 100% [10].

The exposure variables applied for determining associations of successful cessation were the gender (male, female) and age (under 25, 25–29, 30–39, 40–49, 50–59, and 60 years and older) of the respondents. Moreover, age at smoking onset, the age at which respondents started to smoke tobacco on a regular basis, was considered (≤17, 18–20, and 21 years or over). Educational attainment was regarded as primary education, secondary education, and high education. Accordingly, occupational classification of respondents was described as economically not active (pupils, students, persons occupied with household keeping, retired, and pensioners due to disability), currently with a permanent job as employed, and currently with no permanent job as unemployed able to work and unemployed unable to work. Furthermore, respondents' place of residence was a rural or urban area. Socioeconomic circumstances, including ownership of different household items, were also evaluated. The variable called "Asset Index" was created based on summative score of possession of the following assets: functioning electricity, flush toilet, fixed telephone, cell telephone, television, radio, refrigerator, car, washing machine, computer, and internet access. The summative score was then divided into, high, medium, and low. Similar methodology has been validated elsewhere [12]. We also assessed the awareness of the negative health consequences of smoking. Respondents were categorized as aware (those who answered "yes" to the following question: do you think that tobacco smoking causes serious diseases?) and not aware (those who answered "no" and "do not know"). Similarly, awareness of the adverse health consequences of environmental tobacco smoke (ETS) exposure was determined and respondents were characterized as aware and not aware. In addition, we considered cohabitation with a smoker (yes, no).

4. Analysis and Statistics

The STATISTICA Windows XP version 8.0 program was used to perform the statistical analysis. Firstly, a descriptive analysis for all variables included in the study was completed. All analyses were performed separately for men and women. Logistic regression model was implemented to compare those who successfully quit (former smokers who quit ≥1 year) with those who continued to smoke (current daily smokers). We used logistic regression analyses of unweighted data to calculate the odds ratios (ORs) and the 95% confidence interval (CI) of each indicator on outcome measure. In the first stage, crude coefficients, odds ratios (OR) of the impact of odd variables on the successful smoking cessation in males and females, were calculated. This was followed by a multifactorial analysis considering the simultaneous effect of all statistically significant variables on the possibility of successful smoking cessation.

5. Results

The sample comprised 4,517 respondents, of which 450 subjects (336 men and 114 women) had successfully quit smoking and had not smoked for at least 1 year before the interview. The distribution of former, current, and ever smokers, recent quitters, and quit rates of the study sample by gender are available in Table 1.

Table 1: Characteristics of former, current, ever smokers, recent quitters, and quit rates by gender—Global Adult Tobacco Survey Romania 2011.

Characteristic	Male $N = 1015$					Female $N = 433$				
	Former smokers $N = 336$ N (%)	Recent quitters $N = 22$ N (%)	Current smokers $N = 657$ N (%)	Ever smokers $N = 1015$ N (%)	Quit rate[A] %	Former smokers $N = 114$ N (%)	Recent quitter $N = 18$ N (%)	Current smokers $N = 301$ N (%)	Ever smokers $N = 433$ N (%)	Quit rate[A] %
Overall	336 (33.1)	22 (2.2)	657 (64.7)	1015 (100.0)	33.1	114 (26.3)	18 (4.2)	301 (69.5)	433 (100.0)	26.3
Age (years)										
<25	4 (1.2)	0 (0.0)	61 (9.3)	65 (6.4)	6.2	2 (1.8)	2 (11.1)	29 (9.6)	33 (7.6)	6.1
25–29	7 (2.1)	2 (9.1)	61 (9.3)	70 (6.9)	10.0	5 (4.4)	2 (11.1)	28 (9.3)	35 (8.1)	14.3
30–39	28 (8.3)	0 (0.0)	140 (21.3)	168 (16.5)	16.7	24 (21.1)	2 (11.1)	67 (22.3)	93 (21.5)	25.8
40–49	46 (13.7)	9 (40.9)	159 (24.2)	214 (21.1)	21.5	18 (15.8)	6 (33.3)	74 (24.6)	98 (22.6)	18.4
50–59	68 (20.2)	6 (27.3)	140 (21.3)	214 (21.1)	31.8	29 (25.4)	1 (5.6)	69 (22.9)	99 (22.9)	29.3
≥60	183 (54.5)	5 (22.7)	96 (14.6)	284 (28.0)	64.4	36 (31.6)	5 (27.8)	34 (11.3)	75 (17.3)	48.0
Missing data	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	—	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	—
Age at smoking onset										
≤17	131 (39.1)	6 (35.3)	284 (43.3)	421 (41.8)	31.1	17 (14.9)	4 (28.6)	89 (29.7)	110 (25.7)	15.5
18–20	131 (39.1)	9 (52.9)	266 (40.6)	406 (40.2)	32.3	45 (39.5)	3 (21.4)	105 (35.0)	153 (35.8)	29.4
≥21	73 (21.8)	2 (11.8)	106 (16.2)	181 (18.0)	40.3	52 (45.6)	7 (50.0)	106 (35.3)	165 (38.5)	31.5
Missing data	1 (0.3)	5 (22.7)	1 (0.2)	7 (0.7)	—	0 (0.0)	4 (22.2)	1 (0.3)	5 (1.2)	—
Education										
Primary or less	34 (10.2)	0 (0.0)	39 (5.9)	73 (7.2)	46.5	7 (6.2)	2 (11.1)	22 (7.4)	31 (7.2)	22.6
Secondary	253 (75.8)	19 (86.4)	527 (80.5)	799 (79.0)	31.7	82 (72.6)	11 (61.1)	228 (76.5)	321 (74.8)	25.5
High	47 (14.1)	3 (13.6)	89 (13.6)	139 (13.8)	33.8	24 (21.2)	5 (27.8)	48 (16.1)	77 (18.0)	31.2
Missing data	2 (0.2)	0 (0.0)	2 (0.3)	4 (0.4)	—	1 (0.9)	0 (0.0)	3 (1.0)	4 (0.9)	—
Occupational classification										
Economically not active	200 (60.1)	8 (36.4)	147 (22.4)	355 (35.1)	56.3	41 (36.0)	8 (44.4)	63 (21.1)	112 (26.1)	36.6
Employed	118 (35.4)	11 (50.0)	389 (59.3)	518 (51.2)	22.8	69 (60.5)	8 (44.4)	215 (72.2)	292 (67.9)	23.6
Unemployed, able to work	14 (4.2)	3 (13.6)	112 (17.1)	129 (12.8)	10.9	4 (3.5)	2 (11.2)	20 (6.7)	26 (6.1)	15.4
Unemployed, unable to work	1 (0.3)	0 (0.0)	8 (1.2)	9 (0.9)	11.1	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	—
Missing data	3 (0.9)	0 (0.0)	1 (0.2)	4 (0.4)	—	0 (0.0)	0 (0.0)	3 (1.0)	3 (0.7)	—
Place of residence										
Rural	144 (42.9)	9 (40.9)	282 (42.9)	435 (42.9)	33.1	33 (28.9)	4 (22.2)	104 (34.5)	141 (32.6)	23.4
Urban	192 (57.1)	13 (59.1)	375 (57.1)	580 (57.1)	33.1	81 (71.1)	14 (77.8)	197 (65.5)	292 (67.4)	27.7
Missing data	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	—	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	—
Asset Index										
High	177 (53.6)	14 (63.6)	335 (51.5)	526 (52.4)	33.6	75 (68.2)	11 (61.1)	173 (58.5)	259 (61.1)	29.0
Middle	118 (35.8)	6 (27.3)	222 (34.1)	346 (34.5)	34.1	25 (22.7)	5 (27.8)	91 (30.7)	121 (28.5)	20.7
Low	35 (10.6)	2 (9.1)	94 (14.4)	131 (13.1)	26.7	10 (9.1)	2 (11.1)	32 (10.8)	44 (10.4)	22.7
Missing data	6 (1.8)	0 (0.0)	6 (0.9)	12 (1.2)	—	4 (3.5)	0 (0.0)	5 (1.7)	9 (2.1)	—
Awareness of smoking health consequences										
Yes	328 (98.5)	21 (100.0)	612 (93.6)	961 (95.3)	34.1	111 (97.4)	18 (100.0)	285 (95.6)	414 (96.3)	26.8
No	5 (1.5)	0 (0.0)	42 (6.4)	47 (4.7)	10.6	3 (2.6)	0 (0.0)	13 (4.4)	16 (3.7)	18.7
Missing data	3 (0.9)	1 (4.5)	3 (0.5)	7 (0.7)	—	0 (0.0)	0 (0.0)	3 (1.0)	3 (0.7)	—

Table 1: Continued.

Characteristic	Male $N = 1015$					Female $N = 433$				
	Former smokers $N = 336$ N (%)	Recent quitters $N = 22$ N (%)	Current smokers $N = 657$ N (%)	Ever smokers $N = 1015$ N (%)	Quit rate[A] %	Former smokers $N = 114$ N (%)	Recent quitter $N = 18$ N (%)	Current smokers $N = 301$ N (%)	Ever smokers $N = 433$ N (%)	Quit rate[A] %
Awareness of smoking ETS consequences										
Yes	314 (95.2)	21 (100.0)	591 (91.5)	926 (92.9)	33.9	106 (94.6)	16 (94.1)	272 (91.6)	394 (92.5)	26.9
No	16 (4.9)	0 (0.0)	55 (8.5)	71 (7.1)	22.5	6 (5.4)	1 (5.9)	25 (8.4)	32 (7.5)	18.7
Missing data	6 (1.8)	1 (4.5)	11 (1.7)	18 (1.8)	—	2 (1.8)	1 (4.6)	4 (1.3)	7 (1.6)	—
Cohabitation with a smoker										
Yes	58 (17.4)	3 (13.6)	511 (77.8)	572 (56.5)	10.1	19 (16.7)	3 (16.7)	241 (80.1)	263 (60.7)	7.2
No	276 (82.6)	19 (86.4)	146 (22.2)	441 (43.5)	62.6	95 (83.3)	15 (83.3)	60 (19.9)	170 (39.3)	55.9
Missing data	2 (0.6)	0 (0.0)	0 (0.0)	2 (0.2)	—	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	

[A]Quit rates calculated as a number of former smokers and divided by denominator = number of ever smokers × 100.
ETS: environmental tobacco smoke.

Regarding age, average male ever smokers were 49.7 ± 16.3 years of age compared to 45.9 ± 14.7 years of age for female ever smokers ($P < 0.001$). Similarly, current male smokers were 44.5 ± 14.6 years of age versus 43.6 ± 13.8 years in female ($P > 0.05$). At the mean, former smokers were a bit older, 59.9±14.9 years in males and 51.9±15.2 years in females ($P < 0.001$). The mean age of recent quitters was 51.5 ± 12.4 and 45.5 ± 16.5 years for men and women, respectively, ($P < 0.05$). Women started smoking later than men (data not presented in the tables). Former and current male smokers started smoking by 18.8 ± 5.3 and 18.2 ± 4.5 years of age, respectively, while female former and current smokers started at 23.0 ± 7.8 (men versus women $P < 0.001$) years, respectively. We also observed a lower quit rate among women relative to men, 26.3% for women compared to 33.1% for men ($P < 0.02$). For women who successfully quit, they quit at a slightly younger age than men. The mean age of quitting for male and female former smokers was 44.5 ± 14.0 and 41.9 ± 13.5 years, respectively ($P > 0.05$). Men and women had been smoking 26.2 ± 13.8 and 19.5 ± 11.7 years, respectively, before quitting (males versus females $P < 0.001$). At the time of the interview, male and female former smokers reported mean 15.5 ± 13.5 and 9.9 ± 8.9 years, respectively, since quitting ($P < 0.001$).

During 12 months prior to the interview, 34.0% ($n = 223$) of male current smokers and 37.1% ($n = 111$) of female current smokers ($P > 0.05$) attempted to give up smoking. Almost one-third of the current male smokers, 36.0% ($n = 227$) and 33.1% ($n = 94$) of the current female smokers had no plans to quit ($P > 0.05$). Other respondents considered giving up smoking in the future.

6. Univariable Analysis

The results of the univariable regression analyses are presented in Tables 2 and 3. Male and female smokers experienced the highest likelihood to quit over the age of 60 compared to those less than 25 years of age (male: OR = 29.1, 95% CI: 10.2–82.5; female: OR = 15.3, 95% CI: 3.4–69.9, resp.). Long-term quit odds substantially increased with older age groups, older than 25 years in men and age 30–39 in women (Table 2). Also men and women who started smoking late, after age 21, are more likely to quit relative to those who started smoking before they were 17 years (male: OR = 1.5, 95% CI: 1.0–2.1; female: OR = 2.6, 95% CI: 1.4–4.8, resp.).

Male and female subjects classified as economically inactive have a higher probability of successful smoking cessation relative to the unemployed people (OR = 10.9, 95% CI: 6.1–19.4; OR = 3.2, 95% CI: 1.0–10.2, resp.). Men who were aware of smoking health consequences and ETS consequences were more likely to quit smoking successfully than those who were unaware (OR = 4.5, 95% CI: 1.8–11.5; OR = 1.8, 95% CI: 1.0–3.2, resp.). Awareness of these consequences had no significant association with successful cessation among women. People living alone or with nonsmokers were significantly more likely to quit smoking successfully than those living with smokers (male smokers: OR = 16.7, 95% CI: 11.9–23.4 and female smokers: OR = 20.1, 95% CI: 11.3–35.6). Education, place of residence, and Asset Index were not significantly associated with successful smoking cessation.

7. Multivariable Analysis

The results of the multivariable regression analyses are presented in Tables 2 and 3. After taking all the statistically significant variables in the univariable model into account, age for smoking initiation and awareness of ETS exposure were statistically insignificant among male smokers, while age and occupational classification were statistically insignificant among female smokers.

Cohabitation with a non-smoker was the only significant predictor of long-term smoking cessation in both genders (Tables 2 and 3). The probability of quitting smoking was significantly higher among men and women living alone or with nonsmokers than those living with smokers (male: OR = 13.9, 95% CI: 9.4–20.1 and female: OR = 20.1, 95% CI: 11.1–39.1, resp.). Age, occupation, and awareness of smoking health consequences were significant predictors of smoking cessation among men. The odds of quitting increased with age among men, as male smokers over 60 are most likely to quit smoking compared to those less than 25 (OR: 15.6, 95% CI: 4.7–51.7). Similarly, men who were economically active had a higher likelihood of quitting smoking compared to unemployed male smokers (OR: 2.6, 95% CI: 1.3–5.1). Being aware of smoking health consequences also increased a man's likelihood to stop smoking (OR: 3.1, 95% CI: 1.0–9.6).

The odds of successful smoking cessation increased with age at smoking onset among women. Women who started smoking after age 21 were more likely to quit smoking compared to those who started before age 17 (OR: 2.6, 95% CI: 1.4–4.8). Age and occupation were not correlated with smoking cessation among women.

8. Discussion

In this study, we have evaluated the factors affecting smoking cessation success among Romanian adults.

In Romania, the lifetime quit rate was 26.3% for women and 33.1% for men which means that approximately one-third of people who have ever smoked have quit. Similar findings were derived from GATS Poland, including lower quit rates among women compared to men [10]. However, quit rates are almost two times lower when compared to more developed countries; for example, Canada had a quit rate of approximately 59% [13]. These differences show huge disproportions among middle-income and developed countries in terms of the effectiveness of the implementation of tobacco control policies including cessation measures.

Apart from gender, GATS revealed the association of successful cessation with several other sociodemographic factors among a representative sample of adult population. GATS showed that older age was strongly associated with long-term cessation in men, which is consistent with other studies [11, 14–18]. The possible interpretation of this association is that older persons engaged in smoking cessation have greater motivation, discipline, and immediate preoccupation with

Table 2: Odds ratios (OR) and 95% confidence intervals (CI) for successful smoking cessation to selected sociodemographic and other characteristics in men—Global Adult Tobacco Survey Romania 2011.

Variable	Total $N = 993$	Former smoker $N = 336$			Current smoker $N = 657$			Univariable logistic regression		Multivariable logistic regression[a]	
	N %	N	%	95% CI	N	%	95% CI	OR	95% CI	OR	95% CI
Age (years)											
<25	65 (6.4)	4	6.2	0.4–12.1	61	93.8	87.9–99.6	1.00	Reference	1.00	Reference
25–29	68 (6.8)	7	10.3	3.1–17.5	61	89.7	82.5–96.9	1.75	0.49–6.29	1.79	0.45–7.18
30–39	168 (16.9)	28	16.7	11.1–22.3	140	83.3	77.6–88.9	3.05*	1.02–9.08	3.02	0.92–9.95
40–49	205 (20.6)	46	22.4	16.7–28.1	159	77.6	71.9–83.3	4.41**	1.52–12.80	4.34*	1.35–13.89
50–59	208 (20.9)	68	32.7	26.3–39.1	140	67.3	60.9–73.7	7.41***	2.58–21.24	5.30**	1.68–16.78
≥60	279 (28.1)	183	65.6	60.0–71.2	96	34.4	28.8–40.0	29.07***	10.25–82.48	15.60***	4.71–51.67
Age at smoking onset											
≤17	415 (41.9)	131	31.6	27.1–36.1	284	68.4	63.9–72.9	1.00	Reference	1.00	Reference
18–20	397 (40.1)	131	33.0	28.4–37.6	266	67.0	62.4–71.6	1.07	0.79–1.43	1.01	0.67–1.52
≥21	179 (18.1)	73	40.8	33.6–48.0	106	59.2	52.0–66.4	1.49*	1.04–2.15	1.05	0.63–1.76
Education											
Primary or less	73 (7.4)	34	46.6	35.2–58.0	39	53.4	42.0–64.8	1.65	0.92–2.95		
Secondary	780 (78.8)	253	32.4	29.1–35.7	527	67.6	64.3–70.9	0.91	0.62–1.34		
High	136 (13.8)	47	34.6	26.6–42.6	89	65.4	47.4–73.4	1.00	Reference	1.00	Reference
Occupational classification											
Economically not active	347 (35.1)	200	57.6	52.4–62.8	147	42.4	37.2–47.6	10.88***	6.10–19.41	3.66***	1.71–7.86
Employed	507 (51.3)	118	23.3	19.6–27.0	389	76.7	73.0–80.4	2.43**	1.36–4.32	2.59**	1.32–5.09
Unemployed	135 (13.6)	15	11.1	5.8–16.4	120	88.9	83.6–94.2	1.00	Reference	1.00	Reference
Place of residence											
Rural	426 (42.9)	144	33.8	29.3–38.3	282	66.2	61.7–70.7	1.00	Reference	1.00	Reference
Urban	567 (57.1)	192	33.9	30.0–37.8	375	66.1	62.2–70.0	1.02	0.77–1.31		
Asset Index											
High	512 (52.2)	177	34.6	30.5–38.7	335	65.4	61.3–69.5	1.44	0.76–2.73		
Middle	340 (34.7)	118	34.7	29.6–39.8	222	65.3	60.2–70.4	1.39	0.71–2.70		
Low	129 (13.2)	35	27.1	19.4–34.8	94	72.9	65.2–80.6	1.00	Reference	1.00	Reference
Awareness of smoking health consequences											
Yes	940 (95.2)	328	34.9	31.9–37.9	612	65.1	62.1–68.1	4.50**	1.76–11.51	3.14*	1.03–9.62
No	47 (4.8)	5	10.6	1.8–19.4	42	89.4	80.6–98.2	1.00	Reference	1.00	Reference
Awareness of smoking ETS consequences											
Yes	905 (92.7)	314	34.7	31.6–37.8	591	65.3	62.2–68.4	1.83*	1.03–3.24	1.81	0.81–4.01
No	71 (7.3)	16	22.5	12.8–32.2	55	77.5	67.8–87.2	1.00	Reference	1.00	Reference
Cohabitation with a smoker											
Yes	569 (57.4)	58	10.2	7.7–12.7	511	89.8	87.3–92.3	1.00	Reference	1.00	Reference
No	422 (42.6)	276	65.4	60.9–69.9	146	34.6	30.1–39.1	16.66***	11.87–23.37	13.78***	

ETS: environmental tobacco smoke.
[a]Fully adjusted model including all statistically significant variables.
*$P \leq 0.05$.
**$P \leq 0.01$.
***$P \leq 0.001$.

Table 3: Odds ratios (OR) and 95% confidence intervals (CI) for successful smoking cessation to selected sociodemographic and other characteristics in women—Global Adult Tobacco Survey Romania 2011.

Variable	Total $N = 415$	Former smoker $N = 114$			Current smoker $N = 301$			Univariable logistic regression		Multivariable logistic regression[a]	
	N %	N	%	95% CI	N	%	95% CI	OR	95% CI	OR	95% CI
Age (years)											
<25	31 (7.5)	2	6.5	0.1–15.2	29	93.5	84.8–99.9	1.00	Reference	1.00	Reference
25–29	33 (9.9)	5	15.2	3.0–27.4	28	84.8	82.6–97.0	2.59	0.46–14.53	2.71	0.37–19.87
30–39	91 (21.9)	24	26.4	17.3–35.5	67	73.6	64.5–82.7	5.19*	1.16–23.56	5.57	0.96–32.22
40–49	92 (22.2)	18	19.6	11.5–27.7	74	80.4	72.3–88.5	3.53	0.77–16.24	2.53	0.43–14.92
50–59	98 (23.6)	29	29.6	20.6–38.6	69	70.4	61.4–79.4	6.09*	1.36–27.38	3.55	0.63–20.09
≥60	70 (16.9)	36	51.4	39.7–63.1	34	48.6	36.9–60.3	15.35***	3.37–69.92	4.73	0.71–31.35
Age at smoking onset											
≤17	106 (25.6)	17	16.0	9.0–23.0	89	84.0	77.0–91.0	1.00	Reference	1.00	Reference
18–20	150 (36.2)	45	30.0	22.7–37.3	105	70.0	62.7–77.3	2.24*	1.20–4.20	2.70*	1.21–6.02
≥21	158 (38.2)	52	32.9	25.6–40.2	106	67.1	59.8–74.4	2.57**	1.38–4.76	2.13	0.93–4.90
Education											
Primary or less	29 (7.1)	7	24.1	8.5–39.7	22	75.9	60.3–91.5	0.64	0.24–1.70		
Secondary	310 (75.4)	82	26.5	21.6–31.4	228	73.5	68.6–78.4	0.72	0.41–1.25		
High	72 (17.5)	24	33.3	22.4–44.2	48	66.7	55.8–77.6	1.00	Reference	1.00	Reference
Occupational classification											
Economically not active	104 (25.2)	41	39.4	30.0–48.8	63	60.6	51.2–70.0	3.25*	1.03–10.25	0.79	0.21–3.01
Employed	284 (68.9)	69	24.3	19.3–29.3	215	75.7	70.7–80.7	1.60	0.53–4.87	0.77	0.15–3.96
Unemployed	24 (5.9)	4	16.7	1.8–31.6	20	83.3	68.4–98.2	1.00	reference	1.00	Reference
Place of residence											
Rural	137 (33.0)	33	24.1	16.9–31.3	104	75.9	68.7–83.1	1.00	Reference	1.00	Reference
Urban	278 (67.0)	81	29.1	23.8–34.4	197	70.9	65.6–76.2	1.30	0.81–2.07		
Asset Index											
High	248 (61.1)	75	30.2	24.5–35.9	173	69.8	64.1–75.5	1.50	0.46–4.88		
Middle	116 (28.6)	25	21.6	14.1–29.1	91	78.4	70.9–85.9	0.83	0.23–3.00		
Low	42 (10.3)	10	23.8	10.9–36.7	32	76.2	63.3–79.1	1.00	Reference	1.00	Reference
Awareness of smoking health consequences											
Yes	396 (96.1)	111	28.0	23.6–32.4	285	72.0	67.6–76.4	1.62	0.65–4.08		
No	16 (3.8)	3	18.8	0.1–37.9	13	81.2	62.1–99.9	1.00	Reference	1.00	Reference
Awareness of smoking ETS consequences											
Yes	378 (92.4)	106	28.0	23.5–32.5	272	72.0	67.5–76.5	1.69	0.47–6.06		
No	31 (7.6)	6	19.4	5.5–33.3	25	80.6	66.7–94.5	1.00	Reference	1.00	Reference
Cohabitation with a smoker											
Yes	260 (62.6)	19	7.3	4.1–10.5	241	92.7	89.5–95.9	1.00	Reference	1.00	Reference
No	155 (37.4)	95	36.8	29.2–44.4	60	63.2	55.6–70.8	20.08***	11.34–35.56	20.88***	11.15–39.11

ETS: environmental tobacco smoke.
[a]Fully adjusted model including all statistically significant variables.
*$P \leq 0.05$.
**$P \leq 0.01$.
***$P \leq 0.001$.

health or factors that can help them to succeed. It is also known that a significant percentage of older smokers already show symptoms of smoking related diseases, which may also reinforce their interest in quitting [17]. Patients at higher risk of noncommunicable diseases are screened more often and advised to quit, which may increase quit success [19]. In Romania, 82.1% of smokers had visited a healthcare provider during the previous 12 months; this represents the proportion reported being asked if they smoked by a healthcare provider [20]. Among those screened for tobacco use, 67.3% reported that their healthcare providers advised them to quit. In most GATS countries including Romania, persons aged ≥45 years were more likely to report being screened and advised to quit than those aged ≤24 years. This also partially explains the observed association between screening and quitting. Unlike men, older age was not associated with successful smoking cessation among women. This result should be considered while planning tobacco control policies and intervention approaches but also further in-depth research are needed to clarify the reasons for such differences.

Similar to other studies, we found that older age of smoking uptake was correlated with increased cessation rates among women [21–24]. Several studies reported that being older at first cigarette use likely relates to lower lifetime exposure to cigarettes, which may link to lower levels of nicotine dependence and, in turn, lead to a higher likelihood of quitting [25, 26]. Existing data shows that difficulty in quitting increased with increased nicotine dependence and the number of prior quit attempts [14, 15, 25, 27]. Breslau and Peterson have stressed that programs that postpone smoking initiation are particularly important because even if they do not prevent the uptake of smoking among all young people, they may decrease smoking prevalence in the long run by increasing the probability for successful cessation [25].

However, cohabitation with a smoker seems to be the most important factor limiting cessation success among both genders. In order to reduce ETS exposure, European Union countries including Romania implemented smoking bans in public places and worksites, while less efforts were undertaken to encourage adoption of smoke-free rules in the private settings. Smoking bans are mainly introduced to protect nonsmokers from tobacco pollution, but it also increases quitting among smokers and prevents relapse among former smokers [4]. Data from GATS suggest that the home is a very important target and an opportunity that should be utilized for increasing quit rates and help maintain cessation success among Romanian adults.

GATS also revealed disproportions in cessation success among socioeconomic groups in Romania. Another factor that we assessed was potential correlation between successful cessation tobacco use and employment in Romanian adults. We found that the odds of successfully quitting in employed men were over two times higher compared with unemployed smokers. This result confirms the previous evidence [26, 28]. The lower odds of smoking cessation among the unemployed may result from believing that smoking is a way to reduce stress which includes unemployment. Hence, there is a probable need to promote rational ways of coping with stress especially among the unemployed. Moreover, data shows that having financial difficulties, which could be the case of unemployed men, remains an important barrier to smokers achieving quit success. Further research is required to determine strong mediators of the effect of financial difficulties on successful cessation and to tailor more effective cessation programs [29–32]. But it can also happen that after cigarette price increases, economically disadvantaged smokers switch from manufactured cigarettes to hand-rolled or less expensive brands or buy illegal products and end up not giving up smoking. Nonetheless, many smokers continue the habit in spite of an increase in smoking-associated socioeconomic inequalities. This issue is because disadvantaged smokers are not motivated to quit but rather spend more money on tobacco and less on other goods, which ultimately deepens deprivation. It suggests that aside fiscal policies, other policies should be used to increase cessation among lower socioeconomic groups [10]. However, similar to results obtained from GATS Poland, this association with fiscal policies was not present in the female group [10]. This relationship may be explained by the low participation of females in the labor market, and the socioeconomic and cultural context comparable in middle income, deriving from the post-Soviet bloc European countries. The total labor force participation rate (% of total population ages 15–64) in Romania was 64.3% as of 2011. But female labor participation rate (% of female population ages 15+) in Romania was 48.6% compared to 72% in men as of 2011 [33]. On the other hand, these results should be assessed with caution because employment status may possibly change over the life span, but due to the cross-sectional nature of the study, we can only assess the occupational situation at the time of survey completion.

In contrast to other surveys, we did not observe correlation of other factors reflecting the socioeconomic position of respondents, including education and Asset Index, with long-term cessation [34]. Positive association between success in quitting and socioeconomic resources is well established; thus the lack of association between education and Asset Index should be a subject of further studies to further enlighten this issue.

Moreover, we did not find significant association between awareness of negative health consequences of environmental tobacco smoke exposure and cessation success among men or women. This might be hypothesized that some smokers declare general knowledge on these topics but do not fully acknowledge the increased risk of cancer, stroke, and heart attack due to smoking or environmental exposure to tobacco smoke. Federico et al. revealed that risk judgment among smokers appeared to be unrealistically optimistic [34]. Smokers underestimate their risk of developing lung cancer and other tobacco related diseases. Misunderstandings of smoking and ETS risks do not encourage quitting [34].

9. Study Strengths and Limitations

GATS is a nationally representative survey that includes a large number of respondents, which is carefully designed and based on a standard and consistent protocol. The questionnaire of GATS Romania was adapted from the standard GATS

core questionnaire while maintaining the highest standards to ensure the accuracy and quality. GATS questionnaire covers numerous potential cessation predictors. However, several limitations should still be mentioned. The questionnaire method of data collection has a number of advantages including low cost, ease of obtaining data, and quick evaluation. A lot of studies that have investigated determinants of tobacco quitting have carried out surveys within populations with high risk of cancer or cardiovascular disease. The selected demographic variables also seem to be limited to age, race, and socioeconomic status [10, 35–40]. The methodology also varies among these studies including cross-sectional studies and intervention trials [13, 14, 19, 41–44]. In GATS study, we are unable to assess the motivations for quitting, as respondents were not asked to give their reasons for quitting smoking. Based on this, we cannot compare quitting reasons from Romania with other GATS countries. We are also unable to determine the impact of previous tobacco control measures, such as tobacco tax increase or education campaigns as influences on tobacco cessation.

Using self-reported techniques to obtain data is also a potential limitation, but it has been stated not to reduce the quality of the study, as addressed in previous papers [41, 45]. A number of variables may have been omitted from the GATS questionnaire which may have improved the validity or information provided by the results. Some of these results include nicotine dependence or number of cigarettes smoked which are considered determinants of long-term quitting, use of aids or not for quitting (for those who quit for a year or longer), number of quitting attempts, marital status, and annual household net income [38, 46]. In addition, cross-sectional studies limit the results to one point in time. We are unable to draw conclusions on causality or directionality of findings. Therefore, we are unable to determine which characteristics may have changed over time. However, this study provides the most recent national evidence on the association of successful quitting with selected characteristics in Romania.

10. Conclusions

GATS revealed the need to focus on policies and programs to increase quit rates and to encourage cessation among groups less likely to quit, amongst the younger, unemployed, those who start smoking at a younger age, and those unaware of smoking health consequences. This may bring great health and social and economic benefits for the entire population and is essential to prevent future widening health inequalities among disadvantaged groups. Our study results emphasize the need for an increased effort to promote adopting voluntary smoke-free homes, in order to improve the quitting rates. GATS also shows that other aspects of tobacco control in Romania should be expanded to achieve higher level of compliance with the Framework Convention on Tobacco Control (FCTC) that will support quitting.

Policy makers should consider these points to set priorities and targets for tobacco cessation measures and other tobacco control actions.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Authors' Contribution

Dorota Kaleta outlined the paper, discussed core ideas, and prepared the final paper. Bukola Usidame did the literature search. Elżbieta Dziankowska-Zaborszczyk prepared the dataset and did the data analysis. Teresa Makowiec-Dąbrowska commented on drafts. All authors read and approved the final paper.

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Research Article

Addressing Parental Smoking in Pediatric Settings of Chinese Hospitals: A Qualitative Study of Parents

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This study explored factors associated with SHS exposure from parental smoking in Chinese families and assessed nature of antismoking discussions parents had with their children's pediatricians and how pediatricians might best engage with parents in an effort to reduce children's exposure to SHS. Six focus group discussions (FGDs) were conducted among 33 Chinese parents attending six major hospitals in Guangxi province, China. Most participants (32/33) had family members who smoke, and only 21% had strict restriction on smoking at home. Some parents did not know about health consequences of smoking and effects of SHS exposure on children. Situations that made it especially hard to avoid the child's SHS exposure were having an elderly smoker at home and having a visitor who smoked. Only few parents were asked by pediatricians about child's exposure to SHS at home, but only when child's illness was related to smoking. Parents believed that suggestions coming from pediatricians about smoke-free home and parental quitting would be acceptable to parents and other household members. The findings provide insight into SHS exposure reduction effort among Chinese parents and underscore the demand for pediatrician's engagement in addressing parental tobacco use.

1. Introduction

Tobacco use continues to be the leading global cause of preventable death. It kills approximately 6 million people each year, including more than 600,000 nonsmokers who die from exposure to tobacco smoke [1], of which 31% are children [2]. Since adopting the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC), more than 60 countries have initiated campaigns for smoke-free laws and over 17 countries now have a national law requiring all workplaces and public places to be smoke-free [3]. However, smoke-free laws do not protect children in the home or car, places where children spend much of their time. Although, China has initiated many tobacco control initiatives during the last decade, the prevalence of nonsmokers' exposure to second-hand smoke (SHS) or tobacco smoke pollution (TSP) [4] has remained relatively constant. National surveys on smoking behavior in 1996 and 2002 reported SHS exposure rate at 53% and 52%, respectively [5]. Another cross-sectional survey conducted in 2004 in six counties of China showed that 48.3% of the nonsmokers were exposed often or sometimes to SHS in their household [6]. Given the high prevalence of adult smoking in China, 52.9% in men and 2.4% in women [7], parental smoking has become the major cause of children's exposure to SHS. Studies have shown that the most common place where children are exposed to SHS is their own homes [8–10]. The harmful effects of child SHS exposure are well documented [11]. Several interventions have been implemented and evaluated [8, 12]. The pediatric setting can play an important role in encouraging parents to take measures that will protect their child from SHS exposure [13]. In China, almost 100% of all

parents visit pediatricians in relation to the well child visits or other health-related issues during the early age of their child. Developing interventions that could be delivered through the pediatric setting would have great potential to reach a large number of parents who smoke.

We conducted this study to explore factors associated with SHS exposure from parental smoking in Chinese families and assess nature of antismoking discussions parents had with their child's pediatricians and how pediatricians might best engage with parents in an effort to reduce children's exposure to SHS. We conducted focus group discussions (FGDs) with parents of pediatric patients attending four Chinese hospitals. This study aims to provide a scientific basis for designing effective interventions to reduce children's SHS exposure in China.

2. Methods

2.1. Sample and Settings. Participants were parents of pediatric patients who were attending the departments of pediatrics in the selected six hospitals in four major cities of Guangxi province (a Southern Chinese province bordering Vietnam), China: First Affiliated Hospital of Guangxi Medical University (Nanning), Maternal and Child Health Hospital (Nanning), Liuzhou Maternal and Child Health Center (Liuzhou), Affiliated Hospital of Guilin Medical University (Guilin), Qinzhou Maternal and Child Health Center (Qinzhou), and Zhuxi Community Health Center (Nanning).

2.2. Procedures. Participants were recruited, during April-May 2013, through the hospital liaisons in each hospital who participated in the protocol development workshop of the project in an earlier stage. The liaison person, a senior pediatrician, was provided with the verbal and written background information of the study and the characteristics of people we were looking for to participate in the FGDs. Selection criteria were as follows: father or mother of a pediatric patient, smoker or nonsmoker or former smoker, willing to give consent to participate in FGD, and being able to communicate in Mandarin Chinese or local dialect (Cantonese). The hospital liaison person identified potential subjects and scheduled FGDs. We conveniently invited 5-6 interested parents to attend the FGD on a scheduled time slot.

2.3. Data Collection. A semistructured FGD guide was developed with reference to the research team's earlier work [14] and pilot tested with four parents resulting in minor changes. All of the FGDs were conducted in Mandarin Chinese and audio-recorded. The guide included questions and queries on the following themes: risks of smoking and SHS exposure, attitudes towards SHS, situations where children are exposed to SHS, measures taken to reduce child's exposure to SHS (if any), barriers encounters or potential barriers to reduce child's SHS exposure, experiences with the child's pediatrician about smoking or SHS exposure, and views about pediatrician engagement in promoting SHS exposure reduction and parental smoking cessation. Four interviewers conducted all the FGDs. Interviewers were graduate students at the School of Public Health of Guangxi Medical University and attended a 2-day training course on qualitative research methods and tobacco use reduction research. The training also included a session on the ethical aspects of human subject research. To collect data, two interviewers worked as a team; one moderated the FGD and the other took detailed notes and recorded the session with a digital voice recorder (with permission from the participants). All FGDs were held at the hospital in a private meeting room and lasted for approximately 90 minutes. The sessions started with the moderator explaining the purpose of the group discussion and assuring confidentiality of the data collected for the research project. To compensate for their time, each participant was given a cash amount of RMB 50 (US$8).

Written informed consent was obtained from each participating parent. The study was approved by the Ethics Committee of the Guangxi Medical University.

2.4. Analyses. The interviewers discussed and summarized the content of each FGD and reviewed the notes taken immediately after the FGD. These debriefings were useful (i) to identify most important themes and ideas and (ii) to assess the need for any modification in the subsequent FGD. The audio recordings were reviewed and transcribed for each group. Two members of the research team coded each transcript independently, with discrepancies resolved through consensus. The process of coding involved identifying key themes and marking these out on the transcripts [15]. All additional notes taken during the course of the focus groups were examined to identify various themes presented in these qualitative discussions.

3. Results

Six FGDs were conducted among 33 parents of pediatric patients from 6 hospitals in four major cities of Guangxi province, China. Twenty-two (66.7%) of the participants were males and 11 (33.3%) were females. Education varied from middle school or below (69.7%) to high school or above (30.3%). Close to half (45.5%) were nonsmoker, and 54.5% smoked (Tables 1 and 2).

The findings revealed six main themes relating to children's SHS exposure and parental smoking: attitude towards smoking in front of the child; attitude towards smoking in the car; attitude towards smoking and quitting smoking; knowledge of smoking and SHS; measures taken to reduce children's exposure to SHS; experience with and views about pediatricians inquiry about smoking and children's SHS exposure. These themes are described below supplemented by participants' statements on key themes provided in Table 3.

3.1. Attitude towards Smoking in front of the Child

3.1.1. Household Members Smoking. The participants had varying views about household members smoking. Most (32/33) had family members in the household who smoke and family members interact frequently or occasionally. Some had strict restriction on smoking at home (21%, 6 male

Table 1: Demographic characteristics of focus group discussion (FGD) participants ($n = 33$).

Characteristics	Focus group discussions (6 FGDs; $n = 33$)	
	Smokers ($n = 18$)	Nonsmokers ($n = 15$)
Gender		
Males	18	4
Females	0	11
Age (mean ± SD)	38.56 ± 16.26	32.93 ± 11.14
Education		
Middle school or below	11	12
High school or above	7	3

smoker and 1 female nonsmoker) while others would not dare to have smoking restrictions at home. Eleven parents said older family members (grandfather, grandmother, etc.) smoked at home and argued that, given the Chinese family structure where three generations of family live together, this would be impolite to ask elderly members not to smoke at home.

For example, one female nonsmoker whose daughter got Broncho pneumonitis said, "*I never smoke, my husband only smokes occasionally. But my father-in-law smokes a lot at home. He even smokes when he is cooking. His clothes and mouth always smell like smoke. When he hugs my daughter after smoking, I feel so bad but I cannot say anything.*"

Another smoking man said, "*generations of my family including grandfather, father, uncle, and I, are engaged in smoking at home; older members are accustomed to it, we have to respect their habits. While knowing that smoking in front of kids is bad, but there is no alternative other than smoking when I feel craving for cigarette.*"

3.1.2. Friends Visit and Smoking. Entertaining friends with cigarettes when they visit home was common for both smokers (8/18) and nonsmokers (3/15). Some thought it would be embarrassing to ask a smoking guest not to smoke. A smoking father said, "*when friends came to drink at my home, all teased my son with a cigarette, I wanted my kid stay out, but he saw adults sitting there smoking, he was also eager to give it a try and I allowed. . . .*" A nonsmoking mother said, "*Every time when guests are in the house, everywhere is smoky, I can only let kids go out and play. . ., but it is not possible always as I need to go out with him too.*"

3.1.3. Smoking in Public Places. In situations where others were smoking in front of the children in public places, the majority (27/33, 82%) of participants felt that it was difficult to ask other people stop smoking, even if there was a smoke-free sign in place.

3.2. Attitude towards Smoking in the Car. Although all participants did not have a car, the views of smoking in the car (own car or taxi) were mixed. Several nonsmokers said that they hated cigarette smoke and when people were smoking in the car it makes them uncomfortable as they have to inhale fumes. A nonsmoking man said, "*when I went out with friends, if friends smoke, I would tell them to open the window, . . . only this choice seems to me reasonable. If I asked them to not to smoke in my car, instead, they laughed at me for being so greedy for owing a car!*"

Few smokers thought that smoking in the car is not a serious problem if they open the window, even when kids are there. Some parents expressed concern about bad smell in the car after smoking but were unable to elaborate much about the health hazards associated with these bed smelling chemicals.

3.3. Attitude towards Smoking and Quitting Smoking. Several smokers (7/18) described quitting smoking as a difficult task. A smoking man said, "*I also want to quit, but it is not easy to cut out the habitual craving on my own willpower. I smoke every day just like I take meal every day, . . . frankly speaking, I can give up a meal, but not the cigarettes. . ..*"

Several smokers (6/18) had tried to quit smoking, but found it difficult to quit. A male smoker said, "*I tried to quit smoking many times, but I'm addicted. Several smoking parents thought smoking shows warm feeling and politeness in social engagements*. Few thought they are addicted and they like the smell of cigarettes."

"*We gave up smoking during medical treatment, but after treatment we could not help it*" (a smoker who had pneumonia and another who had tuberculosis). Several nonsmokers (7 female and 2 male) had tried to persuade their family members to quit smoking, but to no avail. A father said, "*I am not smoking at all. My older brother and younger brother are both smokers. They smoke a lot. I told them about the hazards of smoking in the past thirty years, but they never listened to me.*"

3.4. Knowledge of Smoking and SHS. Some parents (10/33) were unable to correctly answer the questions about the health consequences of smoking and SHS exposure of children. Few parents thought their smoking caused no harm to the health of their child. Several parents said that they knew smoking and SHS were harmful to health, but they did not know any specific harms or how dangerous it could be. As one smoker father said, "*Hard to say, some people who never smoke also get lung cancer.*"

3.5. Measures Taken to Reduce Children's Exposure to SHS. Most parents had taken some sort of protective measures to prevent their child from SHS exposure. All female nonsmokers reported that they had taken "passive measures" against their children's exposure to SHS, such as taking kids away from the smoking places (home and public places) or opening the window at home or in the car. Some said applying or adopting measures to protect the child from SHS exposure is sometimes difficult in China when many people smoke.

"*In one occasion, I was on a bus with my daughter. . . a man sitting next to us started to smoke a cigarette. I told him that he should not smoke cigarettes in the bus. But he glanced at me*

Table 2: Demographic characteristics of focus groups ($n = 6$).

Group	Participants per group	Gender		Average age	Smoking status			Any family smoker	
		Female	Male		Previous	Current	Never	Yes	No
1	7	5	2	45		2	5	7	
2	5	2	3	32		3	2	5	
3	6	1	5	32	1	3	2	6	
4	5	0	5	49	1	4	1	4	1
5	5	1	4	29		2	3	5	
6	5	2	3	27		3	2	5	

and pretended not hearing me and continued smoking. I felt so angry and was not sure what to do" (a nonsmoker mom).

The majority of smoking males (12/18) would smoke in the bathroom or balcony to reduce children's SHS exposure. Few said that they would do this in their own accord, while few would do this by coercion of nonsmoking family members. Some thought it would be fine to put the doors and windows open when people were smoking at home and, if possible, buy an air purifier (cleaner) to refresh the air.

3.6. Experience with and Views about Pediatrician Inquiry about Parental Smoking and Children's SHS Exposure. Few respondents (8/33, 24%) had positive experiences about the way they have been asked about SHS exposure of the children or about parental smoking status. Five of these respondents expressed that children's hospitalization due to respiratory diseases prompted doctor to ask them about their smoking behavior and practices at home. However, pediatricians did not enquire about smoking if the child's visit or hospitalization was related to nonrespiratory diseases. For example, a mom said: "*I visited pediatricians several times during the last year for fever and diarrhea of my baby, the doctor never asked me about smoking information.*"

A male smoker said, "*pediatricians never asked me about smoking during the few times I visited them last year. If smoking is really harmful to the child, they should ask and take action. . . . I hope doctors could ask and explain more about the pros and cons of smoking and tell us where to get medications for quitting.*"

"*I hope pediatricians would explain more about health hazards of smoking and SHS . . . and provide guidance about how we can make the home smoke-free. Doctors could give us antismoking stickers or posters to post at home . . . so others will see them and may not smoke*" (a female nonsmoker).

Most parents thought that advice from the pediatrician about the child's SHS exposure reduction or parental smoking cessation would be acceptable to Chinese parents. *"In Chinese society people respect doctors. If a message comes from the doctor, people will believe this and try to obey . . . if the doctor gives written information; we could show this to the smoking members of the family*" (a nonsmoker mom).

4. Discussion

Exposure to parental or household smoking was common among this sample of parents with children attending the pediatric departments in China. The high frequency of smoking at home when guests visited, which was reported by almost all parents in our study, is consistent with the findings of another local study [16]. During the last five years, China has launched a variety of tobacco control projects with support from international funding agencies. The Chinese government also enacted an indoor smoking ban in public places on May 1, 2011. Although smoking in public places may have decreased significantly, the prevalence of exposure to SHS at home among nonsmokers, including children, (67.33% in Jiangxi, 71.91% in Henan) is still very high [16]. From our findings, it is obvious that current Chinese cultural factors, which approve smoking, may play key roles in tobacco control and SHS exposure reduction in China. Why do parents of children feel that they have to expose their child to SHS from others? Possible reasons could be traditional Chinese cultural values which are pervasive in Chinese society and smoking culture, such as "to show respect to others," "to be polite or friendly," "to maintain the good relationships," and "to develop business relationships" [17, 18]. For example, if parents tried to ask grandparents to stop smoking at home, it might be regarded as an affront or offensive to the elder. Also, sharing cigarettes with visiting guests is a way to welcome and establish rapport with guests [17, 19]. These kinds of social pressures represent the prevailing social norms surrounding smoking and could send mixed signals to smokers about the need to quit smoking. It is easy to see how the prevailing social pressures in China promote smoking among nonsmokers and work to maintain tobacco addiction among smokers. Physicians who highlight the ill effects of SHS exposure of children may help to shift social pressures toward healthier behavioral norms.

The findings show that some parents had incorrect knowledge about the hazards of smoking and SHS exposure of children. Earlier studies also showed low smoking-related knowledge and inappropriate attitudes towards SHS exposure among smokers and nonsmokers in China [20–22]. Our findings also shows that parents are aware of the importance of restricting children's exposure to SHS but take inappropriate strategies to prevent SHS at home or in the car, such as opening a window or a door, smoking in a separate room, and using air purifier. These findings are in agreement with Phillips et al. [23] and underscore the need for educational intervention engaging parents and household members with strategies to implement a home and car smoking ban [24].

Table 3: Typical statements made by parents by key themes.

Attitude towards smoking in front of your children	Attitude towards smoking in the car	Attitude towards smoking and quitting smoking	Knowledge of smoking and SHS	Measures taken to reduce children's exposure to SHS	Experience with and views about pediatricians inquiry about smoking and children's SHS exposure
Senior adults (e.g., grandpa) smoke at home; I cannot say anything to stop them. It is too rude. That's not respectful of senior (male smoker and female nonsmoker).	If spending much time in the car, my friends definitely would smoke; I think it is ok (male smoker).	I tried to quit smoking for many times. Once I stopped smoking for half month, then I went to a dinner with friends. They shared cigarettes to me and I had to accept to show politeness. Also after drinking, it's comfortable to have a smoke (male smoker).	Before my son got sick, I did not know smoking was harmful, and I liked to amuse him with cigarettes and allowed him to try in few occasions (male smoker).	When relatives and friends come to visit and smoke at home, I always tell kids to play outside (male smoker).	If the pediatrician told me some smoking-related health hazards, I would recognize (female nonsmoker).
When friends or relatives come and have a visit, they will smoke. It is unavoidable (male smoker). My hubby's friends always smoke when they drink at home, then the house will be a noisy, smoky bar full of foul air. I am very angry with such mess, but have nothing to do with that (female nonsmoker).	We do not smoke. It's uncomfortable when seeing somebody smoking around our child. That's very annoying (female nonsmoker).	Only aggressive measures can be taken in stopping smoking. My sister's husband is a teacher; his school prohibits smoking by fines and other strict measures. There is no way for him to smoke out of school frequently, so he had to quit smoking (female nonsmoker).	Warning labels in cigarette packet says, "smoking is harmful to health"; but I have no idea what exact harms does smoking cause (male smoker).	Children should be taken away; keep them from exposure to smoking environment (female nonsmoker).	As a smoker, I am accustomed to smell of cigarettes. But when pediatricians smell it, they often told me to quit smoking. But frankly speaking, I did not take it seriously (male smoker).
I smoke even when children at home. When craving come up, I am unable to control, no choice (male smoker).	If children are in the car, I do not let people smoke in it. Without kids, it does not matter (male nonsmoker).	My dad is in his seventies. When I requested him to quit, he said you better ask me to quit eating rather than quit smoking (male nonsmoker).	I would cough when I smell the smoke, I know smoking is harmful but do not know it's so serious (male nonsmoker).	I hide in the bathroom, den, or balcony to smoke (male smoker).	Engagement of pediatricians would be acceptable to parents in reducing child's SHS exposure.
It is a very difficult thing to stop people smoking in front of kids (male smoker and female nonsmoker).	When I drive alone, I definitely smoke. Taking someone else in car, if friends smoke, I will follow (male smoker).	When I was pregnant, my husband quitted smoking in his own accord. Now, he smokes again, and I ask him not to smoke; he said baby was born and smoking did not matter (female nonsmoker).	I am not sure if smoking is really harmful. Why some smokers live longer than nonsmokers? (male smoker).	I try not to smoke and remind others for not smoking in the presence of children (male smoker).	I hope we can get more information about smoking and assistance in quitting smoking at the hospitals (male smoker).

Table 3: Continued.

Attitude towards smoking in front of your children	Attitude towards smoking in the car	Attitude towards smoking and quitting smoking	Knowledge of smoking and SHS	Measures taken to reduce children's exposure to SHS	Experience with and views about pediatricians inquiry about smoking and children's SHS exposure
It's get me very upset that my husband smokes at home. I confined him in balcony or bathroom to smoke, but it's still smoky in house (female nonsmoker). I really hate the smoky smell of my father-in-law; it's so strong and really horrible. After smoking, he just goes to hold the baby without mouthwash and I feel bad (female nonsmoker).	When I drive, even kids in the car, I can't help smoking. I just open the window (male smoker).	I know smoking is harmful, but I'm addicted to it (male smoker). When I smoke, I always tell myself this is the last one, but, no, that's just another one (male smoker). In my circle, every men smoke. It's so common. That's life, nothing is serious. I never thought about quitting (male smoker).			

Preventing children's SHS exposure in public places has always been a difficult task, especially where smoking is not prohibited. The measures taken by some parents (i.e., walking away from smoke) should be encouraged and more awareness raising campaigns to discourage public place smoking should be initiated. Posting no-smoking signs and announcing moderate penalties for smokers caught in public venues was effective in Hong Kong [25], and similar measures should be considered for mainland China.

Some of the parents in our study expressed their frustration about not receiving enough smoking cessation or SHS related information from the pediatricians. While these sentiments reflect the clearly expressed hope among parents of pediatric patients to engage with pediatricians about tobacco use and SHS exposure, they also highlight a large gap in the existing pediatric healthcare delivery system. However it is encouraging to note that a few parents experienced brief advice to quit smoking or reduce the child's SHS exposure even in the absence of any mandatory or systematic requirement for inquiry and recording of parental tobacco use or SHS exposure status of children. Earlier studies reported that lack of knowledge about tobacco control measures and lack of skills and confidence in providing counseling to quit or to reduce SHS exposure were associated with not engaging in tobacco control efforts among physicians in Hong Kong [26] and China [27]. Organized training of pediatricians to build their capacity to provide smoking cessation and SHS exposure reduction counseling to parents, which could be incorporated within the CME programs of the Chinese Pediatric Society/Chinese Academy of Medicine (pediatric chapter), would engage more pediatricians in the SHS exposure reduction effort. A policy strategy at the hospital level to adopt mandatory recording of parental smoking and SHS exposure status within the electronic medical record system could prompt pediatricians to initiate child's SHS exposure reduction conversation with the parents or caregivers [28].

Strengths of our study were not only the diverse range of respondents in terms of age, socioeconomic group, and location (four different cities) but also inclusion of both men and women, smokers and nonsmokers to gather varying views. One limitation was that all participants were recruited from the pediatric departments of Chinese hospitals, limiting the generalizability of the findings to attendees in other departments. However, there is no reason to believe that the views about protecting child's health gathered from parents of young children who attended the pediatric departments would be different from the parents who attend other departments within the hospital.

5. Conclusion

The findings of this qualitative study among parents of Chinese children indicate that children's exposure to SHS in the home is shaped by a range of sociocultural influences, gaps in knowledge, attitudes towards SHS, and parental smoking behaviors. The findings also highlight the demand for pediatricians to address parental tobacco use and SHS exposure of children. While there is a need for a nationwide survey to better understand actual SHS exposure reduction practices in the pediatric setting throughout China, the current local findings suggest the need for pediatrician engagement to enhance parental smoking cessation and SHS exposure reduction support for children attending pediatric departments. Enhanced pediatrician training and hospital system change might prompt more pediatricians to engage in SHS exposure reduction conversation with parents of children [29].

6. What Is New?

This study assessed nature of antismoking discussions Chinese parents had with their child's pediatricians and how pediatricians might engage with parents in an effort to reduce children's exposure to SHS, supporting the creation of model interventions for developing countries.

Conflict of Interests

The authors have no conflict of interests relevant to this paper to disclose.

Authors' Contribution

Abu S. Abdullah and Zhenyu Ma are co-first authors.

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Research Article

Association between Positivity and Smoking Cessation

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The literature documents that personality characteristics are associated with healthy lifestyles, including smoking. Among positive traits, Positivity (POS), defined as a general disposition conducive to facing experience under a positive outlook has shown robust associations with psychological health. Thus, the present study investigated the extent to which POS is able to predict (i) relapse after quitting smoking and (ii) the desire to smoke again. All participants (481) had previously attended a Group Counselling Program (GCP) for Smoking Cessation (from 2005 through 2010). They were contacted through telephone interview. Among participants, 244 were ex-smokers (age: years 56.3 ± 10.08, 52% female) and 237 were still-smokers (age: years 55.0 ± 9.63; 63.5% female). The association of POS with "craving to smoke" levels was assessed with multivariate linear regression analysis while controlling also for important differences in personality such as conscientiousness and general self-efficacy, as well as for gender and age. Results showed that POS was significantly and negatively associated with smoking status and with craving to smoke. Among covariates (i.e., conscientiousness, generalized self-efficacy), gender was associated with smoking status and with craving to smoke. Altogether these findings corroborate the idea that POS plays a significant role in sustaining individuals' efforts to quit smoking.

1. Introduction

In Italy about 11 million adults are smokers, 20.7% of the entire adult population, according to the Osservatorio Fumo, Alcol e Droga [1]. Mortality trends over time for men and women demonstrate that smoking is "a huge threat to public's health" and explicitly posits "cigarette smoking among the most important health hazard" [2, 3]. As it stands, smokers lose at least one decade of life expectancy, as compared with those who have never smoked. Likewise, for people who smoke, the risk of death from cigarette smoking continues to increase over the years. Hence it has been established that smoking killed about 100 million people in the 20th century and it will kill about 1 billion in the 21st century [2, 3]. Thus, identifying reliable psychological predictors of smoking cessation seems a noteworthy enterprise.

In this regard, a large body of research has recently focused on human strengths and personality qualities associated with mental and physical health [4], with an emphasis on the personality characteristics associated with healthy lifestyles, including smoking [5–7]. Empirical studies on tobacco dependence have reported positive associations between quality of affective experience and the status of nonsmokers, reporting that nonsmokers experience higher quality of their life than smokers [8, 9]. Recently, Fidler and West [10] described "the enjoyment to smoke" as an important predictor of the individual's engagement in quitting smoking. These findings are a bit surprising as they seem not to be consistent with other results showing that quitting smoking can lead to experiencing a deterioration in the perceived quality of life [11–13]. All in all, it is likely that a decrease in self-perceived quality of life may nonetheless

occur when smokers believe that quitting smoking means to lose an important source of enjoyment [14, 15] and that this eventually has the potential for making them less happy [16]. In this regard, individual differences in personality may play a major role in determining the attraction of smoking and the ability of quitting smoking. Among personality variables that may help to address the various issues associated with happiness and smoking, Positivity (POS) [17–20], namely, a personality trait associated with an individual disposition to view oneself, life, and the future under a positive outlook, appears a good candidate.

1.1. Positivity (POS). Theoretically, POS represents a basic disposition that pervasively affects how people view themselves and the world, colours their relations with other people, and shapes their expectations about the future [17, 19]. The theory of POS [17, 21, 22] suggests that the personality features assessed by this construct represent basic assets that exert fundamental biological functions. In this regard, Caprara and associates [17–19, 21, 22] suggested that people could not face the experiences of aging and death, nor cope with the adversities and losses of life, unless they are equipped with the basic belief that they are worthy of regard, that life is worth living, and that the future is promising. Positivity is conceptualized as a trait-like basic disposition [17, 22] identified with what is common to self-esteem, life satisfaction, and optimism. Findings from twin studies [20] have converged with longitudinal and cross-sectional data in attesting to the trait-like nature of POS and to its stability [21]. Cross-cultural studies have documented the generalizability of POS factorial structure across countries that differ widely in terms of cultural models of self, language, cultural and historical roots, and ways of life [18, 22]. Recent studies posited POS among the major predictors of health, quality of friendships, resiliency, and positive affectivity over an extended length of time in the transitions from adolescence to adulthood [21]. Finally, they attested a correlation of POS with success at work in samples of adults [23].

1.2. Study Aims. This is the first study where POS has been adopted in the field of drug addiction. It aims to investigate the extent to which POS is able to predict (i) relapse after quitting smoking and (ii) the desire to smoke again. In pursuing this aim, we were particularly solicited by the recent data on the incidence and consequences of smoking over time.

1.3. Gender, Age, Conscientiousness, and General Self-Efficacy as Potential Confounders. To make our results more compelling, in addition to examining the predictive value of POS, other important individual differences in personality such as conscientiousness and general self-efficacy beliefs have been taken into account together with gender and age. All these variables have been previously associated to health related behaviors [24] and to nicotine addiction [25–27]. Whereas gender and age are well-known sociodemographic covariates of smoke addiction [25–27], the mechanisms linking personality to smoke addiction deserve some more attention. People high in conscientiousness are more likely to enact specific conscientious behaviors, such as taking better care of one's health, which in turn lead to better health. As demonstrated by empirical studies a large part of taking care of one's health involves avoiding health-damaging behaviors, such as smoking [24]. Individuals high in general self-efficacy beliefs are expected to possess more robust coping strategies necessary to maintain smoking cessation. Over the years, a number of empirical studies have repeatedly shown that individuals higher in general self-efficacy show a fewer episodes of relapse after an initial treatment [28]. These covariates were considered also for methodological reasons. As stated by Wiggins [29] the demonstration of incremental validity against well-established measures (such as conscientiousness and general self-efficacy beliefs) and already known predictors (such as gender and age) is a basic step in the study of the relevance and of the utility of newly introduced psychological constructs, such as POS.

2. Methods

2.1. Baseline Characteristics of Participants before Entering the Group Counselling Program (GCP) for Smoking Cessation. From January 2005 to December 2010, 686 subjects motivated to quit smoking (292 males and 394 females, average age 49.9 (SD ± 10.7) years, and smoking an average of 22.7 (SD ± 9.5) cigarettes/day for a period of 32.7 (SD ± 11.1) years were recruited by the outpatient unit at the Teaching Hospital Umberto I, Policlinico of Rome, "Sapienza" University of Rome. All patients attended a 6-week Group Counselling Program (GCP) for Smoking Cessation [30–32] and, in the absence of specific medical problems, were asked if they wanted to add to counselling a pharmacologic therapy consisting of nicotine replacement therapy, or Bupropion for a seven-week period or Varenicline (starting in 2007) for a twelve-week period according to tobacco treatment guidelines [33, 34]. Pharmacological treatment was accepted by 321 (46.8%) of the participants. Prior to admission to the GCP for smoking cessation, subjects underwent a structured interview about their smoking history. The amount of exhaled carbon monoxide (CO; Smokerlyzer Monitor Bedfont Scientific Ltd., Rochester, England; cutoff: 10 ppm) was taken as a measure to confirm the subjects' current smoking status. The level of nicotine dependence was measured using both the Fagerström Test for Nicotine Dependence (FTND) [35] and the Severity of Dependence Scale (SDS) [36–39]. A self-efficacy test, whereby the subject had to rank himself or herself from 0 to 10 on the possibility of "becoming a nonsmoker" [30, 31, 40], was administered. During this interview, other parameters were collected, such as weight, body mass index (BMI), and the GCP was explained. Follow-up assessments to verify continuous abstinence rate were carried one year after the quit day; subjects were asked about their smoking status and invited to come to the hospital to complete the final form and to measure exhaled CO. Values of exhaled CO obtained from the 207 subjects who came to the 1-year follow-up visit were consistent with the self-reported

smoking status (exhaled CO: 26.6 ppm among smokers, n = 23, and 1.9 ppm among nonsmokers, n = 184).

2.2. Telephone Interview and Ethical Approval. All data for the present study were gathered during a follow-up telephone interview, conducted 2–6 years after the end of the previous described GCP for smoking cessation (from January to December 2012). All subjects who attended the GCP were called. All interviews were conducted by a team of four expert licensed clinical psychologists. Each interviewer used structured protocol to conduct the interview and filled out a prestructured paper questionnaire with answers obtained by subjects (questionnaires are available upon request).

In particular, besides the measures of interest described below, subjects were asked about their smoking behavior, since their last follow-up, with the following questions: "Do you smoke at the moment?" If the answer was "no," this second question was posed: "How long you have not being smoking: years, months, days?" whereas if the answer was "yes," they were asked: "How many cigarettes do you smoke daily/weekly?"

The study was approved by the local ethical committee, and each participant approved informed consent before all questions were submitted through the telephone interview.

2.3. Measures of Interest

Smoking Status. Subjects were asked about their smoking status. Their answers were coded "0" (ex-smokers) or "1" (still-smokers), depending on their status.

Craving to Smoke. Subjects were asked to fill in a Visual Analogue Scale (VAS) to measure the intensity of their "craving to smoke" [41, 42]. *Positivity* (POS). To measure POS we used the P-Scale [43]. The scale is composed by eight items, of which seven are positively worded (e.g., "I feel I have many things to be proud of"), and one was negatively worded (e.g., "At times, the future seems unclear to me"). This item was reverse scored as appropriate, to indicate high positivity. Participants were asked to provide their ratings using a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The individual score on POS is computed as the individual mean score on the eight items of the P-Scale. Cronbach's alpha of the eight-item scale was .78.

Generalized Self-Efficacy (GSE). The GSE was measured using three items of the original version of the scale developed by Schwarzer and Jerusalem [44] in Germany and then translated into many languages. This scale was designed to assess a general sense of perceived self-efficacy used to cope with a variety of demands in life. Participants were asked to provide their ratings using a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Cronbach's alpha was .72.

Conscientiousness (CONSC). Participants rated their conscientiousness as personality trait on 4 items derived by the Big-Five Questionnaire [45]. Participants rated their orderliness, precision, and the fulfilling of commitments using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Item example was "usually, when I finish a work, I check the accuracy of every detail." Cronbach's alpha was .75.

2.4. Statistical Analysis. Before analyses, the normality assumption was checked and accepted for all continuous variables, by looking at coefficients for skewness and kurtosis. These coefficients were all below recommended standards of 1.00 [46]. In detail, coefficients for skewness ranged from −.58 (POS) to .86 (GSE), and coefficients for kurtosis ranged from .16 to .43 (CONSC). Statistical comparisons between groups for continuous variables were performed using two sample t-tests, whereas categorical variables were analyzed using Pearson's chi square tests. Correlations were computed using tetrachoric coefficients for couples of dichotomous variables (i.e., smoking status and gender), and poliserial coefficients for couples of continuous (i.e., scores on the P-Scale, GSE, and CONSC) and dichotomous variables. Statistical analyses were performed using SPSS 20.0. To evaluate the role of variables related to the natural history of smoking as predictors of smoking cessation, one logistic regression analysis was carried out with smoking status as the outcome (nonsmokers versus still-smokers). The association of POS with "craving to smoke" levels was assessed with multivariate linear regression analysis. All regression equations were adjusted for CONSC, GSE, gender, and age in order to evaluate if individual's level of POS was independently associated with each of the above outcomes (i.e., smoking status and craving to smoke). The adequacy of the logistic regression equation was investigated using the Hosmer-Lemeshow (H-L) test, which indicates the extent to which the model provides better fit than a null model with no predictors. If the H-L goodness-of-fit test statistic is greater than .05, one fails to reject the null hypothesis that there is no difference between observed and model-predicted values, implying that the model's estimates fit the data at an acceptable level. We also reported the Nagelkerke R-square as a measure of the total amount of variability in the dependent variable explained by the predictors considered in the equation. The adequacy of the linear regression equation was investigated using the R-square coefficient, which indicates how well data points fit a statistical model. A significant R-square coefficient indicates that the proportion of variance explained by a regression equation is greater than that explained by a model with no predictors and thus is worth of empirical consideration.

3. Results

In the present study all the 686 subjects, who attended the GCP and who were nonsmokers (n = 312, 45%) or smokers (n = 374, 55%) at previous 1-yr follow-up, were contacted through a telephone call, to ascertain the present smoking status (Figure 1). Seventy percent (n = 481) of the subjects answered at the telephone call while thirty percent (n = 205) resulted unreachable (no answered, n = 144), or refused the interview (n = 43), or were deceased (n = 18). Table 1 shows the baseline characteristics and smoking history of the 481 subjects at enrolment, before entering the six-week

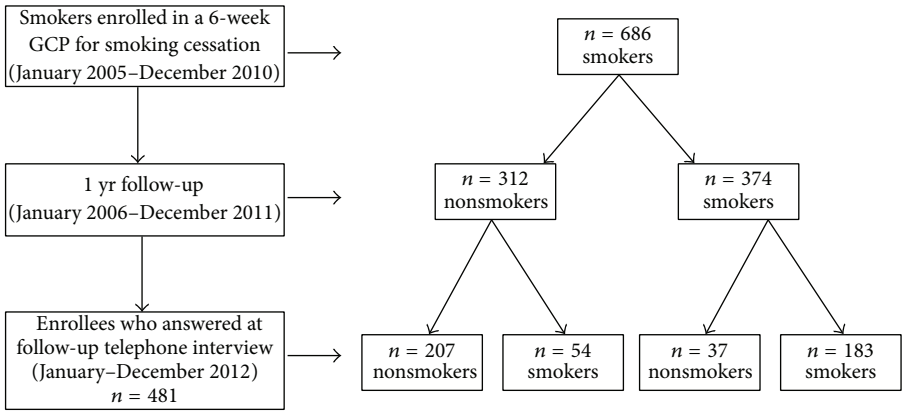

Figure 1: Chart of the subjects who previously attended a 6-week Group Counselling Program (GCP) for Smoking Cessation and answered at the follow-up telephone interview.

GCP for smoking cessation. At enrolment, according to the results at the telephone interview, ex-smokers compared to still-smokers showed lower values of (1) FTND (5.2 ± 2.1 versus 5.6 ± 2.1, $P < .05$), (2) SDS (9.6 ± 2.4 versus 10.1 ± 2.2, $P < .05$), (3) exhaled CO (22.1 ± 11.7 versus 24.5 ± 13.4, $P < .05$), (4) BMI (24.4 ± 3.8 versus 25.2 ± 4.0, $P < .05$), and (5) were less suffering from respiratory pathologies (73.4% versus 81.8%, $P < .01$). Moreover Table 2 shows the "current" characteristic of the same subjects according to their smoking status at the telephone interview: actually ex-smokers or still-smokers. More in detail, ex-smokers and still-smokers differed ($P < .05$) in (1) gender (ex-smokers were more likely to be males than females), (2) body weight (still-smokers weighted less), (3) weight gain (ex-smokers were more likely to gain weight), (4) craving to smoke (still-smokers reported higher levels of VAS), and (5) quit attempts other than the GCP (more attempts for still-smokers). With regard to psychological variables, we found statistically significant differences ($P < .05$) only for POS: ex-smokers reported higher levels of POS.

Table 3 contains also the zero-order correlations between the major study variables (gender, age, POS, GSE, CONSC, smoking status, and craving to smoke). These correlations represent the first-order effects of each variable without controlling for the effect of the others. Results showed that male gender was inversely associated with both smoking status and craving to smoke, but positively related to POS. Age was negatively related with POS, but positively related with generalized self-efficacy and conscientiousness. POS was negatively related to both smoking status and craving to smoke. Of interest, the three personality traits were positively associated with each other, and craving to smoke was positively and significantly associated with smoking status. With regard to sociodemographic variables, females referred to smoke and craving to smoke more than males. Males reported higher scores in POS than females. Younger individuals reported higher scores in POS than older individuals. Finally, older individuals showed higher scores in GSE and in CONSC than younger. Importantly, individuals higher in POS seemed more incline to quit smoking and to crave less to smoke than individual low in POS.

3.1. The Predictive Value of POS. Table 4 shows results from multiple logistic and linear regression analyses. POS resulted significantly ($P < .05$) and negatively associated with smoking status (i.e., more positive individuals were more likely to be ex-smokers) and with craving to smoke (i.e., more positive individuals referred lower levels of craving to smoke). Among covariates, only gender was associated with smoking status (i.e., females were more likely to be still-smokers) and with craving to smoke (i.e., females referred higher levels of craving to smoke). Age, CONSC, and GSE beliefs were not associated with the outcomes considered. All models showed an adequate data fit, as attested by nonsignificant H-L test and significant R-square values (Table 4).

4. Discussion

Identification of positive traits, behaviors, emotions, and cognitions that may promote well-being and flourishing has become a major goal of recent psychological research. Indeed, psychological literature is increasingly recognizing and appreciating the value of individual's characteristics and qualities as crucial elements for a healthy and long life [5–8]. This is reflected in the novel orientation of psychological science in promoting empirical studies aimed to identify ways able to lead individuals to pursue and maintaining healthy life habits [15, 16]. This study contributed to this literature by presenting innovative data corroborating the value of POS, a positive psychological trait, as a predictor of smoking cessation.

All in all, present findings are consistent with the idea that POS may play a moderate (as attested by the R-square values), although non-negligible role in sustaining individuals' efforts to quit smoking. In accordance with our hypothesis, levels of POS positively predicted smoking status, with more positive individuals more likely to be in the ex-smokers conditions.

Table 1: Baseline characteristics and smoking history of participants who answered at the telephone call, at enrollment, from January 1, 2005 through December 31, 2010, before entering the six-week Group Counselling Program (GCP) for Smoking Cessation.

Characteristics	*n* (%) or mean ± SD *n* tot = 481
Females (%)	283 (58.8)
Age: years (range)	50.9 ± 9.9 (24–74)
Years of smoking (range)	33.6 ± 10.4 (2–62)
Education (%)	
Primary school	68 (14.1)
Middle school	235 (48.9)
Degree	178 (37.0)
Occupation (%)	
Unemployed/household	47 (9.8)
Employed or students	351 (73.0)
Retired	83 (17.2)
Marital status (%)	
Single	98 (20.4)
Married/living together	271 (56.3)
Divorced or separated or widowed	112 (23.3)
Family history of smoking: yes (%)	430 (89.4)
Others smokers in household: yes (%)	201 (41.8)
Body weight: Kg	69.8 ± 13.6
BMI (Kg/m^2)	24.8 ± 3.9
Exhaled carbon monoxide (CO) (ppm)	23.3 ± 12.6
Number of cigarettes per day	22.6 ± 9.3
Number of previous quit attempts (%)	
0	76 (15.8)
1	129 (26.8)
2	122(25.4)
3+	154 (32.0)
Number of cups of coffee per day	3.3 ± 1.8
No alcohol consumption	107 (22.2)
Fagerström Test For Nicotine Dependence (0–10)	5.4 ± 2.1
Severity of Dependence Scale (0–15)	9.9 ± 2.4
Craving Scale (0–100)	61.2 ± 20.2
Self-efficacy evaluation (0–10)	5.8 ± 2.2
Respiratory pathologies: yes (%)	373 (77.5)
Cardiovascular diseases: yes (%)	288 (59.9)

Of relevance our findings suggest that POS not only predicts smoking status, but also reduces the craving to smoke. These results are of interest, since they underline the potential represented by this newly introduced positive personality trait. As it stands, positive ex-smokers were characterized by a lower desire to revert to the past negative habits.

While the benefits associated with POS for smoking cessation are clearly attested by our findings, our data are mute with respect to the psychological mechanisms processes through which POS translates into this healthier lifestyle (i.e., nonsmoking). Since this is the first study that examines the association with POS and smoking cessation, it seems premature to present hypotheses in this regard. Speculations are however possible, although limited.

We are inclined to think that POS may act as a motivational mechanism that sustains individual's efforts in quitting a bad habit (such as smoking), by leading them to a favourable evaluation of the efforts done. It is unlikely that also ex-smokers have not had recidivisms, nor have they never been tempted by a friend who smoked, nor have they never been close to restart with the bad habit. In our view, positive ex-smokers are sustained in their walk out from smoking by positive feelings about their ability to resist, and, if at times they may have relapsed, they tend to evaluate their recidivism as an "incident," or also a "momentary distraction."

On a related side, it is likely that POS may contribute to quitting smoke by fostering high tolerance to stress, resiliency, and commitment to valued goals, such as quitting smoke [23]. A certain amount of distress is normal when people try to quit a bad and pervasive habit, such as smoking. But some people may be affected more than others. Moreover, daily stressful events may trigger the recurrence to smoking as a previously experienced successful coping strategy.

By leading individuals to see events as predictable and generally occurring in one's best interest [17, 18, 22], POS may lead people to perceive events in their life as less threatening, their life and health related goals as more attainable, and to reduce the impact of the challenges and stressors resulting from daily experiences and social interactions. Thus POS may help to prevent the pernicious effect of stress in guiding individuals toward previous bad habits.

Despite speculations, understanding the psychological pathways, through which POS sustains healthy habits, represents a critical point that should find an answer in future studies. The knowledge of these mechanisms may indeed likely lead to more effective psychological interventions.

5. Conclusions

Looking on POS as a predisposition opens new avenues to both research and practice concerned with promoting human potentials and strengths. Whereas recent findings suggest that POS, although stable, is malleable to change [17, 18, 22], both whether and how POS has a beneficial function, and whether and why a lack or an excess of POS may carry negative consequences, deserve further investigation. From our perspective, such knowledge is crucial to individuate practices useful to effectively promote and sustain individuals' POS. Likely, the same principles that have proved to foster smoking cessation through mastery experiences may serve to nurture positivity through mastery experiences in the domain of emotion regulation and interpersonal relations [40]. Likely, the more the people are able to manage their emotions and to benefit from their relations, the more they have reason to be

Table 2: Characteristics of the 481 participants enrolled in the study, according to their smoking status at the telephone interview.

	Ex-smokers	Still-smokers	*P* value*
Number of subjects	244	237	
Age: years	56.3 ± 10.1	55.0 ± 9.7	.121
Females (%)	52.0	65.8	.001
Occupation (%)			
Unemployed/household	8.6	7.6	
Employed or students	60.7	64.6	.675
Retired	30.7	27.8	
Marital Status (%)			
Single	17.0	19.9	
Married/living together	65.1	51.3	.005
Divorced or separated or widowed	17.9	28.8	
Body weight: Kg	74.6 ± 14.8	67.5 ± 13.2	<.001
Weight gain from enrollment (Kg)	2.8 ± 6.8	−0.2 ± 6.6	<.001
Children at home: yes (%)	25.0	19.1	.079
Number of cigarettes per day	0	17.9 ± 11.6	
Number of further quit attempts (%)			
0	79.2	55.6	
1	14.4	23.1	<.001
2	3.8	11.5	
3+	2.5	9.8	
Takes prescription drugs: yes (%)	64.3	59.5	.158
Craving Scale (0–100)	7.8 ± 19.1	69.2 ± 27.8	<.001
POS	3.8 ± 0.7	3.6 ± 0.8	.016
GSE	4.0 ± 0.6	3.9 ± 0.7	.241
CONSC	4.2 ± 0.6	4.1 ± 0.6	.503

Note. Data are reported as mean ± SD or as percentage of the total number of subjects observed for each group. POS: Positivity Scale; GSE: General Self-Efficacy Scale; CONSC: Conscientiousness Scale. *Pearson's chi square or Student's *t*-test.

Table 3: Zero-order correlations among gender, age, conscientiousness, generalized self-efficacy, Positivity, smoking status, and craving to smoke ($n = 481$).

	Gender	Age	POS	GSE	CONSC	Smoking status at interview	Craving to smoke
Gender	1						
Age	.03	1					
POS	.10*	−.12**	1				
GSE	.01	.10*	.42**	1			
CONSC	−.03	.10*	.37**	.49**	1		
Smoking status at interview	−.14*	−.07	−.11*	−.05	−.03	1	
Craving to smoke	−.12*	−.06	−.18**	−.08	−.04	.79**	1

Note. POS: Positivity; GSE: Generalized Self-Efficacy; CONSC: Conscientiousness.
*$P < .05$ and **$P < .01$. Correlations were computed using tetrachoric coefficients for couples of dichotomous variables (i.e., smoking status and gender), poliserial coefficients for couples of continuous and dichotomous variables (i.e., GSE and gender), and Pearson's coefficients for continuous variables (i.e., scores on the POS, GSE, and CONSC; smoking status at interview: "*still-smokers* or *nonsmokers* at the telephone interview").

confident in themselves and to look on life and on the future under a positive outlook and the more they are able to accord their habits to healthy styles [17, 22].

On a related side, a better understanding of the biological correlates of POS may be useful to fully clarify how to use POS for promoting valued changes in individuals' lifestyles. More broadly, the knowledge of the biological substrates and of the pathways of influence that link POS with other constructs associated with psychological well-being (e.g., positive affect) may enhance our comprehension of the complex interplay between the biological and psychological systems in promoting and sustaining health.

Table 4: Results from multiple regression analyses (n = 481).

			Smoking status at telephone interview[a]		
	Beta	Wald	P value	OR	95% CI
Gender	−.53	7.77	.00	.59	.40, .85
Age	−.02	3.14	.08	.98	.96, 1.00
CONSC	.07	.15	.69	1.07	.75, 1.53
GSE	−.01	.01	.92	.98	.71, 1.36
POS	−.31	4.61	.03	.73	.55, .97
Test of Hosmer-Lemeshow = $\chi^2(8) = 12.56$, $P = .13$. R-square = .04					
			Craving to smoke		
	Beta	t-test	P value	—	95% CI
Gender	−.10	−2.14	.03	—	−14.7, −.64
Age	−.09	−1.88	.06	—	−.70, .02
CONSC	.04	.82	.41	—	−3.88. 9.47
GSE	−.01	−.11	−.92	—	−6.38, 5.73
POS	−.19	3.75	.00	—	−15.5, −4.84
R-square = .06, P = .041					

[a]Referent class: *still-smokers* at the telephone interview; gender coded: 0: females, 1: males; OR: odds ratio.

6. Limitations

We acknowledge a few limitations of the present contribution. Although POS relies on a set of subjective evaluations that are not easily accessible other than self-reports, other methods such as implicit measures, clinical interviews, and reports from other informants would be useful complements to the use of self-report data. Moreover, the cross-sectional nature of these data does not permit strong inferences about causal effects. Notwithstanding these limitations, the results contribute to the understanding of the relation between POS and positive affectivity.

Ethical Approval

This work was approved by the Ethics Committee of the Hospital Policlinico Umberto I at Sapienza University of Rome.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Authors' Contribution

Maria Caterina Grassi and Guido Alessandri contributed equally to this paper, and the order of their names was arbitrary.

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Research Article

Smoking Ban Policies in Italy and the Potential Impact of the So-Called Sirchia Law: State of the Art after Eight Years

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Objective. The aim of the present work is to describe the state of the art of tobacco habits in Italy, eight years after the law was introduced. *Methods*. Time series analyses, based on estimates of smoking prevalence/consumption derived from the openly available data of national surveys performed during the 2001–2013 period, were performed. Data have been expressed in percentage of smokers and daily cigarettes consumption. Time changes are expressed as expected annual percentage change (EAPC). *Results*. Over time, the percentage of Italian smokers shows a constant and statistically significant decrease (from 28.9% in 2001 to 20.6% in 2013, EAPC = −2.6%, and $P < 0.001$). Regarding data stratified by gender, we found a stronger reduction among men (EAPC = −2.9%, $P < 0.001$) than in women (EAPC = −2.5%, $P < 0.001$). Similarly, the consumption of tobacco smoking, measured as the number of daily cigarettes smoked, registered a downward trend ($P < 0.001$). No join point (time point when a significant trend change is detected) resulted from the trend analysis. *Conclusions*. Data show a constant decrease of tobacco consumption in Italy, with no join point related to the introduction of the banning law. These findings require to reflect on the priorities of the smoking banning policies that may be focused on other intervention activities such as to increase the price of cigarettes.

1. Introduction

Currently, smokers in Italy are around 11 million: of them, 43.5% are women [1]. In Italy tobacco use is an important public health issue, being the first preventable cause of death (the third one is passive smoking) [2].

Lung cancer kills 36,000 Italians each year [3] and smoking-related deaths are nearly 72,000, accounting for 12.5% of total deaths in Italy [4].

Over 25% of smoking-related deaths occur among individuals aged between 35 and 65 [5]. In addition, Russo and Scafato calculated that around 15% of total hospitalizations can be related to smoking effects, with an economic cost to the health system accounting for 3 billion euros (6.7% of national health costs) [5].

Since 1975 in Italy several laws aimed at controlling tobacco use have been enacted. In particular, from 10 January 2005, the law number 3 of 16 January 2003 (the so-called Sirchia Law named after the Health Ministry who promoted it) that banned smoking in all indoor public places was into force. This represents one of the first smoke-free legislation introduced in Europe, aiming at controlling smoking habits in all the public and private places such as bars and restaurants in order to protect nonsmokers. Afterwards, Italy, with the law number 75 of 18 March 2006, has ratified the Framework Convention of the World Health Organization to control and fight tobacco smoking. This convention can be considered a milestone for the promotion of public health and provides new horizons for international health cooperation. Such global initiatives have achieved important goals: to date, about 2.3 billion people are now covered by at least one tobacco control measure at the highest level of achievement [6]. Interestingly, a suitable scale was created by an international experts panel who proposed the Tobacco Control

Scale (TCS) in order to evaluate the quality of implementation of tobacco control policies across European countries. In particular, the scale considers six specific policies to be implemented: bans and restrictions on smoking in public places and workplaces, cigarette taxation, public information campaigns, bans on the advertising and promotion of tobacco products, health warnings on tobacco product packaging, and treatment to help quitting [7].

In this framework, there are still few research experiences investigating the impact of the introduction of the smoking banning policies worldwide: for instance, in Germany, Anger et al. found that the introduction of smoking bans in 2007-2008 did not change smoking behaviour in the whole population, but only selected groups (men and young and unmarried people, as well as for those living in urban areas) were positively influenced by the law [8]. A recent study carried out in the USA did not find evidence that smoking bans, either in workplaces or in bars and restaurants, have a real effect on smoking behavior, in terms of consumption and smoking cessation [9].

An Italian study published in 2013 investigated only the short-term effect of the Sirchia law, by analyzing differences in smoking behavior between 2004 and 2005. They found that, immediately after the introduction of such a law, Italian smokers changed their habits [10]. Moreover, a previous Italian study conducted before and after the introduction of the indoor smoking ban (2001–2006) reported that the introduction of the ban improved the efficacy of smoking cessation treatments at 1-year follow-up [11].

The present work aims to describe the state of the art of tobacco habits in Italy, eight years after the banning law was introduced in 2005, by using a time trend analysis in order to show the long-term effects of such a law.

2. Methods

The openly available online data of tobacco consumption of national surveys commissioned by the National Institute of Health in collaboration with the Mario Negri Institute for Pharmacological Research and the Italian Cancer League (LILT) and conducted annually by the DOXA Institute of Statistics (the Italian branch of the Gallup International Association) have been elaborated. The DOXA Institute interviews a representative sample comprising more than 3,000 Italian citizens aged more than 15 regarding the prevalence, the attitudes, and the behaviors of Italian smokers each year [1]. The time period considered was 2001–2013.

3. Statistical Analysis

Data have been expressed in percentage of smokers and daily cigarettes consumption. Furthermore, data were stratified by age (age groups: 15–24, 25–44, 45–64, and 65+) and gender, where available. Authors were not able to retrieve data stratified by age for the year 2001, so these analyses were performed for the period from 2002 to 2013. In order to obtain the time trends of tobacco consumption, the following formula was applied for logarithmic transformation of the consumption rates:

$$\ln(\text{rate}) = b \times \text{years}, \quad (1)$$

where "x" represents the calendar years, "b" is the regression coefficient, and "y" is the incidence rate.

In particular, a join point represents the time point when a significant trend change is detected. Time changes are expressed as expected annual percentage change (EAPC) with the respective 95% confidence interval (95% CI); significance levels of time trends are also reported. The null hypothesis was tested using a maximum of 3 changes in slope with an overall significance level of 0.05 divided by the number of join points in the final model. Linear graphs were created to represent trends. Statistical analysis was conducted by using the join point regression program software version 4.0. The Poisson model was applied to control heteroskedasticity in the population [12, 13].

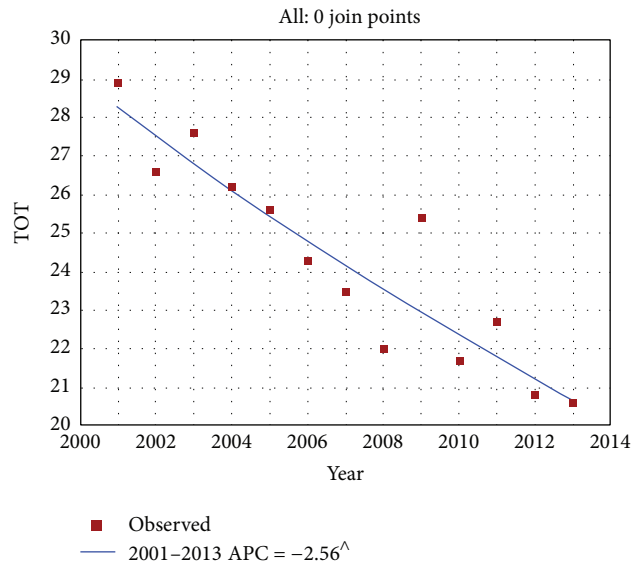

Figure 1: Time trends of annual percentage of tobacco smokers in Italy (2001–2013). ^Statistically significant results APC = annual percentage change.

4. Results

Over time, the percentage of Italian smokers shows a constant and statistically significant decrease (from 28.9% in 2001 to 20.6% in 2013, EAPC = −2.6%, and $P < 0.001$); see Figure 1. Regarding data stratified by gender, we found a stronger reduction among men (EAPC = −2.9%, $P < 0.001$) than in women (EAPC = −2.5%, $P < 0.001$).

Similarly, the consumption of tobacco smoking, measured as the number of daily cigarettes smoked, registered a downward trend (from 16.4 cig/day in 2001 to 12.7 cig/day in 2013, EAPC = −2.1%, and $P < 0.001$); see Figure 2. Interestingly, Italian women seem to have lesser propensity to reduce the number of daily cigarettes than men. Indeed, in 2001, women used to smoke 12.2 cig/day and in 2013

Table 1: Percentage of smokers and daily cigarettes consumption (overall data plus data stratified by gender). Italy, 2001–2013.

Calendar year	Percentage of smokers (overall)	Percentage of smokers (males)	Percentage of smokers (females)	Daily cigarettes consumption (overall)	Daily cigarettes consumption (males)	Daily cigarettes consumption (females)
2001	28.9	34.8	23.6	16.4	18.8	12.2
2002	26.6	31.1	22.3	16.8	19.2	13.1
2003	27.6	33.2	22.5	16.1	18.6	12.2
2004	26.2	30.0	22.5	14.8	16.1	13.1
2005	25.6	29.3	22.1	14.0	15.8	11.9
2006	24.3	28.6	20.3	13.6	14.8	12.0
2007	23.5	27.9	19.3	14.1	14.9	13.0
2008	22.0	26.4	17.9	14.4	15.3	13.0
2009	25.4	28.9	22.3	14.1	16.0	11.7
2010	21.7	23.9	19.7	13.0	14.5	11.5
2011	22.7	26.0	19.6	13.6	15.6	11.1
2012	20.8	24.6	17.2	13.0	14.3	11.3
2013	20.6	26.2	15.3	12.7	13.5	11.5

Table 2: Expected annual percentage change (EAPC) and 95% confidence interval (CI) of tobacco consumption (data stratified by age and gender).

	Expected APC[a] of tobacco consumption (2002–2013)			
Age group	EAPC[a]	95% CI	*P* value	
15–24	−3.45	(−5.7; −1.2)	0.02	Males
25–44	−1.98	(−3.3; 0.7)	0.01	
45–64	−1.16	(−2.8; +0.2)	0.07	
65+	−1.94	(−5.7; +2.0)	0.20	
15–24	−3.86	(−6.5;−0.9)	0.02	Females
25–44	−3.56	(−5.3; −1.9)	0.002	
45–64	+0.90	(−1.5; 2.9)	0.40	
65+	−4.18	(−6.8; −1.5)	0.02	

[a]APC: annual percentage change.

11.5 cig/day (EAPC = −1,P = 0.03) while men have reduced their consumption from 18.8 cig/day to 13.5 cig/day in the same time period (EAPC = −2.5, $P < 0.001$).

Data on the prevalence of smokers and tobacco consumption (overall data and data stratified by gender) are shown in Table 1.

No statistically significant join point resulted from the trend analysis. Nevertheless we have to acknowledge that in 2009 an increase in smoking prevalence was registered (from 22% in the previous year to 25.4% in 2009). In 2010 the prevalence registered a decrease (21.7%). Notwithstanding, this trend change was not statistically significant.

Regarding data stratified by age groups, we retrieved that women belonging to extreme age groups were more likely to stop smoking than men and women of the other groups: indeed women older than 65 years and aged 15–24 yielded EAPC values of −4.18% (P = 0.02) and −3.86% (P = 0.02), respectively (in the time period 2002–2013). Particularly, women aged 45–64 seem to increase their tobacco consumption, showing the only positive value of EAPC = +0.90; nevertheless this finding does not result in being statistically significant (P = 0.40). All the results of the trend analysis stratified by age group are showed in Table 2.

5. Discussion and Conclusions

The present work analyzes the possible long-term impact of the so-called Sirchia Law that since 2005 banned smoking in all public places in Italy. Our data show a statistically significant decrease of tobacco consumption, constantly lasting from 2001 and registering no join point related to the introduction of the banning law.

A previous Italian study by Federico et al. aimed at evaluating the immediate as well as the longer-term impact of the Sirchia law on smoking in the overall population and by educational level in the period until 2010 and concluded that the Italian smoke-free policy on smoking seems to be for short term only. Indeed, banning policies may not achieve the secondary effect of reducing smoking prevalence in the long term, and they may have limited effects on inequalities in smoking [14].

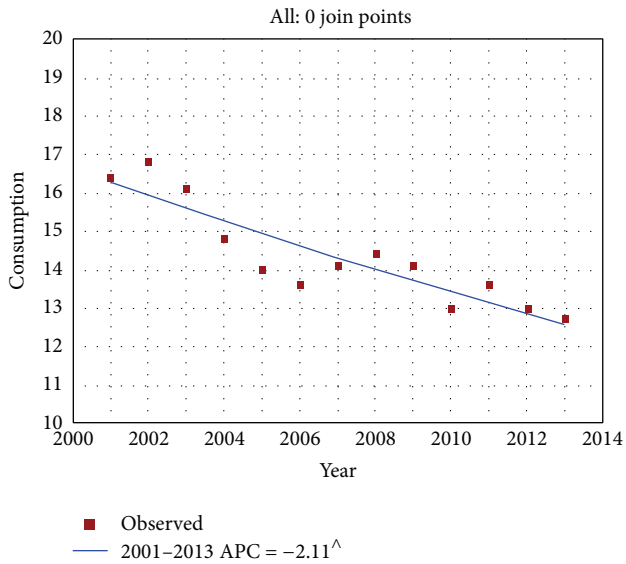

Figure 2: Time trends of tobacco consumption (daily cigarettes smoked) smokers in Italy (2001–2013). ^Statistically significant results APC = annual percentage change.

Based on the results of the present study and inline with previous data, we can affirm that since 1990 in Italy there was a downward trend of tobacco consumption [1]. Even though Italian women used to smoke less than men (4.7 million versus 6.1 million), we found a lower percentage of reduction among women (EAPC = −2.5%, $P < 0.001$) than in men (EAPC = −2.9%, $P < 0.001$). Probably this can be related to the female propensity to smoke in order to control negative mood/affect, depression, and/or postcessation weight gain [15].

Nevertheless, by analyzing the stratified data, it arose that women older than 65 years and aged 15–24 are more likely to quit smoking than men and women of the other age groups. These differences by gender, particularly among adolescents, in this kind of behavior are reported in literature also [16]. In addition, a study published in 2006 demonstrated that older women are more likely to quit smoking [17].

An interesting fact was registered in 2009, when a peak of increasing prevalence was registered, mainly attributable to former smokers in 2008 who relapsed [18]. Considering that the 2009 survey was carried out during the period of the peak recession in Italy, a possible explanation for this unexpected data, as reported by the current literature, could be the economic crisis that, by causing psychosocial stress, increases tobacco consumption [19–21].

Regarding the consequences of this banning law, current literature reports that the bans were largely respected, with positive effects in particular on passive smoking, and it appears that in Italy the smoke-free law did not affect the business of restaurants and bars [22].

Moreover, a possible synergistic effect of banning policies and smoking cessation methods (such as bupropion) seems to exist [11].

In addition, other studies have suggested that smoking bans should decrease the phenomenon of the "social acceptability" of smoking, registering a reduction of smoking habits in private places and houses also. For instance, in Italy in 2006 more than 50% of people interviewed declared that their guests could smoke only outside of their home [23].

Given this context, we suggest to reflect on the priorities of the smoking banning policies that may be focused on other intervention activities to discourage tobacco habits, such as to increase the price of cigarettes, to cover the pharmacological supports for smoking cessation, and to introduce health warnings on cigarette packages. Concerning the last measure, the European Union on 7 March 2012 adopted 14 new health warnings to appear on cigarettes' packs. In this regard, a recent Italian study showed some positive effects of the introduction of health warnings on cigarette packages. In fact, almost all the smokers interviewed were informed on tobacco effects, 14% of them reduced the amount of daily smoking, and 5% attempted to quit [24].

Additionally, the role of the health professionals in helping their patients/citizens to quit smoking has to be considered [25, 26]. Given the high prevalence of smokers among these kinds of professionals [27, 28], it would be important to develop some specific actions of promoting the smoking cessation addressed to the health workers, in order to create a cascade effect, from the healthcare professionals to the patients/citizens.

Interestingly, about the future trends, international projections to 2025 that smoking prevalence and smoking-attributed mortality will decrease in parallel in most developed countries towards lower limits that are not yet defined [29].

The present work is affected by some limitations that should be acknowledged. First of all, our trends' calculations are based on aggregate data, not considering the individual level. In consequence of this weakness, our findings should be interpreted considering the limitations that affect the ecological studies. Moreover, data are based on surveys registering self-reported data, thus giving a possible underestimation of the smoking prevalence. The other limits are related to the possible biases occurring in the population-based surveys, such as information and recall bias. Nevertheless, the highly representative nature of the sample makes these data very accurately estimated [22].

6. Conclusions

Given that Italy has now reached the final stage of the tobacco epidemic, antismoking strategies should focus on support for smoking cessation. Given our results, Italy should introduce new policies and measures for tobacco control. For instance, to increase tobacco taxes and prices and to introduce the coverage for smoking cessation treatment in the national health system are highly recommended. Furthermore, since Italy was one of the first countries to introduce such a law in Europe, it will be interesting to analyze data from all the other European countries, when available, in order to assess the global impact of the smoking banning laws in

Europe. The future priorities of the public health agenda may be focused on promoting other intervention activities to discourage tobacco habits among the European and Italian citizens.

Conflict of Interests

The authors declare that they are no conflict of interests.

Authors' Contribution

Maria Rosaria Gualano and Fabrizio Bert conceived the research; Maria Rosaria Gualano, Fabrizio Bert, Giacomo Scaioli, and Stefano Passi elaborated data and drafted the paper; Giuseppe La Torre and Roberta Siliquini revised the paper.

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Research Article

Smoking Habits among Italian Adolescents: What Has Changed in the Last Decade?

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Tobacco use, alcohol abuse, overweight and obesity are risk factors for numerous diseases in Italy as elsewhere. However, children and adolescents are not usually included in official national surveys although it is at this stage of life when unhealthy habits are often established. Italian participation in HBSC and GYTS surveys allows our country to implement standardized surveillance systems providing reliable information on tobacco-related behaviors of this population. Data from three HBSC surveys (2002–2010) show that following the drop in the first half of the decade, prevalence of tobacco use stabilized in the second half. The decline was significant for younger age groups, while prevalence of regular tobacco use remained stable among 15-year-olds. Many adolescents reported being exposed to secondhand smoke, to have at least one parent who smokes, and having seen teachers and students smoking at school. Although the sale of tobacco products to minors is prohibited, the vast majority had no trouble in buying cigarettes. Data from GYTS and HBSC surveys provide a wealth of information about attitudes and behaviors of Italian adolescents with respect to smoking. Despite some progress, sizeable gaps remain in meeting standard recommendations for discouraging smoking initiation and motivating adolescent smokers to quit the habit.

1. Introduction

Despite the many reports on the harmful effects smoking has on health, tobacco remains the world's leading preventable cause of death and disability [1, 2]. Effective tobacco-control programs rely on systematic surveillance to monitor trends in tobacco use. The data so far collected through existing surveillance systems suggest that by 2030 there will be more than 8 million tobacco-related deaths every year largely because of the rising smoking rates among youth, particularly among girls, the high risk of uptake of smoking by nonsmokers, increased exposure to secondhand smoke, and hidden or indirect marketing of tobacco products [3].

Tobacco use, alcohol abuse, physical inactivity, overweight, and obesity are all risk factors for numerous diseases in Italy as elsewhere. However, children and adolescents are not usually included in official national surveys (ISTAT, PASSI, ISS/Doxa), although it is precisely at this stage of life when unhealthy habits are most often established. Regarding tobacco use, most adult smokers lit their first cigarette or were already addicted to nicotine before the age of 18 years [4–8]. Because smoking-related health problems are a function of the duration and intensity of use, smoking prevention in adolescents is of critical concern. The longer the uptake of smoking is delayed, the less likely a person is to become addicted. But once addiction occurs, nicotine dependence is extremely difficult to break. In addition, there is evidence to support a close relationship between cigarette smoking and the use of alcohol and marijuana [9, 10]. In spite of the negative consequences of tobacco use, adolescents may have a positive perception of smoking for many reasons: a way to control negative moods, relax, reduce boredom, belong to a group, control weight, especially among girls, and be identified with a certain image of maturity and self-reliance [11].

The factors that contribute to youth smoking are well documented. The behaviors, attitudes, and expectations of parents and peers can influence the smoking patterns of

adolescents [12–16]. This makes it important to investigate such variables as peer relationships, parental support, and school environment to study smoking within a broader context and as part of an adolescent's lifestyle rather than look only at smoking prevalence rates. This was the main aim of the two surveys implemented in Italy. The first is the national health behavior in school-aged children (HBSC) survey in which Italy has participated since 2002. It is a multicenter study carried out in collaboration with the World Health Organization (WHO), coordinated by the Universities of Turin, Siena, and Padua, with the aim of collecting data on health-related behaviors in adolescents aged 11, 13, and 15 years. The second is the global youth tobacco survey (GYTS) promoted by the WHO and the US Centers for Disease Control and Prevention (CDC), which specifically investigates tobacco use among students aged 13–15 years, and implemented for the first time in Italy in 2010.

Equally important is monitoring tobacco use through international and standardized surveillance systems that can capture the changes in habits and attitudes of younger age groups. US data from the national youth tobacco survey (NYTS) indicate that during the past decade (2000–2011) both the prevalence of current tobacco use and cigarette smoking experimentation declined among middle- and high-school students but that the overall prevalence did not decrease from 2006 to 2009 or from 2009 to 2011. Similarly, no change in susceptibility to initiate cigarette smoking was observed [17, 18]. These results are consistent with those from the European School Survey Project on Alcohol and Other Drugs (ESPAD) in which Italy has been involved from the very beginning in 1995. The ESPAD questionnaire starts with a small number of question items on cigarette smoking. Trends for the countries with data from all five waves (1995, 1999, 2003, 2007, and 2011) display, for cigarette use in the past 30 days, a decrease between 1999 and 2007 followed by a stabilization in smoking rates until 2011 [19]. Specifically, for the Italian students, the ESPAD data show a fall in lifetime prevalence between 2000 and 2005, while no significant changes can be detected after 2005 [20].

The aim of this study was to verify on the basis of the results of the three national HBSC surveys (2002, 2006, and 2010) and the first GYTS implemented in 2010 whether the Italian data show a decrease in the prevalence of adolescents who tried smoking and of current smokers in the last decade; an additional aim was to evaluate whether these trends can be seen across all the age-groups involved in the two surveys.

2. Methods

2.1. Participants. The HBSC is an international school-based survey that collects data on adolescents' health and well-being, social environments, and health behaviors. It consists of repeated cross-sectional cluster sampled surveys among 11-, 13- and 15-year-old students in nationally representative samples of approximately 1500 students from each of the three age groups.

The GYTS is a school-based survey designed to enhance the capacity of countries to monitor tobacco use among students aged 13–15 years and to guide the implementation and evaluation of tobacco prevention and control programs. The CDC normally recommends a sample size of 1500 students for countries participating in the GYTS, as this ensures representative estimates with a precision level of ±5%.

Both the HBSC and the GYTS apply standardized sampling methods for selecting schools and classes, questionnaire design, procedures for conducting the survey in the field (self-completion questionnaires administered in the classroom), and data management (http://www.hbsc.org/; http://www.who.int/tobacco/surveillance/gyts/en/) [21–23].

For the Italian GYTS sample, as agreed with the CDC, sampling was not carried out on the basis of the list of all first and second level secondary schools; instead, schools were selected from those previously sampled for the HBSC study. In agreement with the CDC, the idea was that, for economic and organizational reasons, the GYTS would be conducted on a subsample of the HBSC sample, as the reference schools for both surveys were the same (first and second level secondary schools). Accordingly, the CDC sampled the schools, starting from the list of those surveyed for the HBSC study. The classes from the surveyed schools were randomly selected for participation, starting from a comprehensive list of the previously selected schools.

2.2. Ethical Aspects. Participation in the surveys was voluntary and compilation of the questionnaires was anonymous.

The Ethics Committee of the Italian National Institute of Health approved the protocols and methods of the surveys implemented in 2010. Protocols and methodology of the HBSC surveys carried out in 2002 and 2006 were approved by the Board of the Italian Ministry of Health and Ministry of Education.

2.3. Measures. The HBSC questionnaire includes mandatory question items investigating tobacco consumption: one is related to smoking initiation ("*Have you ever smoked tobacco? -at least one cigarette, cigar or pipe*") and another investigates the frequency of the habit ("*How often do you smoke tobacco at present*?") with response options ranging from "*I do not smoke*" to "*every day*."

The GYTS questionnaire comprises a core set of items that are used by all participating countries and that investigate seven domains: prevalence of tobacco use, knowledge about and attitudes toward smoking, role of the mass media and advertising in encouraging/discouraging tobacco use, accessibility to tobacco products, antitobacco education in school, exposure to secondhand smoke, and smoking cessation.

In order to make comparisons with the HBSC survey regarding the prevalence of tobacco use, we analyzed the responses to the following questions: "*Have you ever tried or experimented with cigarette smoking, even one or two puffs*?" to evaluate first experimentation with tobacco and "*During the past 30 days, on how many days did you smoke cigarettes?*" (response options ranging from "*0 days*" to "*all 30 days*") in order to assess the prevalence and frequency of a regular habit.

2.4. Statistical Analysis. Weighted prevalence estimates and 95% confidence intervals (95% CI) were computed for each age group and gender. The significance level was set at $P = 0.05$. All analyses were performed using the Stata 12 statistics package.

HBSC. The 2010 HBSC database was linked to the 2002 and 2006 databases for calculating the trend analyses. All analyses are design-adjusted to take account of the effect of the complex survey design (stratification, clustering, and weighting) on the precision of the estimates.

Trying smoking and daily cigarette use trends over time were evaluated using logistic regression analyses. Having tried smoking (yes/no) and daily cigarette use (yes/no) were used, respectively, as the dependent variable and survey year and Family Affluence Scale (FAS), a four-item measure of family wealth used in the HBSC as a measure of socioeconomic status (SES), as independent variables [24]. Analyses were stratified by age group and gender and simultaneously assessed for linear and quadratic (nonlinear but significant trend over time, depicted by a curve with one bend) trends. The significance of the trends was tested from the P value of the slope coefficient β from the logistic fitting process.

GYTS. The GYTS data are weighted to adjust for sample selection (school and class levels), nonresponse (school, class, and student levels), and poststratification of the sample population relative to the grade and sex distribution in the total population.

3. Results and Discussion

HBSC. Data were available for 4811 students from the 2010 survey: 50.1% males and 49.9% females. Survey population breakdown: 33% 11-year-olds, 34.9% 13-year-olds, and the remaining 32.1% 15-year-olds. The distribution by sex and age was similar in the 2002 and 2006 surveys.

Trend analyses for the three Italian surveys (2002, 2006, 2010) refer to 13,088 adolescents.

GYTS. Out of the 1854 response sheets that were completed and returned, we report on the 1587 sheets completed by students belonging to the survey target age groups (those who stated being 13, 14, or 15 years of age when they completed the questionnaire). Males made up 47.6% of the sample (52.4% females). The population breakdown by age group was: 35.1% 13-year-olds, 32.3% 14-year-olds, and the remaining 32.6% 15-year-olds.

Table 1 shows the results of the two surveys implemented in 2010, referring to the prevalence of adolescents who stated they tried smoking and those who reported smoking every day. These two question items, and their similar modalities, allow in this case for a direct comparison between the HBSC and the GYTS data.

The data reported in Table 1 show that, for both items, the results from the 2010 GYTS and HBSC surveys are substantially coherent and show no statistically significant differences in the results of the analysis of the two age groups (13- and 15-year-olds). More marked differences, statistically significant for the females who reported having experimented with smoking, emerge between the two surveys when comparing data by gender (excluding in this case the HBSC data for the 11-year-olds as they are not compatible with the GYTS data). A possible explanation for the differences resides in the fact that the comparison is made between two age groups (13- and 15-year-olds) for the HBSC versus three age groups (13-, 14-, and 15-year-olds) for the GYTS, where the analyses by age group showed precisely that in the move from 13 to 14 years of age there was a significant rise in the prevalence of adolescents who reported having experimented with smoking.

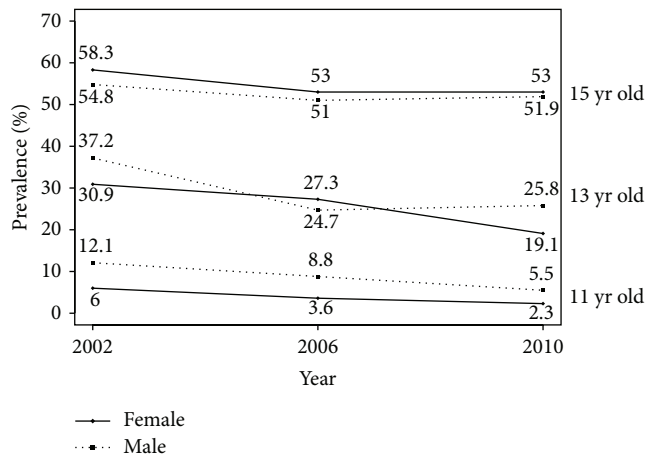

Figure 1: Prevalence (%) of students who reported having tried smoking. Trends stratified by age group and gender (HBSC 2002–2006-2010). Results from logistic regression analyses controlling for FAS. 11 yr old: statistically significant linear trend ($P < 0.05$) for both males and females. 13 yr old: statistically significant linear trend ($P < 0.05$) for females and square trend for males ($P = 0.02$).

Figure 1 illustrates the time trends for all three age groups and both sexes with regard to first experimentation with smoking (prevalence of early experimentation with smoking). The 2002–2010 HBSC survey data show a significant reduction over time of the prevalence of 11- and 13-year-olds of both sexes who reported they had experimented with smoking. No statistically significant difference emerged for the 15-year-olds of both sexes: following a decline between 2002 and 2006, the prevalence then stabilized in 2010. All surveys showed an inversion in the prevalence among males and females, with more females experimenting with smoking with increasing age, though the difference between the sexes was not statistically significant.

The international HBSC protocol uses the proportion of adolescents who report smoking at least once a week to measure smoking frequency rates and to identify the proportion of those who progress from experimentation to regular tobacco use. Table 2 reports the data from the three HBSC surveys stratified by age group (13- and 15-year-olds) and sex.

No substantial changes in smoking habits among the 15-year-olds emerge over time. The prevalence remains fairly stable and is nearly always higher among the females, confirming the trend seen for first experimentation with

Table 1: Comparison between the 2010 HBSC and the GYTS. Percent prevalence (95% CI) stratified by age and gender of students who reported having tried smoking or who smoked every day.

Item	Tried smoking		Smoke every day	
Survey (2010)	HBSC	GYTS	HBSC	GYTS
Questions and answers used for comparison between HBSC and GYTS	"*Have you ever smoked tobacco? (at least one cigarette, cigar or pipe)*" Yes	"*Have you ever tried or experimented with cigarette smoking, even one or two puffs?*" Yes	"*How often do you smoke tobacco at present?*" Every day	"*During the past 30 days, on how many days did you smoke cigarettes?*" All 30 days
		Prevalence (95% CI)		
Age (yrs)				
11	4.0 (2.7–5.8)	—	0.3 (0.1–0.7)	—
13^	22.5 (19.9–25.4)	29.0 (22.5–36.3)	1.8 (1.2–2.7)	1.6 (0.7–3.7)
14	—	50.3 (41.1–59.5)	—	8.0 (5.5–11.4)
15^	52.4 (49.3–55.6)	60.3 (52.7–67.3)	15.8 (13.7–18.1)	12.7 (9.1–17.5)
Gender (11-year-olds surveyed in the HBSC survey not included)				
Male^	38.2 (35.1–41.4)	45.1 (39.4–50.9)	8.2 (6.8–9.9)	5.8 (4.0–8.5)
Female°	*35.5 (32.5–38.6)*°	*46.7 (39.6–53.9)*°	8.8 (7.2–10.7)	8.3 (5.4–12.4)

^There were no significant differences between the results of the two surveys for any of the feasible comparisons, except for females for tried smoking analysis°.

Table 2: Prevalence (%) of smoking at least once a week. Trends by age group* and gender (HBSC 2002-2006-2010).

HBSC	2002 prevalence (95% CI)	2006 prevalence (95% CI)	2010 prevalence (95% CI)	*P*-value for linear trend
Smoked at least once a week				
13 yr old				
M	*8.6 (6.2; 11.8)*	*6.1 (4.1; 8.9)*	*5.1 (3.7; 7.2)*	*0.037*
F	6.7 (4.5; 9.7)	5.5 (3.6; 8.2)	4.3 (3.0; 6.0)	0.170
15 yr old				
M	21.3 (17.5; 25.6)	20.0 (16.8; 23.7)	21.9 (18.9; 25.3)	0.957
F	24.8 (21.1; 28.9)	19.6 (16.0; 23.9)	23.1 (19.6; 27.0)	0.637

*11-year-olds not included due to small numbers.

smoking. A downward trend is evident among the 13-year-olds of both sexes, which was statistically significant for the males but not the females.

Trend analysis of the HBSC data for adolescents who reported smoking every day was performed only for the 15-year age group. No significant changes across the three surveys can be noted: the prevalence of daily smokers of both sexes remains about 15% (95% CI: 13.02–16.71) (data not shown).

Our findings from the 2010 HBSC and GYTS are congruent in documenting that in Italy, as in many other parts of the world, tobacco use by young people remains a serious problem: by age of 15 years, over 50% have already experimented with smoking and nearly 15% are daily smokers. Furthermore, the GYTS data on susceptibility to initiate smoking within 1 year among those who have not yet started indicate that 35.4% of the males and 46.6% of the females fall into the susceptible category. (By analyzing the responses to the items "If one of your best friends offered you a cigarette, would you smoke it? "and "At any time during the next 12 months do you think you will smoke a cigarette?" only from among those students who stated they had never experimented with tobacco, the GYTS derives the finding related to the susceptibility of the interviewees to start smoking. Under the protocol, the "susceptible" category was defined as those who, never having smoked, gave responses other than "definitely not" to both these items.)

The HBSC data on the trend for the past decade are substantially in line with published data that show a drop in the prevalence of experimentation with smoking and regular tobacco use among adolescents. The estimated prevalence stabilized in the second half of the decade, however [17–20]. In detail, the Italian data show a significant drop in first experimentation only for the younger age groups (11- and 13-year-olds), with a less pronounced decline, or stabilization, between 2006 and 2010. Similar trends have been observed in other studies, some of which also carried out on HBSC data: a German paper analyzing data collected in the same time frame as ours (2002–2010) shows a strong decrease in the use of psychoactive substances (tobacco, alcohol,

and cannabis) by adolescents, but also a clear flattening of the decrease from 2006 to 2010 [25]. A Dutch study published in 2010 demonstrates a clear decline in ever and current smoking between 1996 and 2005 among adolescents; the same results were highlighted in the Dutch HBSC data, showing a continuous decrease in the lifetime prevalence of smoking among Dutch adolescents from 1996 to 2005 [26].

One possible explanation for the Italian trend is the implementation of various interventions during the early years of the decade, among which were restrictions on access by minors to tobacco products and the ban on tobacco product advertising in the media. Between 2003 and 2004, the Italian government implemented European directives on banning tobacco product advertising and misleading consumer information that some tobacco products were less harmful than others. As an additional deterrent to the purchase of tobacco products by minors (<16 years of age), starting in 2004, cigarette vending machines can be operated only during nighttime hours. Since 2007, the machines must contain an electronic device to verify the age of the buyer. But it was with the enactment of Law 3/2003 that the public began to realize the harmful effects of smoking on the health of smokers and those exposed to secondhand smoke. As of January 2005, smoking is prohibited in indoor public places, including bars and restaurants, as well as public and private workplaces. Already before the law went into effect, largely through the print media, greater attention directed toward smoking-related health problems helped to grow awareness and perception of the risks associated with smoking and influence adolescents' attitudes toward smoking.

These interventions appear to have been effective in reducing first experimentation with smoking among the younger age groups but not among the 15-year-olds and to have failed to reduce the prevalence of current smokers or daily smokers which has remained substantially unchanged over time. From this we may infer that antismoking policies seem to have delayed initiation among adolescents rather than reducing uptake by the younger age groups and to have failed to reach young smokers already addicted to the habit.

Another plausible explanation for the stabilization of smoking prevalence after 2006 is that no new antismoking laws were enacted and that attention to smoking risks waned following the success of Law 3/2003. Many Italians recognized the benefits of antismoking legislation: more than 90% were moderately to strongly in favor of smoke-free areas in public places and about 87% supported the ban in workplaces. The data demonstrate its short-term effect on cigarette sales (down 8.9% between 2004 and 2005) and on consumption, with a greater decline among women and young people [27, 28].

In this perspective, the GYTS data provide useful information for shaping an effective public health response. The data depict the current situation of adolescents and their attitudes toward smoking, in which there are sizeable gaps in meeting recommendations for reducing the prevalence of smoking and raising awareness among adolescents about the known health risks associated with smoking.

Youth protection laws and antismoking legislation in general (prohibition of selling tobacco products to minors less than 16 years of age —Royal Decree 2316/1934, amended in 2012 with harsher penalties imposed on retailers, and the legal age of sale of tobacco products raised to 18 years, and ban on smoking in public places and schools) are sometimes disregarded and lessons to adolescents by adults or other reference persons about smoking often fall short of expected goals. There is cause for concern when, on the one hand, the data indicate that over half of 14-year-olds have already experimented with smoking and that by age of 15 years over 10% are daily smokers and have no desire to quit the habit, yet, on the other hand, parents and teachers often smoke at home or school: 46% of the students involved in the GYTS reported having at least one parent who smokes. When stratified by smoking status, a significant association emerged ($P < 0.01$) between smoker or nonsmoker status and having a parent who smokes: about 42% of the students who do not smoke and 56.6% of current smokers have at least one parent who does smoke. Nevertheless, 78% of responders, with no differences between the smoker and the nonsmoker groups, responded that the harmful effects of smoking had been discussed in the family. Moreover, smoking inside school buildings is prohibited by law (Law no. 584/1975 and Law no. 3/2003) and ensuring that schools are smoke-free environments is one of the policies the literature considers effective to make smoking less acceptable in everyday life and to effectively discourage students from starting the habit [29–32]. Thanks to the results obtained through surveillance studies on adolescents conducted to date, new legislation has been recently enacted, including the increase in the legal age of sale of tobacco products mentioned above and, in mid-2013, the introduction of smoke-free ordinances prohibiting smoking near school grounds. The data collected through the 2010 GYTS show, in fact, that both teachers and students were often seen smoking inside and outside the school building: 44% and about 56% of the responders said they had seen teachers and students, respectively, smoking inside the school building. This happened though about 60% of the students stated that during the past school year they had been taught in class about the dangers of smoking or had discussed in class why people of their age smoke.

In brief, adults who smoke are not in a position to give children lessons about smoking. In addition, the vast majority of adolescent smokers had no trouble in buying cigarettes at a tobacco store: 92% of those who bought cigarettes over the counter were not refused the purchase because of their age.

Media messages about smoking are often contradictory: over 90% of GYTS responders stated having seen/heard health warnings about smoking yet 98% recall having seen show business personalities smoking in a film or a video and 64% recall having seen a cigarette logo during a televised show or sports event. Far fewer than nonsmokers, 28% of smokers reported owning a gadget displaying a cigarette brand and over 14% said they had been offered free cigarettes by a cigarette sales representative.

Incongruencies in behavior and knowledge emerged on analysis of the responses from the adolescents participating in the GYTS, which probably reflect those of their parents and teachers, as well as deciders, and stem from an adolescent's typical desire to challenge rules, appear grown up, and belong

to a group. The GYTS data show that the adolescents surveyed are well aware of the unhealthy effects of smoking: 85% of both males and females stated that smoking was definitely harmful and, when combined with those who stated it was probably harmful, the proportion rose to 97%. Significant differences emerged, however, when the responders were stratified by smoking status: 63.6% (95% CI, 57.5–69.7) of current smokers (under the GYTS protocol, they are the students who had smoked at least on one day during the 30 days before participating in the survey: 20.7% overall, 19.4% of the males and 21.6% of the females) stated that smoking was definitely harmful versus 91.3% (95% CI, 89.5–93.0) of nonsmokers. Overall, about 62% of responders stated that secondhand smoking was definitely harmful and, when combined with the 30.7% who stated that it was probably harmful, the proportion rose to 92%. When stratified by smoking status, only 47% of current smokers stated that secondhand smoking was definitely harmful. Although the data reveal that smokers and nonsmokers are aware of the health risks associated with smoking and exposure to smoke, only 28% of current smokers stated that they wanted to quit the habit and 81.4%, irrespective of sex, responded that they felt they could quit whenever they wanted.

4. Conclusions

School-based surveys like the HBSC and the GYTS have several limitations. First, as the survey sample base consists of school attendees, the surveys are not representative of all Italian youths aged 11, 13, and 15 (HBSC) and 13–15 years (GYTS). However, in Italy, as in the majority of countries, most young people in these age groups attend schools. Second, the data apply only to the students who were in school on the day the surveys were administered and who completed the questionnaires. In this respect, the response rates were very high (>80%) for both surveys, suggesting that any bias attributable to absence or nonresponse was limited. Third, the data are derived from self-reports of students who might under- or overreport their behaviors or attitudes. We are unable to determine the extent of this bias; however, reliability studies conducted in the United States have indicated good test-retest results for tobacco-related questions (and for items related to substance use in general) which were not so different from the questions we used in our surveys [33].

In addition, the strength of the reliability of our data is corroborated by the fact that the results of the two surveys do not show significant differences in the response to the items compared here (Table 1) and that they provide comparable estimates of the prevalence for first experimentation with smoking and regular tobacco use (daily smokers).

The results of the 2010 surveys, also as compared with the data from previous HBSC surveys, show that even with a weak signal of a decline or delay in first experimentation with smoking among the younger age groups, the need remains to keep awareness high, implement comprehensive prevention and cessation interventions of proven efficacy, and monitor adherence to current rules and regulations [29–32]. Besides adolescents, an important target for intervention is their reference persons, given that adolescents often learn behaviors and attitudes by their example. What appear to be lacking in Italy are key concepts underpinning recommendations for discouraging the uptake of smoking among younger age groups: initiatives and programs in schools and the family and by decision makers in the adoption of behaviors coherent with the rules to be taught to young people, direct involvement of students and school staff in adherence to maintaining a smoke-free school environment, monitoring of compliance by retailers with the prohibition of the sale of tobacco products either over the counter or by vending machines, and compliance with laws prohibiting smoking in public places and, as of mid-2013, also in outdoor areas near school buildings.

In this context, monitoring the behavior of adolescents and the changes in the contexts in which they live through the administration of surveys such as the HBSC and the GYTS represents an opportunity for Italy to step up to the challenges of implementing and evaluating effective anti-smoking interventions. The 2014 HBSC and GYTS surveys will provide a basis for highlighting and evaluating the extent of possible improvements in the situation, following the enactment of recent legislation, communication campaigns directed specifically at adolescents and promoted by the Ministry of Health in late 2013, and school-based prevention programs delineated in the Regional Prevention Plans and the guidelines on the primary prevention of smoking published in October 2013.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Research Article

Knowledge about Health Effects of Cigarette Smoking and Quitting among Italian University Students: The Importance of Teaching Nicotine Dependence and Treatment in the Medical Curriculum

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Aims of the study were to compare medical students (MS) to non-MS with respect to their knowledge of smoking and to investigate the effect of a short educational intervention on MS knowledge. MS ($n = 962$) and students of architecture and law ($n = 229$) were asked to complete a 60-item questionnaire addressing knowledge of smoking epidemiology and health effects ("Score 1"), and effectiveness of cessation treatments ("Score 2"). Upon completion of questionnaire, fourth year MS received a lecture on tobacco dependence. These students were asked to complete the same questionnaire one and two years later. Mean values for Score 1 were 48.9 ± 11.5% in MS and 40.5 ± 11.4% in non-MS ($P < 0.001$; $d = 0.69$). Respective values for Score 2 were 48.1 ± 10.8% and 42.6 ± 10.6% ($P < 0.001$; $d = 0.50$). Fifth year students who had attended the lecture in year 4 scored higher than students who had not attended the lecture. Significant differences were noted one but not two years after the educational intervention. In conclusion, MS know slightly more about smoking-related diseases and methods to achieve cessation than nonmedical students; a short educational intervention was associated with better knowledge one year later, but the effect was moderate and short-lived.

1. Introduction

Tobacco smoking is the leading cause of preventable death in developed countries and is the most important risk factor for cancer worldwide, responsible for approximately 22% of all cancer deaths per year [1, 2]. According to the Osservatorio Fumo, Alcol e Droga, about 11 million adults in Italy are still current smokers, 20.7% of the entire adult population [3]. Smoking is the largest avoidable health risk in Europe, causing more problems than alcohol, drugs,

high blood pressure, excess weight, or high cholesterol (http://ec.europa.eu/health/tobacco/policy/index_en.htm). Consequently, every year, 695,000 Europeans die prematurely of tobacco-related diseases and it is estimated that, within the EU, smoking causes annual costs of at least €100 billion (http://ec.europa.eu/health/tobacco/docs/eurobaro_attitudes_towards_tobacco_2012_en.pdf). Conversely, smoking cessation reduces health risks and improves quality of life. In particular, the cumulative risk of dying of cancer, cardiovascular and lung diseases can be drastically reduced if smokers quit, even at an advanced age [4–6]. There is no doubt that medical advice helps smokers quit [7], yet often this opportunity is missed [8–10]. The frequent observation of general practitioners (GPs) not adhering to guidelines for brief counseling might at least partially be due to inadequate training in undergraduate education. Indeed, substantial deficiencies in medical education on smoking-related issues have been described [11–15]. This is not surprising since little attention is being paid to nicotine dependence in medical school curricula; a worldwide survey recently revealed that only one in four medical schools taught a specific module on nicotine dependence [16].

Recent studies on medical education in various European countries have consistently shown that undergraduate training in this area is insufficient. This is surprising when considering that well-conceived educational interventions to improve knowledge, skills, and attitudes of medical students regarding the treatment of smokers are available [17, 18]. Arguably, one factor limiting the implementation of such programs is their high cost in terms of resources and teacher time. Therefore, there is a need for straightforward and relatively simple but yet effective tobacco curricula. For instance, even one single lecture on the topic might be enough to stir the interest of students eliciting self-directed learning activities with regard to tobacco toxicology and treatment options. More high-quality research in this area is clearly needed [19].

We recently reported that Italian students attending the fourth year of undergraduate medical education have limited knowledge about tobacco dependence, smoking-related pathologies, and the role of physicians in promoting smoking cessation [20]. While these findings in themselves are a cause for concern, their interpretation might be further enhanced by comparing them to survey results obtained from nonmedical students. Since medical education needs to prepare future physicians for their role as health advocates, one would expect medical students to know substantially more about smoking and cessation than students of nonmedical professions. However, to the best of our knowledge, nonmedical students have rarely been surveyed with regard to their knowledge about tobacco.

Based on these considerations, the aims of this study were to (i) verify the consistency of our previous findings [20], (ii) assess whether nonmedical students of the same age have different perceptions and knowledge about smoking compared to medical students, and (iii) monitor knowledge retention of tobacco dependence and medical students smoking status, one and two years following a short educational intervention.

2. Methods

2.1. Questionnaire. Students were asked to complete a 60-item questionnaire, previously validated [20], derived from studies on this topic [21, 22]. The questionnaire was composed of four main sections:

(i) demographics and personal smoking history: gender, age, age at initiation, cessation history, intention to quit, and nicotine dependence using the Fagerström Test for Nicotine Dependence (FTND) [23],

(ii) knowledge of smoking-related epidemiologic facts: knowledge of smoking attributable mortality, tobacco toxins, health risks associated with smoking, and the benefits of smoking cessation,

(iii) knowledge of clinical guidelines on tobacco dependence treatment, as well as competence in counseling a smoker seeking help to give up smoking,

(iv) perception of the influence of smoking on life expectancy: students were asked whether they personally knew smokers and nonsmokers who had lived to the age of 90 years (total 2 questions). One further question was asked about knowledge of tobacco treatment centers in the city of their university and one final question was asked to students, "Would you like a smoke-free university?" Response options were "yes" or "no."

To assess the knowledge of tobacco and cessation, two scores were computed. "Score 1" was based on responses to questions on the epidemiology of smoking and related risks, as well as on the benefits of quitting smoking; "Score 2" was based on responses to questions about nicotine dependence treatments and their effectiveness (see data analysis for the details of scores computing). For a detailed description of the questionnaire, see our previous paper [20]. The questionnaire is available upon request.

2.2. Study Participants. Students from four different medical schools and one school of architecture and law were invited to participate in the study. Two of the four medical schools (Sapienza University of Rome, Catholic University, Rome Campus) as well as the Schools of Architecture and Law (Sapienza University of Rome) were located in Rome whereas the other two medical schools were located in Northern Italy (University of Udine and University of Verona). All medical schools involved offered a standard core curriculum representative of that given by other medical schools in Italy, in which drug addiction is a topic of the fourth year. In this year preclinical courses are dealing with general and specific health risks including cigarette smoking. In order to address the three study aims, students were divided into eight different groups as described below.

Study Question 1. "Does the questionnaire produce consistent results in consecutive cohorts of medical students?" To answer this study question, fourth year medical students from two consecutive cohorts (2010: Group 1; 2011: Group 2) were invited to participate in the study. Students in both cohorts

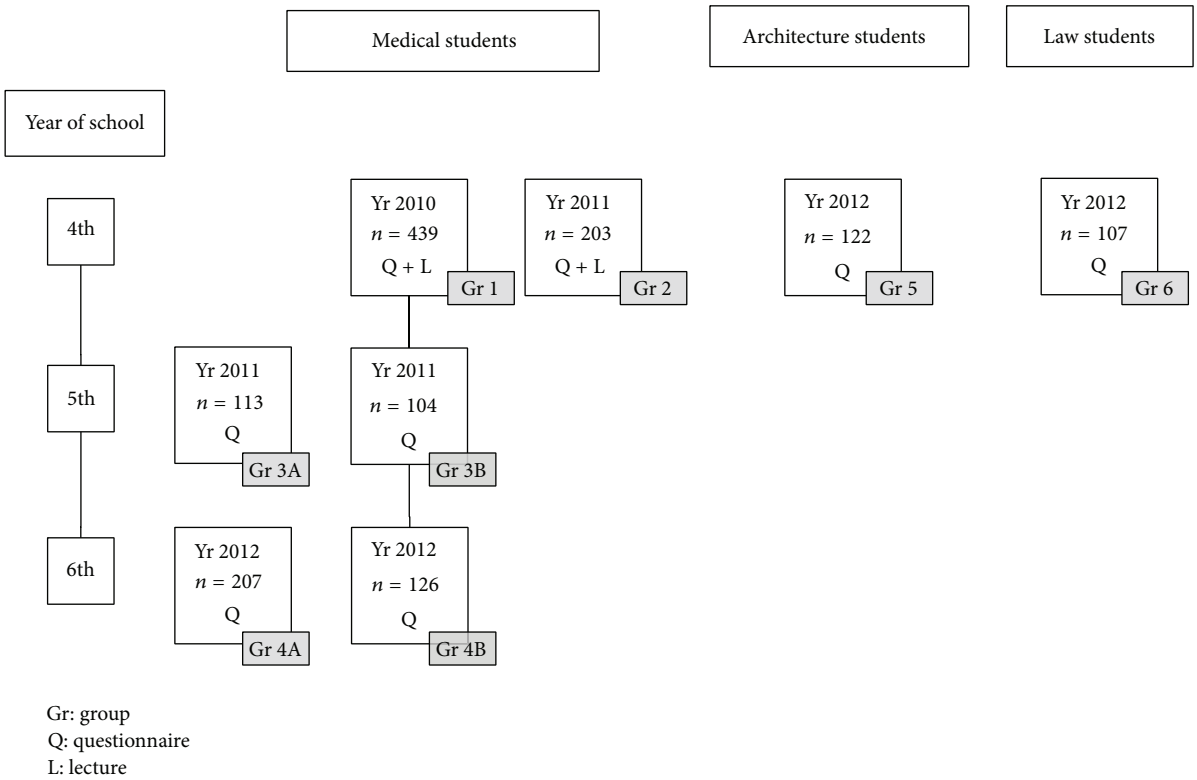

Figure 1: Chart of the different groups of 1191 students enrolled in the study according to year of school, university school, and intervention on nicotine dependence (questionnaire and lecture or questionnaire only).

were enrolled in the course of pharmacology and toxicology and completed the questionnaire before attending a lecture on nicotine dependence.

Study Question 2. "Do nonmedical students of the same age have different perceptions and knowledge about smoking compared to medical students?" To answer this study question, two cohorts of fourth year students studying architecture (Group 5) and law (Group 6) were invited to complete the study questionnaire in 2012 and were compared with fourth year medical students (Group 1 and Group 2).

Study Question 3. "How much knowledge of nicotine dependence is retained by medical students one and two years following a short educational intervention?" To answer this study question, the 2010 student cohort was followed up for 2 years (2011: Group 3; 2012: Group 4). Each year, students completed the same questionnaire. While doing so, they were asked whether they had attended the lecture in 2010. Based on their replies, students were labelled as being in the "control" (neither questionnaire nor lecture: Groups 3A and 4A) or "intervention" (questionnaire + lecture: Groups 3B and 4B) cohorts.

For more information on the flow of participants through the study and sample sizes, please see Figure 1.

2.3. Data Collection. Between April 2010 and November 2012, students attending the academic courses were invited to complete the questionnaire; participation was voluntary and anonymous. After having explained the purpose of the study, a pharmacology lecturer distributed the questionnaire and students were allowed 30 minutes to complete it. Lecturers remained in the room but kept at a distance from participating students in order to ensure anonymity of the responses. In the case of students attending the course of pharmacology and toxicology, offered only to the fourth year in all participating medical schools, a teaching lecture based on specific protocol, dealing with epidemiology of smoking-related diseases, health risk of smoking, and nicotine dependence and its treatment, was delivered by the pharmacology teacher, after questionnaire completion.

2.4. Data Analysis. As previously described [20], the questionnaire contained 46 close-ended questions and 1 open-ended question, for a total of 60 items, since some questions consisted of more than 1 item. Ten questions (14 items) were used to calculate Score 1 whereby each answer was assigned a value between 0 and 2 (range 0–28). A value of 2 implied that the students answered correctly, a value of 1 implied that the answer was in the 10% range of a quantal response, and a value of 0 implied a totally incorrect answer. Questions that were not answered were counted as incorrect answers. The items for Score 1 included (i) smoking epidemiology; (ii) risks associated with smoking; and (iii) benefits of cessation. Using nine additional questions (14 items), another Score 2 was computed, assigning a value of 0 to 2 to each answer

(same mechanism for assigning values for Score 1), to evaluate students based on their knowledge of (i) clinical guidelines on smoking cessation; (ii) effectiveness of smoking cessation methods.

Descriptive statistics were performed for each question. Since all data were collected anonymously, we were unable to match individual student data obtained in the 2010 cohort to subsequent surveys in this longitudinal cohort. Thus, all groups were treated as independent groups, and analysis of variance (ANOVA) was performed to assess significant differences between groups, followed by post hoc Bonferroni corrections for study questions 1 and 3. Student's t-test was used to compare mean values obtained from the two groups (study question 2). Cohen's d effect sizes were calculated.

For dichotomous variables, chi-square tests were performed. Differences were considered statistically significant at a P value <0.05. Statistical analyses were performed using SPSS Version 20.0 for Mac.

Approval of the study method was obtained from the Ethics Committee of the Hospital Policlinico Umberto I, at Sapienza University of Rome, as well as from the Dean of each of the other participating medical and nonmedical schools.

3. Results

The questionnaire was completed by 1191 students, 962 of whom were medical students (61% female, mean age 23.9 ± 2.8 years, range 20–55), 122 studied architecture (57% female, mean age 23.2 ± 3.4 years, range 20–41), and the remaining 107 studied law (72% female, mean age 21.7 ± 2.0 years, range 20–38). All the students present in the class agreed to complete the questionnaire. Questionnaire completion was satisfactory, as the response rate was of 100%, missing items were fewer than 10%, and the proportion of missing values did not differ significantly between groups.

3.1. Demographic Characteristics, Personal History of Tobacco Use, and Intention to Quit. As shown in Table 1, self-reported current smoking was significantly higher ($P < 0.01$) among architecture (26.2%) and law (26.2%) students compared to medical students (16.9%). Among the latter, the percentage of current smokers was significantly higher in males than females (22.0% versus 13.6%; $P = 0.001$). A similar gender difference was observed among architecture and law students, although statistical significance was not reached (architecture: 29.4% versus 25.4%; law: 33.3% versus 24.0%). Smoking students scored low on the FTND, and the majority (66.8%) smoked less than 10 cigarettes per day and wanted to stop smoking (57.9%). A particularly low smoking prevalence was noted in the 6th year medical students who had attended the lecture on nicotine dependence during their fourth year (2010 cohort; Group 4B). Their smoking prevalence of 10.3% was less than half of that found in sixth year students who had missed the lecture (Group 4A: 23.7%; $P = 0.001$). Only one-fifth of the smoking students (22.3% of medical and 18.3% of nonmedical students) reported having received advice to stop smoking by a GP during the past year.

3.2. Smoking and Life Expectancy, Wishing a Smoke-Free University, and Knowledge of Tobacco Treatment Centers. As expected from our previous work [20], we found that the percentage of medical students claiming they personally knew a smoker who had lived to the age of 90 years was significantly greater in smokers than in nonsmokers (55.8% versus 39.8%; $P < 0.01$), whereas the percentage of students answering that they personally knew a nonsmoker who had reached the age of 90 years was similar in smokers and nonsmokers (87.3% smokers versus 87.1% nonsmokers) with no statistically significant differences between the six groups considered.

The vast majority of nonsmoking medical students (91.4%) claimed they would like to study in a smoke-free university while this view was only supported by 48.2% of smokers ($P < 0.001$). The corresponding figures for architecture and law students were 78.9% versus 15.6% ($P < 0.001$) and 79.7% versus 35.7% ($P < 0.001$), respectively.

Finally, 40.4% of fifth year medical students in Group 3B, 16.7% of sixth year medical students in Group 4B, 11.3% of those in Groups 1, 2, 3A, and 4A, and only 2.6% of nonmedical studentswere aware of the existence of tobacco treatment centers in the city of their university.

3.3. Comparisons between Student Groups

3.3.1. Study Question 1. As shown in Figure 2, fourth year medical students had limited knowledge of the epidemiology of smoking, in terms of attributable morbidity and mortality, and of the benefits of stopping smoking (Score 1), before attending the educational intervention, with no statistically significant differences between groups. We also confirmed that knowledge of clinical guidelines on nicotine dependence treatment, perceived competence in both counseling and treating smokers was insufficient (Score 2), with no statistically significant differences between groups.

3.3.2. Study Question 2. In order to address study question 2, only data obtained from fourth year students were included in the analysis. Medical students survey data were collected in 2010 (Group 1) and 2011 (Group 2) while nonmedical students data were collected in 2012 (Groups 5 and 6). Mean values for Score 1 were 48.9±11.5% in medical students and 40.5±11.4% in nonmedical students ($P < 0.001$; effect size $d = 0.69$). Respective values for Score 2 were 48.1 ± 10.8% and 42.6 ± 10.6% ($P < 0.001$; $d = 0.50$). These results suggest that the choice and attendance of a medical school are associated with marginal improvement in these parameters.

3.3.3. Study Question 3. In 2011, there were statistically significant differences in knowledge levels between those who had attended the lecture in 2010 (Group 3B) and those who had missed it (Group 3A). This was true for Score 1 (55.0 ± 12.7% versus 50.5 ± 11.6%, $P = 0.01$; effect size $d = 0.37$) as well as for Score 2 (55.4 ± 13.7% versus 49.7±11.0%, $P = 0.001$; effect size $d = 0.46$). However, no significant differences were observed in 2012 (i.e., two years after attending versus missing the lecture; see Figure 2 and Table 2).

Table 1: Smoking habits, medical advice to quit, and intention to quit among 1191 university students.

	School							
	Medical						Architecture	Law
Year of observation	2010	2011	2011	2011	2012	2012	2012	2012
Group	1	2	3A	3B	4A	4B	5	6
Year of school	4	4	5	5 (Retest)	6	6 (Retest)	4	4
n	*439*	*203*	*113*	*104*	*207*	*126*	*122*	*107*
Smoking habits°								
Never smokers**	330 (75.2)	145 (71.4)	75 (68.2)	80 (76.9)	133 (64.3)	101 (80.2)	73 (59.8)	62 (57.9)
Current smokers**	67 (15.3)	38 (18.7)	21 (18.6)	14 (13.5)	49 (23.7)	13 (10.3)	32 (26.2)	28 (26.2)
Former smokers*	42 (9.6)	18 (8.9)	14 (12.7)	10 (9.6)	25 (12.1)	12 (9.5)	17 (13.9)	15 (14.0)
Mean age at onset of smoking among never smokers: years	16.5 ± 2.4	17.1 ± 2.7	17.2 ± 3.2	16.6 ± 2.5	17.4 ± 2.8	17.0 ± 3.5	16.8 ± 2.2	16.4 ± 1.7
(range)	(12–24)	(12–25)	(9–25)	(13–24)	(12–24)	(11–24)	(13–22)	(13–22)
Mean age of smoking cessation among former smokers: years	20.1 ± 2.4	20.9 ± 3.7	20.2 ± 4.2	21.3 ± 3.3	20.7 ± 3.5	20.3 ± 3.0	21.1 ± 2.7	20.5 ± 2.2
(range)	(15–24)	(15–31)	(14–30)	(15–25)	(14–30)	(15–24)	(17–29)	(18–27)
Characteristics of current smokers								
Fagerström score	1.3 ± 1.7	1.2 ± 1.6	1.5 ± 2.3	1.7 ± 1.9	1.9 ± 2.2	0.3 ± 0.7	2.0 ± 2.4	1.8 ± 1.9
(range)	(0–6)	(0–5)	(0–8)	(0–5)	(0–7)	(0–2)	(0–7)	(0–6)
Tried to quit and relapsed in the past	30 (44.8)	20 (54.1)	9 (42.9)	6 (42.8)	18 (36.7)	4 (30.8)	12 (37.5)	11 (39.2)
Tried to stop smoking during university	29 (43.3)	20 (54.1)	11 (52.4)	7 (50.0)	16 (32.7)	4 (30.8)	16 (50.0)	11 (39.3)
Tried in the last year to stop smoking and succeeded for 1 day or longer	36 (53.7)	25 (67.6)	15 (71.4)	10 (71.4)	27 (55.1)	9 (69.2)	20 (62.5)	16 (57.1)
Medical advice to quit (answered yes)								
"In the last year, did a doctor advise you to stop smoking?"	11 (16.4)	12 (32.4)	4 (19.0)	3 (21.4)	11 (22.4)	4 (30.8)	6 (18.8)	5 (17.9)
Intention to quit (answered yes)								
"Would you like to give up smoking altogether?"	40 (59.7)	24 (64.8)	11 (52.3)	9 (64.3)	25 (51.0)	5 (38.5)	18 (56.3)	21 (75.0)
Which of the following statements best describes your current intentions with regard to smoking?								
"I want to quit, but I'm not ready to try now."	26 (38.8)	11 (29.7)	5 (23.8)	5 (35.7)	17 (34.7)	4 (30.8)	5 (15.6)	10 (35.7)
"I will continue to smoke for now."	13 (19.4)	8 (21.6)	9 (42.8)	3 (21.4)	20 (40.8)	6 (46.2)	14 (43.4)	12 (42.9)

Data are expressed as *n* (%) or M (±SD); $^{*}P < .05$ and $^{**}P < .01$ Pearson's chi-squared test.
°Seven missing answers: two in Group 2, three in Group 3A, and two in Group 6.

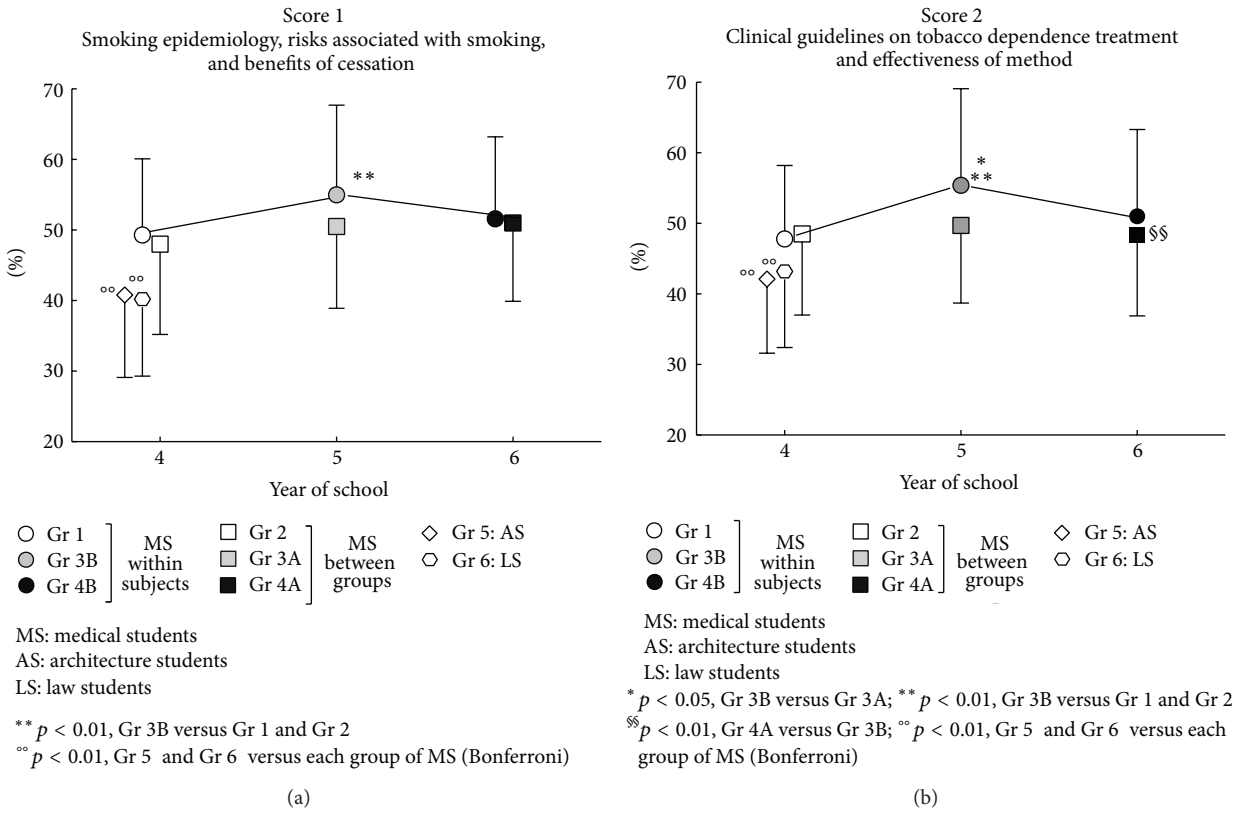

Figure 2: Scores of knowledge in medical students without or with a previous education intervention on nicotine dependence and in fourth year nonmedical students.

Table 2: Mean scores for two sets of 14 grouped items in 1191 university students.

	School								*P* value[a]
	Medical						Architecture	Law	
Year of observation	2010	2011	2011	2011	2012	2012	2012	2012	
Group	1	2	3A	3B	4A	4B	5	6	
Year of school	4	4	5	5 (retest)	6	6 (retest)	4	4	
Total sample (*n*)	439	203	113	104	207	126	122	107	
Knowledge of smoking epidemiology, risks associated with smoking, and benefits of cessations: Score 1									
n	393	180	103	97	189	120	109	95	
Mean (SD)	49.3 (10.8)	47.9 (12.8)	50.5 (11.6)	55.0 (12.7)	51.0 (11.1)	51.6 (11.6)	40.8 (11.7)	40.2 (10.9)	<.001
Range (0–100)	17–87	17–87	23–70	27–87	23–80	20–83	17–77	20–67	
Knowledge of clinical guidelines on tobacco dependence treatment and effectiveness of method: Score 2									
n	391	182	103	98	191	118	105	92	
Mean (SD)	47.8 (10.4)	48.8 (11.5)	49.7 (11.0)	55.4 (13.7)	48.4 (11.5)	51.0 (12.3)	42.1 (10.5)	43.2 (10.8)	<.001
Range (0–100)	7–87	17–87	30–77	23–87	17–77	20–80	20–67	13–70	

n: number of subjects observed.
[a]Analysis of variance.

4. Discussion

The present study confirms and extends our previous observation about the inadequate knowledge among medical students of nicotine dependence and provides two additional novel findings. Thus, our findings in the 2010 cohort that had previously been reported [20] were confirmed in a subsequent albeit smaller sample of fourth year medical students (Group 2). This is important since, due to a limited sample size in our earlier study, we were unable to exclude confounding of our results by selection bias. Moreover, we found that knowledge scores in nonmedical students were significantly lower than in medical students; however, the difference appeared relatively small when considering

that the latter had already received three years of medical education. The knowledge levels observed in nonmedical students are likely to reflect general knowledge levels in well-educated young adults. A mean difference of only 10% points between medical and nonmedical students indicates a substantial failure of medical education in providing medical students with better knowledge of a fundamental issue of disease prevention than a general student population. Finally, medical students attending a lecture on nicotine dependence did better in a follow-up test one year later than students who had not been exposed to this intervention. Unfortunately, this difference between "intervention" and "control" groups was lost two years later.

The finding that a single lecture significantly improved the knowledge about tobacco-related issues one year later is of considerable interest and is consistent with similar results obtained in other medical disciplines. In particular, giving a single teaching lecture on a specific medical issue [24–26] has been found to permanently improve the ability to deal with those medical problems. Unfortunately, differences in knowledge seemed to be transient in as far as scores were back to baseline levels two years later. Yet, it is interesting to note that, even two years after the intervention, this group of students showed a smoking prevalence of 10.3% and the lowest FTND scores among groups. However, this result may also be explained by selection bias favouring students who were interested in the topic, thus being more motivated to complete the questionnaire again. Incidentally and in agreement with previous observations [27], all smoking students scored low at FTND; the lowest values were found in medical students.

Smoking prevalence among medical students was lower (16.9%) with respect to both the Italian population (20.7%) [3] and their colleagues of architecture and law school (26.3%). As smoking status was not biochemically validated, there is a possibility that smoking prevalence was underestimated in medical students. One potential explanation for this is selection bias in that smoking students might have been less likely to attend the lecture in the first place. Secondly, the students sampled may not be representative of all Italian medical students. Thirdly, according to the effect of social desirability, smoking medical students may have been more likely to misreport their smoking status as they felt it would be inappropriate for future physicians to be smoking. At the same time, our findings could actually reflect true smoking prevalence, as nonsmokers may be more likely to study medicine. Given the uncertainty associated with self-reports of smoking status, we refrained from conducting subgroup analyses or running statistical models including smoking status as a moderating variable.

As discussed above, our educational intervention that consisted of a single lecture on nicotine dependence was associated with higher knowledge levels one year after the intervention. A combination of educational and interactive training during medical school improves knowledge, attitude, and counselling skills on tobacco cessation and behavioural change [28, 29]. Role-playing and interaction with patients are equally effective and both represent more powerful learning tools than web-based learning with or without a teaching lecture [30]. Yet, overcrowded core curricula in many medical schools limit the possibility of extended training, and perhaps the most parsimonious strategy may consist in educating clinical teachers to mention tobacco toxicology whenever the possibility arises. This could be a cost-effective and efficient way of improving knowledge.

Thus, our results provide the rationale for studies comparing the effects of a single educational intervention with those yielded by a more comprehensive training in the health consequences of smoking. Interestingly, recent research has revealed that the choice of the educational method is far less important for student learning than summative assessments. As a consequence, medical students should undergo valid summative assessments of their knowledge of nicotine dependence [31].

In our opinion, the present study has five main limitations: (i) we included medical students from only four Italian universities; therefore, our sample is not fully representative of the entire population of Italian medical students; (ii) attrition substantially reduced to approximately one-fourth the number of students that were retested in the fifth and sixth years; thus, selection bias favoring the subsequent participation of students with higher interest levels in tobacco-related issues and higher motivation might have skewed our results; (iii) the sample size of architecture and law students was relatively small, questioning the representativeness of our findings in these groups; (iv) smoking status of participating students was only assessed by means of self-report so that smoking prevalence might have been underestimated; (v) we could not track individuals and their change in responses since we did not include identifying information.

5. Conclusions

In summary, this study revealed that Italian undergraduate medical students have marginally higher knowledge about smoking-related disease and methods to achieve cessation than students of nonmedical schools. Attending a lecture on nicotine dependence was associated with slightly better knowledge one year later, but the effect was moderate and short-lived. Greater efforts are needed to educate a generation of physicians that will have to deal with the consequences of the smoking epidemic in the 21st century.

Ethical Approval

This work was approved by the Ethics Committee of the Hospital Policlinico Umberto I, at Sapienza University of Rome, as well as by the Dean of each of the other participating medical and nonmedical schools.

Conflict of Interests

The authors declare that there is no conflict of interests.

Authors' Contribution

Maria Caterina Grassi, Massimo Baraldo, and Christian Chiamulera conceived the research and delivered the educational lecture; Maria Caterina Grassi, Massimo Baraldo,

Christian Chiamulera, and Carlo Patrono participated in data collection and analysis and interpretation of the results; Maria Caterina Grassi, Franco Culasso, and Amy K. Ferketich elaborated the data; Maria Caterina Grassi, Massimo Baraldo, Christian Chiamulera, Tobias Raupach, and Paolo Nencini drafted the paper; all authors revised and approved the paper.

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Research Article

Complete Workplace Indoor Smoking Ban and Smoking Behavior among Male Workers and Female Nonsmoking Workers' Husbands: A Pseudo Cohort Study of Japanese Public Workers

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A pseudo cohort study using national cross-sections (2001, 2004, 2007, and 2010) was conducted to examine differences in smoking prevalence under different smoking ban policies such as a complete workplace indoor smoking ban (early or recent implementation) and a partial smoking ban among male public workers and husbands of female nonsmoking public workers. The effectiveness of smoking bans was estimated by difference-in-differences (DID) with age group stratification. The results varied considerably by age and implementation period. Although DID estimates (positive value of DID estimate represents smoking cessation percentage) for both smoking bans on total male smoking were not significant, the over-40 age group indicated a significant DID estimate of 5.0 (95% CI: 0.2, 9.8) for the recent smoking ban. For female workers' husbands' smoking, the over-40 age group indicated positive, but not significant, DID estimates for the early and recent smoking bans of 7.2 (−4.7, 19.2) and 8.4 (−2.0, 18.7), respectively. A complete indoor workplace smoking ban, particularly one recently implemented among public office workers aged over 40, may reduce male workers' smoking and female workers' husbands' smoking compared with a partial smoking ban, but the conclusion remains tentative because of methodological weaknesses in the study.

1. Introduction

Tobacco smoking is the most attributable and preventable risk factor for adult mortality and morbidity in Japan [1, 2]. At least ten years of average life expectancy are lost among current smokers in Japan and worldwide [3, 4]. Secondhand tobacco smoke (SHS) is a cause of various illnesses such as neoplastic, respiratory, and cardiovascular diseases [5, 6]. It is estimated that annually at least 4,600 nonsmoking women die from the effects of SHS in Japan [7]. Partly because the health risks of smoking have become generally known, adult smoking prevalence in Japan has declined recently: that is, current smoking has decreased from 48% in 2001 to 33% in 2010 among men and from 14% in 2001 to 10% in 2010 among women [8].

A key intervention in reducing the burden of disease attributable to tobacco use is the smoking ban policy. Along with an increase of population-level knowledge on the risk of SHS, affirmed by the US Surgeon General's Report in 1986, there has been an increase in the number of legislative smoking bans in countries such as Australia, England, and the USA [9]. Smoking bans vary in their comprehensiveness by settings, that is, the extent to which they allow smoking or restrict it to designated areas and where those smoking

restrictions occur [9]. In Japan, the Health Promotion Law (HPL) and the Workplace Smoke-free Guideline (WSFG) [10], which promote smoke-free enclosed public places and workplaces, respectively, but allow partial smoking bans as an option, were implemented in 2003 [11], although a partial smoking ban was recommended rather than a complete smoking ban in the WSFG. A partial ban can allow smoking in one part of the same room but not the other and it can also include requirements for smokers and nonsmokers to be separated by a wall and/or different types of ventilation. The partial smoking ban in the WSFG only requires a smoking room where smoke is prevented from leaking into nonsmoking space by a ventilation system which directs exhausted smoke outdoors.

A complete indoor smoking ban has been recommended rather than the partial smoking ban, especially after ratification of the World Health Organization Framework Convention on Tobacco Control (FCTC) by the Japanese government in 2005. The spaces the HPL designated as smoke-free environments include schools, hospitals, gymnasiums, department-stores, restaurants, and public offices, but the execution level of the complete indoor smoking ban differs considerably by setting. For example, the execution rate of the complete indoor smoking ban was 97% in public schools in 2012 [12] but 27% in restaurants in 2011 [13]. Because the law has no penalty for noncompliance, some jurisdictions, such as Kanagawa and Hyogo prefectures, recently implemented their own legislation for public smoking bans which includes penalties [11]. Even in public offices, therefore, there are many varieties in the execution of complete indoor smoking bans by prefectures in Japan. However, because the legislation in Kanagawa and Hyogo cames into operation very recently in April 2010 and April 2013, respectively, we could not evaluate the effect of the legislation on smoking and have focused on the situation before the prefecture-based legislation era in Japan.

Although the main reason for workplace smoking bans is to protect nonsmokers from the harmful health effects of exposure to SHS at work, an incidental impact is to provide a supportive environment for people who want to quit smoking [14]. The diffusion theory [15] suggests that the smoke-free norm of a workplace smoking ban policy can disseminate into adjacent environments such as the home; the workplace smoking ban may therefore affect not only employees but also their families. From the public health perspective, these may provide beneficial impacts [9].

Our objective in this study was to assess the difference in smoking prevalence under different smoking ban policies such as a complete workplace indoor smoking ban and a partial smoking ban among male public workers and husbands of female nonsmoking public workers, before the prefecture-based legislation era in Japan.

2. Methods

2.1. Study Subjects. We used pseudo cohort data from nationally representative cross-sections which collect information from all household members on health-related factors, such as smoking behavior, every three years: the 2001, 2004, 2007, and 2010 Comprehensive Survey of Living Conditions of People on Health and Welfare, conducted by the Japanese Ministry of Health, Labour and Welfare (MHLW) [16]. To assess the impact of the smoking ban policy in public offices, we used subsamples of male public workers and husbands of female nonsmoking public workers. To interpret the causal inference between a workplace smoking ban and smoking by husbands more easily, husbands who worked at public offices were excluded from the analysis for husbands' smoking. Data were used with permission from MHLW.

2.2. Intervention: Smoking Ban in Japanese Governments' Buildings. The execution of a complete indoor smoking ban policy, but no partial smoking ban, in a prefectural government administration building was used as an exogenous proxy indicator for a hypothetical legislative public office smoking ban intervention. To date, previous studies that examined smoking ban legislation and smoking behaviors with consideration of factual execution are scarce [9, 17]. This may be due, in part, to the high level of execution in a number of countries such as Australia, Scotland, and the Netherlands [18–20]. However, it may be appropriate to evaluate smoking ban policy by execution level, as this could reduce underestimation, especially in low execution level countries including Japan [21]. Although Japan implemented HPL and WSFG as well as FCTC for promoting a smoke-free environment, execution of the complete indoor smoking ban remained low, even in government administration buildings, against a target of 100% complete indoor smoking ban.

In 2000, 42 out of 47 prefectural government offices executed partial smoking bans and five allowed smoking in the workplace [22], although we had no specific data for these five prefectures. To investigate the local situation for smoking ban policy across Japan, Yamato and colleagues conducted a mail survey of Japanese local government buildings (including 47 prefectural government offices, 46 prefectural capital municipality offices, 23 wards in Tokyo, and 5 other metropolitan cities) in 2007, 2008, 2010, 2011, and 2013 (response rates were 100% because of intensive reminder notice) [23]. The execution date of the complete indoor smoking ban in governmental building was reported. Of 47 prefectures only 61% executed a complete indoor smoking ban in government office buildings instead of a partial smoking ban in June 2011, although no prefecture allowed smoking in working areas. Based on the implementation period of the complete indoor smoking ban in the building, we classified prefectures into three categories: "Partial smoking ban (reference area)" where smoking was allowed in designated rooms or areas in June 2011; "Early smoking ban" where the prohibition of indoor smoking started between 2003 and 2007 and continued; and "Recent smoking ban" where the ban started between 2008 and 2011. Forty-seven prefectures in Japan were categorized as follows; "Partial smoking ban": Aomori, Iwate, Fukushima, Gunma, Tokyo, Niigata, Ishikawa, Gifu, Shizuoka, Aichi, Mie, Tottori, Hiroshima, Nagasaki, Kumamoto, Oita, Miyazaki, and Kagoshima; "Early smoking ban": Yamagata, Ibaragi, Saitama,

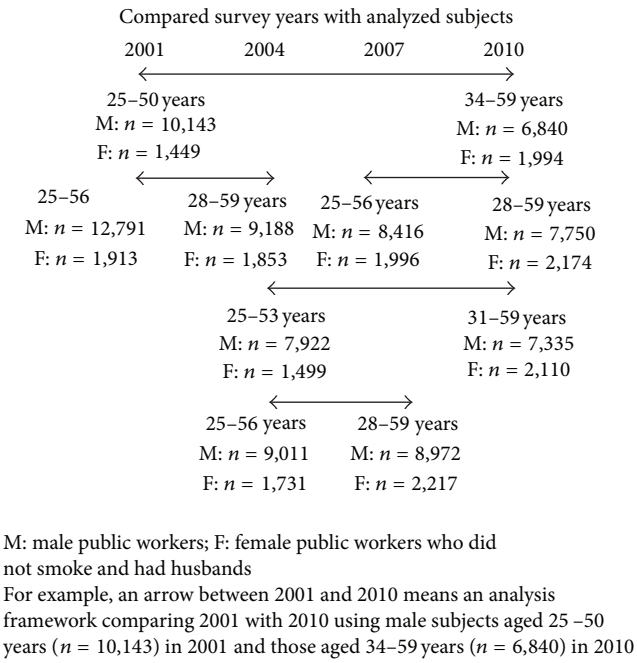

Figure 1: Analytic frameworks with their age groups and total number that were used as study subjects.

Kanagawa, Yamanashi, Nagano, Osaka, Hyogo, Yamaguchi, Kochi, Saga, and Okinawa; "Recent smoking ban": Hokkaido, Miyagi, Akita, Tochigi, Chiba, Toyama, Fukui, Shiga, Kyoto, Nara, Wakayama, Shimane, Okayama, Tokushima, Kagawa, Ehime and Fukuoka. This information was merged with the survey data on the basis of subjects' prefecture of residence. Because the decision regarding the smoke-free policy had been made prior to its execution and had potential impact prior to its implementation (e.g., via anticipation effects) [24], data from May 2003 to May 2011 were used in the study.

2.3. Smoking Outcome. The outcome was current smoker prevalence among male employees and husbands of female nonsmoking employees, because there were few female smokers. Current smokers were defined as persons who smoked cigarettes regularly at the time of survey. Smoking behavior was surveyed based on the following four categories: (a) "I do not smoke"; (b) "I smoke every day"; (c) "I smoke occasionally but not every day"; and (d) "I have stopped smoking for more than one month". We categorized (b) and (c) as current smoker. Unfortunately, the information on former smokers (d) was biased [25], potentially because many quitters selected (a) instead of (d); so we could not use this variable to estimate smoking cessation rates. However, current smoker prevalence was reliable because this was consistent with current smoker prevalence in another Japanese representative study of the National Health and Nutrition Survey [25].

2.4. Statistical Analysis. Because Japanese people typically retire at 60 years and over, subjects aged 25 years at baseline and up to 59 years in the follow-up period were analyzed by pseudo-cohort methods [26]: for example, persons aged 25–50 years in 2001 were aged 34–59 years in 2010 (Figure 1). Japanese adults aged over 25 years were less likely to start smoking [27], and therefore decreases from pre- to post-current smoker prevalence could be assumed as smoking cessation rates. To evaluate the effect of a complete indoor workplace smoking ban (intervention) on smoking behavioral changes, a difference-in-differences (DID) estimate was calculated by subtracting post (follow-up) outcome rate from pre (baseline) outcome rate in the intervention and reference groups [16, 28]:

$$\text{DID} = \text{difference}_{\text{intervention}} - \text{difference}_{\text{reference}}. \quad (1)$$

The positive value of the DID estimate represents the smoking cessation percentage, while the negative value may indicate that of relapse of smoking. Since different tendencies for the health-related behavior between the old and the young were expected [29], we stratified subjects over and under 40 years in baseline with each group representing roughly half of the sample.

Firstly, we compared smoking rates between 2001 and 2010. Next, other time periods such as 2007–2010 were analyzed to validate the result (Figure 1). Furthermore, to compensate for methodological weaknesses which arose from the lack of consideration of background differences between pre- and post-characteristics, confounding factor (such as marital status and housing tenure)-adjusted DIDs were implemented as a sensitivity analysis (see supplementary data). Probability values for statistical tests were two tailed, and $P < 0.05$ was regarded as statistically significant. All statistical analyses were performed using SAS version 9.2 (SAS Institute, Cary, NC).

Table 1: Subjects number among public office workers according to smoking ban categories.

Smoking ban categories	Men				Married nonsmoking women			
	2001		2010		2001		2010	
	N	%	*N*	%	*N*	%	*N*	%
Total subjects								
Partial smoking ban	3785	37.3	2644	38.7	472	32.6	775	38.9
Early smoking ban (2003–2007)	4001	39.5	2576	37.7	651	44.9	733	36.8
Recent smoking ban (2008–2011)	2357	23.2	1620	23.7	326	22.5	486	24.4
Subjects aged 25–39 years[a]								
Partial smoking ban	1896	38.0	1412	38.8	177	31.1	442	42.0
Early smoking ban (2003–2007)	1952	39.2	1373	37.7	265	46.5	351	33.3
Recent smoking ban (2008–2011)	1137	22.8	855	23.5	128	22.5	260	24.7
Subjects aged 40–50 years[a]								
Partial smoking ban	1889	36.6	1232	38.5	295	33.6	333	35.4
Early smoking ban (2003–2007)	2049	39.7	1203	37.6	386	43.9	382	40.6
Recent smoking ban (2008–2011)	1220	23.7	765	23.9	198	22.5	226	24.0

[a]Categorized by age in June 2001.
Notes: Subjects number in other framework such as 2004 and 2007 was similar with this distribution (data not shown).

Table 2: Current smoker prevalence, decrease, and difference-in-differences (DID) estimates among male public office workers according to smoking ban categories.

Smoking ban categories	Current smoker prevalence				Effect size of the public office smoking ban
	2001 %	2010 %	Decrease, % point (95% CI)	Decrease by percent change, %	DID estimates[a], % point (95% CI)
Total male workers	46.4	31.6	14.8 (13.5, 16.2)	31.9	
Partial smoking ban	46.8	32.9	13.9 (12.6, 15.3)	29.8	
Early smoking ban (2003–2007)	46.8	32.0	14.8 (13.5, 16.1)	31.6	0.9 (−3.0, 4.7)
Recent smoking ban (after 2007)	45.7	30.0	15.8 (14.4, 17.1)	34.5	1.8 (−1.5, 5.2)
Male workers aged 25–39 years[b]					
Partial smoking ban	47.4	33.3	14.1 (12.8, 15.5)	29.8	
Early smoking ban (2003–2007)	47.3	33.2	14.1 (12.8, 15.4)	29.8	0.0 (−5.5, 5.4)
Recent smoking ban (After 2007)	43.6	30.9	12.8 (11.4, 14.1)	29.2	−1.4 (−6.0, 3.3)
Male workers aged 40–50 years[b]					
Partial smoking ban	46.2	32.4	13.8 (12.5, 15.2)	29.9	
Early smoking ban (2003–2007)	46.4	30.7	15.7 (14.3, 17.0)	33.8	1.8 (−3.7, 7.4)
Recent smoking ban (After 2007)	47.7	28.9	18.8 (17.5, 20.1)	39.4	5.0 (0.2, 9.8)

[a]The category of "Partial smoking ban" was used as a reference. Positive value of DID estimates represents smoking cessation rates among male workers.
[b]Categorized by age in June 2001.
CI: confidence interval.

3. Results

Data were available for 247,195 (response rate: 87.3%) households in 2001, 220,836 (79.8%) in 2004, 229,821 (79.9%) in 2007 and 228,864 (79.1%) in 2010. Of these, subsamples of male public workers (n = 10, 143–12,791 in 2001, 7,922–9,188 in 2004, 8,416–8,972 in 2007 and 6,840–7,750 in 2010) and husbands of female non-smoking public workers (n = 1, 449–1,913 in 2001, 1,499–1,853 in 2004, 1,996–2,217 in 2007 and 1,994–2,174 in 2010) were analyzed (Figure 1). Sample numbers in 2001 and 2010 according to the smoking ban categories and characteristics are shown in Table 1 and supplementary Table S1 and S2 in supplementary materials available online at http://dx.doi.org/10.1155/2014/303917.

Current smoker prevalence, the decrease and DID estimates (effect sizes) among male public office workers according to smoking ban categories are shown in Table 2. Current smoker prevalence decreased from 46.4% in 2001 to 31.6% in 2010 among total male workers. It could be assumed that 14.8% (31.9% of smokers) men stopped smoking during 2001–2010. DID estimates for early and recent smoking bans were not significant among total men: 0.9 (95%CI: −3.0, 4.7) and

Table 3: Current smoker prevalence, decrease, and difference-in-differences (DID) estimates among husbands of female nonsmoking public office workers according to smoking ban categories.

Smoking ban categories	Current smoker prevalence of husbands				Effect size of the public office smoking ban
	2001 %	2010 %	Decrease, % point (95% CI)	Decrease by percent change, %	DID estimates [a], % point (95% CI)
Husbands of total female workers	52.7	34.9	17.8 (16.4, 19.2)	33.8	
Partial smoking ban	51.9	35.4	16.6 (15.2, 17.9)	31.9	
Early smoking ban (2003–2007)	47.2	32.3	14.9 (13.6, 16.3)	31.6	−1.6 (−10.5, 7.2)
Recent smoking ban (after 2007)	55.9	36.0	19.9 (18.5, 21.3)	35.6	3.3 (−4.3, 11.0)
Husbands of female workers aged 25–39 years[b]					
Partial smoking ban	58.2	34.4	23.8 (22.5, 25.1)	40.9	
Early smoking ban (2003–2007)	46.9	35.4	11.5 (10.1, 12.8)	24.5	−12.3 (−25.8, 1.1)
Recent smoking ban (After 2007)	59.2	38.5	20.8 (19.4, 22.1)	35.1	−3.0 (−14.6, 8.5)
Husbands of female workers aged 40–50 years[b]					
Partial smoking ban	48.1	36.6	11.5 (10.1, 12.9)	23.9	
Early smoking ban (2003–2007)	47.5	28.8	18.7 (17.4, 20.0)	39.4	7.2 (−4.7, 19.2)
Recent smoking ban (After 2007)	53.6	33.8	19.9 (18.5, 21.2)	37.0	8.4 (−2.0, 18.7)

[a]The category of "Partial smoking ban" was used as a reference. Positive value of DID estimates represents smoking cessation rates among husbands of female workers.
[b]Categorized by age in June 2001.
CI: confidence interval.

1.8 (−1.5, 5.2), respectively. The over 40s age groups indicated significant DID estimates of 5.0 (0.2, 9.8) for the recent smoking ban, although the younger groups did not show significant DID estimates for either smoking ban.

Table 3 shows current smoker prevalence, the decrease and DID estimates among husbands of female nonsmoking public office workers according to smoking ban categories. Spousal (husbands') smoking prevalence decreased from 52.7% in 2001 to 34.9% in 2010 among total female nonsmokers. It could be assumed that 17.8% (33.8% of spousal smokers) husbands stopped smoking during 2001–2010. DID estimates for early and recent smoking bans on spousal smoking was not significant among total female workers. The over 40s age group indicated positive DID estimates for early and recent smoking bans of 7.2 (−4.7, 19.2) and 8.4 (−2.0, 18.7), respectively, although these were not statistically significant.

Table 4 shows DID estimates by several periods before and after 2007, such as 2007–2010, according to smoking ban categories. As for the recent smoking ban, after 2007, the DID estimate among the over 40s was significant for male current smoking and not statistically significant but had a positive value for spousal smoking; 5.7 (1.5, 10.0) and 4.6 (−3.5, 12.7), respectively, although those were nearly zero before 2007. The early smoking ban showed DID estimates for male current smoking were around zero with small range, while those for spousal smoking showed positive values among the over 40s, especially after 2004 including 2004–2010. DID estimates for 2004–2010 were rather higher than those for other time periods for both recent and early smoking bans, particularly among the over 40s; that is, statistically significant results of 5.5 (0.9, 10.1) for recent smoking ban among over 40s male workers, 11.8 (3.2, 20.5) for early smoking ban among husbands of all female workers, 13.6 (2.6, 24.6) for early smoking ban among husbands of over 40s female workers and 11.0 (1.7, 20.2) for recent smoking ban among husbands of over 40s female workers. Furthermore, the sensitivity analysis showed smoking-related factors-adjusted DID results did not largely differ (data not shown).

4. Discussion

There is insufficient evidence as to whether a complete smoking ban decreases tobacco use compared with a partial smoking ban [9]. We found that the complete workplace indoor smoking ban, particularly that recently implemented among over 40s public office workers, decreased workers' smoking prevalence compared with a partial ban, especially after 2007. This result of decreased prevalence following a workplace smoking ban is in line with previous studies [14], suggesting a new aspect of the comparison between a complete smoking ban and a partial smoking ban. We also found the workplace smoking ban indicated positive values, although mostly nonsignificant, on the decrease of husbands' smoking prevalence among over 40s female nonsmoking workers compared with a partial ban. This may imply an increase in smoke-free homes after the implementation of a workplace smoking ban among over 40s female nonsmoking workers. This is in line with previous studies that found smoke-free legislation stimulated the adoption of smoke-free homes [30]. The workplace smoking ban may have a beneficial impact on smoking workers, nonsmoking workers and their families. However, our findings remain tentative because of limited significant results and methodological weaknesses in this study.

In the WSFG in 2003 [10], construction of a comfortable working environment was highlighted rather than workers'

Table 4: Difference-in-differences (DID) estimates by before and after 2007 time durations, according to smoking ban categories.

Smoking ban categories	DID estimates[a]				
	Before 2007		After 2007	Before and after 2007	
	2001–2004	2004–2007	2007–2010	2001–2010[b]	2004–2010
	% point (95% CI)	% point (95% CI)	% point (95% CI)	% point (95% CI)	% point (95% CI)
Total male workers					
Early smoking ban (2003–2007)	0.8 (−2.7, 4.3)	−1.6 (−5.3, 2.1)	1.0 (−3.0, 5.1)	0.9 (−3.0, 4.7)	−1.1 (−5.1, 2.9)
Recent smoking ban (after 2007)	0.6 (−2.5, 3.6)	−0.8 (−4.0, 2.5)	3.2 (−0.4, 6.7)	1.8 (−1.5, 5.2)	2.2 (−1.3, 5.7)
Male workers aged 25–39 years[c]					
Early smoking ban (2003–2007)	3.9 (−1.6, 9.4)	−3.8 (−9.8, 2.1)	−3.0 (−10.5, 4.5)	0.0 (−5.5, 5.4)	−6.8 (−12.9, −0.8)
Recent smoking ban (after 2007)	−1.7 (−6.5, 3.1)	−0.8 (−6.2, 4.5)	−2.5 (−9.1, 4.0)	−1.4 (−6.0, 3.3)	−2.3 (−7.6, 3.0)
Male workers aged 40[c]–59[d] years					
Early smoking ban (2003–2007)	−1.4 (−5.9, 3.2)	−0.6 (−5.3, 4.2)	2.8 (−2.0, 7.6)	1.8 (−3.7, 7.4)	3.2 (−2.1, 8.5)
Recent smoking ban (after 2007)	2.0 (−2.0, 5.9)	−1.2 (−5.4, 3.0)	**5.7 (1.5, 10.0)**	**5.0 (0.2, 9.8)**	**5.5 (0.9, 10.1)**
Husbands of total female workers					
Early smoking ban (2003–2007)	−8.4 (−17.1, 0.3)	6.4 (−2.0, 14.7)	2.1 (−5.8, 10.0)	−1.6 (−10.5, 7.2)	**11.8 (3.2, 20.5)**
Recent smoking ban (after 2007)	1.5 (−5.7, 8.8)	1.5 (−5.5, 8.5)	1.6 (−5.4, 8.6)	3.3 (−4.3, 11.0)	4.2 (−3.2, 11.6)
Husbands of female workers aged 25–39 years[c]					
Early smoking ban (2003–2007)	−15.2 (−31.0, 0.5)	4.6 (−10.6, 19.8)	0.0 (−14.6, 14.7)	−12.3 (−25.8, 1.1)	8.7 (−5.9, 23.2)
Recent smoking ban (after 2007)	1.0 (−12.1, 14.0)	−1.3 (−14.5, 11.9)	−6.8 (−20.4, 6.8)	−3.0 (−14.6, 8.5)	−8.7 (−21.4, 3.9)
Husbands of female workers aged 40[c]–59[d] years					
Early smoking ban (2003–2007)	−6.0 (−16.4, 4.5)	8.1 (−2.0, 18.2)	2.8 (−6.6, 12.2)	7.2 (−4.7, 19.2)	**13.6 (2.6, 24.6)**
Recent smoking ban (after 2007)	1.0 (−7.7, 9.7)	2.0 (−6.4, 10.3)	4.6 (−3.5, 12.7)	8.4 (−2.0, 18.7)	**11.0 (1.7, 20.2)**

[a]The category of "Partial smoking ban" was used as a reference. Positive value of DID estimates represents smoking cessation rates.
[b]Represented from Tables 2 and 3.
[c]Age in baseline period.
[d]Age in follow-up period.
CI: confidence interval.

health. However, workers' health harm reduction was prioritized in a recent report for workplace smoke-free policy by the MHLW in 2010 [31]. In the context of the new report and the HPL [11] in Japan, all employers have a responsibility and statutory duty to provide and maintain a working environment which is safe and free from risks to health including SHS exposure. Although we only accessed public office workers in the study, generally, the most heavily exposed and most at risk are those working in the hospitality industry such as bar workers, waiters and waitresses [32]. Intake of SHS in bar staff can be four times higher than that arising from living with at least one smoker [33]. The health risks to these employees are therefore especially high, and need to be prevented. Governments initially tend to implement the law affecting only public or unavoidable places [32]. This may widen the degree of inequality in the smoking ban between public and non-public places, although compliance with the law is also important. Thus, from the equity perspective, complete smoking ban policies for all workplaces, including not only public office but also the hospitality industry, must be required.

Unlike the USA where tobacco taxation differs by states, the same cigarette price is applied throughout Japan and there are no media anti-smoking campaigns [11]. Therefore, the impact of these measures which are most influential factors on smoking behavior could be ignored as a strength of this study. Simultaneously, the underlying downward trend in smoking prevalence observed between 2001 and 2010 could be taken into account by the DID method [16].

4.1. Workplace Smoking Ban and Husbands' Smoking. A workplace smoking ban may increase awareness of the dangers to nonsmokers of SHS, and help establish norms regarding the inappropriateness of smoking around nonsmokers. The norm of unacceptable smoking around nonsmokers, resulting from compliance with the indoor smoking ban policy, might influence people to adopt such rules voluntarily for their homes [14], and might improve husbands' smoking cessation by enhancing conjugal support and communication [34]. Thus, the mechanism between the workplace smoking ban and home smoking behavior may decrease husbands' smoking.

In a previous review, workplace smoking bans were deemed to have a smaller effect on smoking behavior than home smoking bans in studies that analyzed both workplace and home smoking bans simultaneously [14]. However, according to the above mechanism, voluntary home smoking bans may mediate between workplace smoking bans and

smoking behavior. Thus, the adjustment for home smoking bans may result in underestimation of the effect of workplace smoking ban; that is, although the variable of home smoking ban was not used in the current study, it may be appropriate for evaluation on the effect of a workplace smoking ban.

4.2. Effect Modifications. In this study, large age group differences in the effect of a smoking ban on smoking behaviors were seen. Generally, smoking cessation may be more difficult for older than for younger adults, because of a longer duration of smoking and thus a stronger nicotine dependence. However, the observed age group difference in the study is not surprising, because older people are more likely to conduct healthy behavior change than younger people [35]. Although few previous studies have examined the smoking ban using age group stratification, a lower effectiveness of smoking restrictions among young populations was observed [36], consistent with this study. Johnson et al. note that older people are more likely than young people to try to avoid unnecessary risks owing to their accumulated experience of health risks over a lifetime [35]. Another reason for the age group differences might be similar to resistance to the smoking ban by adolescents who start smoking as a form of rebellion [37], and thus a positive effect of smoking ban was not observed among the under 40s. Furthermore, different personal compositions, such as age and housing tenure, might cause a difference, although the results of sensitivity analyses adjusting these covariates did not materially differ.

In terms of difference due to implementation period, the effect of recent smoking ban was observed, particularly in 2007–2010, although the effect of the early smoking ban, which was implemented in 2003–2007, was not stable (Table 4). This might be due to a potential interaction. The smoking ban was one component of a multi-component effort to reduce tobacco use. The prefectural execution of the complete indoor smoking ban might occur during a period when other tobacco control strategies were relatively steady in the prefecture. A recent smoking ban might have a better interaction effect with a recently improved environment which promotes smoking cessation than an early smoking ban, because population norms against smoking had been reinforced by recent other tobacco control measures such as increased tobacco taxation and improved cessation assistance [11]. Thus, it is not generally possible to attribute all changes in smoking behavior to the smoking ban.

In terms of husbands' smoking, a wide range of baseline smoking prevalence by stratified categories might result in unstable DID estimates with limited significance. This might be due to chance and small sample size.

4.3. Limitations. There are several other limitations in the study. First, smoking outcomes were self-reported without biomarker validation, but the reliability of self-reporting smoking behavior was generally high [38]. Second, because this study is based on repeated cross sections instead of longitudinal data, changes in one individual could not be specified. Therefore, results may be biased by accidental distributions between different years. Longitudinal studies, however, have the problem that disadvantaged people are likely to leave the study. In this study, all respondents with characteristics of disadvantage could be included. Furthermore, the prefecture-based proxy indicator, which was used for intervention identification, may also lead to an ecological fallacy, an accident or underestimation by misclassification. Third, because public workers were studied, the ability to generalize from the results might be limited. The smokers in public offices might be more susceptible to pressure to change their behavior [14]. Therefore, this may lead to overestimation. Fourth, the execution of the smoking ban was not random. For example, Kanagawa prefecture implemented its own legislation to provide a smoke-free environment. In some cases, it has been argued that antismoking sentiments drove the passage of the law and reductions in smoking behaviors. We could not control for antismoking sentiments in the population, although strong leadership on making-decision by local governors was believed to be important for the implementation of legislation in Japan [39].

5. Conclusions

We examined whether a workplace complete indoor smoking ban would reduce male workers' smoking and female workers' husbands' smoking, compared with a partial ban, among Japanese public workers. The effectiveness of smoking bans considerably varied by age and period. A complete workplace indoor smoking ban, particularly one recently implemented among public office workers aged over 40, may reduce male workers' smoking and female workers' husbands' smoking compared with a partial ban, although other categories indicated weak, negative or no impact on smoking cessation.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Research Article

A Cross-Sectional Study Examining Youth Smoking Rates and Correlates in Tbilisi, Georgia

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Georgia has high smoking rates; however, little is known about the prevalence and correlates of youth smoking. We conducted a secondary data analysis of a 2010 cross-sectional survey of 1,879 secondary and postsecondary school students aged 15 to 24 years in Tbilisi, Georgia, examining substance use, perceived risk, and recreational activities in relation to lifetime and current (past 30 days) smoking. Lifetime and current smoking prevalence was 46.1% and 22.6%, respectively. In secondary schools, lifetime smoking correlates included being male, consuming alcohol, lifetime marijuana use, and lower perceived risk (P's $\leq .001$). Correlates of current smoking among lifetime smokers included being male, consuming alcohol, lifetime marijuana use, lower perceived risk, less frequently exercise, and more often going out (P's $< .05$). In postsecondary schools, lifetime smoking correlates included being male, consuming alcohol, lifetime marijuana use, lower perceived risk, more often going out, and recreational internet use (P's $< .0$). Correlates of current smoking among lifetime smokers included being male (P's $= .04$), consuming alcohol, marijuana use, lower perceived risk, and more often going out (P's $< .05$). Tobacco control interventions might target these correlates to reduce smoking prevalence in Georgian youth.

1. Introduction

There are an estimated 1.3 billion adult smokers among the world's six billion people, with increases anticipated [1]. Cigarette smoking is the second leading risk factor for death worldwide [2–4]. More than six million people die every year as a consequence of tobacco smoking [5]. In 2000, an estimated 4.83 million deaths were attributed to cigarette smoking globally. Tragically, almost half of those deaths occur in the developing world [2, 3]. In fact, four-fifths of current smokers live in low- and middle-income counties (LMICs) [5]. Many LMICs are still in early stages of the tobacco epidemic; thus, the number of smoking-related deaths in these nations is likely to increase [3, 6, 7]. Based on current trends, mortality will increase to 8.3 million a year by 2030, and 80% of these deaths will occur in LMICs [5].

One high-risk region for tobacco use is the area of the former Soviet Union [8]. In a study of eight former Soviet Union countries, almost 80% of men reported a history of smoking [8]. Rates of current smoking ranged from 43.3% in Moldova to 65.3% in Kazakhstan. There are drastically different smoking rates among men and women in these regions, with men having a much higher prevalence of smoking. In general, men from rural areas, of lower education and income, had higher rates of smoking, while women in urban areas and of higher education and income had higher smoking prevalence rates [8, 9].

The Republic of Georgia, one former Soviet Union country and a lower middle-income country [10, 11], has shown a record decrease in population over recent years, mainly attributed to premature mortality and migration [12]. The tobacco-related death toll in Georgia is estimated to be around 11,000 deaths per year [12]. Among Georgian men, estimated 54.9% are current daily smokers, 17.0% are less than daily smokers, and 28.1% are nonsmokers (past and never smokers) [12]. Among Georgian women, an estimated

12.2% are current daily smokers, 6.4% are less than daily smokers, and 81.4% are nonsmokers [12]. Similar to the trends of the other former Soviet Union countries, smoking prevalence is higher among men with lower education and lower income and among those who live in smaller settlements [12], whereas the smoking prevalence among women is higher among the more educated and affluent and those who live in larger cities. This may be a sign of the growing tobacco epidemic among Georgian women, such that rates of smoking among women grew from roughly 24% in 1997 to 34% in 2007 in Tbilisi, with the greatest increases among those under 40 years of age [12]. Given the growing tobacco use epidemic in Georgia, strides are being made to curtail this epidemic. In December 2005, Georgia ratified the Framework Convention on Tobacco Control (FCTC), which mandates that nations that ratify the FCTC implement policies including smoke-free public policies and regulation of tobacco advertising, among other tobacco control policies.

The Socioecological Model (SEM) [13–15] is a framework to examine the multiple effects and interrelatedness of environmental, contextual, and social factors on individual behavior. The SEM involves a comprehensive approach that integrates multiple levels of influence that impact health behavior and ultimately health outcomes. Those levels of influence include intra- and interpersonal factors, community and organizational factors, and public policies [13–15]. For example, some variables that might influence smoking may be intrapersonal factors such as sociodemographics, substance use behaviors, and attitudes toward smoking and smoking-related policies; interpersonal factors such as social exposure to smokers; community or organizational factors such as prevalence of smoking in their community, social norms within their community, or exposure to tobacco advertising; or public policies including those that regulate advertising, taxation, or smoke-free policies in public places. Drawing from this perspective, the current study focuses on individual-level factors including nonmodifiable factors such as sociodemographic characteristics as well as modifiable factors including substance use behaviors and involvement in activities with the potential for social influence on smoking initiation and maintenance among youth in Tbilisi, Georgia. These factors are impacted by the cultural context and social norms related to tobacco use in this understudied, high-risk country.

In terms of substance use behaviors, a large amount of literature has documented the association between cigarette use and alcohol use [16–18], as well as smoking and marijuana use [19, 20]. However, little research has documented these findings among youth in LMICs or specifically in Georgian youth. In particular, alcohol is a major concern among Georgian youth. One 2009 survey [21] found that more than 90% of youth have had drunk alcohol at least once, and more than 43% have had their last drink at home. This suggests a cultural acceptance of alcohol use in the Georgian society and within Georgian families. Given the high prevalence of both tobacco use and alcohol use in this context, the comorbid nature of behaviors perceived to be high risk in other cultures may not be associated among youth in Georgia.

Additionally, activity involvement may indicate specific risk or protective influences related to smoking behavior. For example, social factors have been found to play a particularly important role in smoking initiation and maintenance in other countries. Family influences, such as parents' smoking [22–25], and peer and school influences, such as peers' smoking [24, 26–28], are well- documented predictors of youth smoking. On the other hand, being married and having a family have been associated with lower likelihood of smoking in young adulthood in developed countries [29, 30]. In addition, low academic achievement [26, 31] and low school commitment or attachment [31] has been found to be risk factors for smoking among youth in developed countries. Additionally, engagement in sports or physical activity has been documented protective factors against smoking among youth [32, 33] as well as predictive of tobacco use [34, 35]. Finally, Internet use among youth has been a factor more recently examined and may indicate risk for exposure to tobacco advertising, as the Internet provides tobacco companies with a highly active environment to advertise their products in increasingly regulated countries [36, 37].

Despite the literature regarding risk factors for smoking among youth, limited research has documented these associations in LMICs or in Georgia in particular. Given the limited tobacco control policy adoption and enforcement in these countries including Georgia, the social norms regarding smoking may be more conducive to smoking initiation or may have little differential impact given the pervasive nature of tobacco use in the community and social networks of youth. Moreover, the pervasiveness of tobacco use may also impact the perceived harm of cigarette smoking, such that youth will perceive the threat to be lower [16, 38]. Thus, examination of social factors impacting smoking among youth in LMICs is critical in informing approaches aimed at smoking prevention and cessation.

Given the aforementioned literature, the specific aims of this study are to examine sociodemographics, other substance use, perceived risk of smoking, and engagement in various social and academic activities in relation to lifetime use of cigarettes and current (past 30 day) cigarette use among lifetime cigarette users in a sample of 15–18-year-old secondary school students and 18–24-year-old postsecondary school students in Tbilisi, Georgia. We hypothesize higher lifetime and current cigarette smoking rates among the older age group, males, alcohol and marijuana users, those perceiving less harm related to cigarette smoking, and those who more frequently engage in activities where social influence might promote smoking.

2. Materials and Methods

2.1. Ethics Statement. The current study is a secondary data analysis of the 2010 USAID-funded Georgia HIV Prevention Project Behavioral Surveillance Survey among School and University Students in Tbilisi. The Georgia HIV Prevention Project is a five-year effort that began February 4, 2010, designed to improve and expand upon HIV prevention among the highest risk populations. This study was

conducted among 15–18-year-old secondary school students and 18–24-year-old postsecondary school students in Tbilisi in order to fill the gap in current data about the knowledge, attitudes, and behaviors of youth in Tbilisi. This research was approved by the Institutional Review Boards of the Research Triangle Institute and the Maternal and Child Care Union in Georgia. All participants were informed of the nature of the study prior to their participation. For participants under the age of 18 years, both written parental consent and the student's written consent were obtained. For students 18-year old and older, written consent was obtained. In addition, the youth were informed that at any time during the interview they had the freedom to refuse to answer a question or to quit the interview. Both institutional review boards approved these procedures.

2.2. Participants and Procedures. The statistical population of this study is students 15 to 24 years of age attending public (state) or private secondary schools (9th to 12th grades); undergraduates in private or public universities; or students in vocational-technical training schools in Tbilisi in 2011. The total number of secondary school students in Tbilisi was 55,842; the total number of postsecondary students in Tbilisi universities and professional vocational-technical training schools was 73,652 (per the Ministry of Education and Science as of September 2010).

The sample size calculation was done using the methodology for descriptive studies for an estimated percentage in the target population with the event of interest (e.g., lifetime sexual activity, lifetime alcohol consumption, lifetime cigarette use) of 50% (confidence interval (CI) of 0.10; confidence level of 95%), indicating a minimum of 384 students in each of the four gender and age (15–18 year olds; 18–24 year olds) groups. Next, estimation of the sample size was done for a comparison of proportions of dichotomous variables for alpha error = 0.05 (two-sided test), power = 80%, and the expected smaller proportion = 0.5 (again maximizing the sample size) for the detection of difference = 0.10. By this methodology, it was determined that a minimum of 407 students should be selected per each group to reach an adequate statistical significance for mutual comparisons of age and gender groups. Therefore, this study attempted to enroll 2,000 students in total, 500 per age and gender group, considering a potential 80% response rate. The probability proportional to size sampling technique was used for the selection of institutions; that is, we aimed to obtain subgroups of participants relative in size to the size of the subpopulation in the general population. As a result, 24 secondary schools (16 state and 8 private) and 13 universities and/or vocational-technical training schools (7 state, 5 private universities, and one vocational-technical training school) were selected. Data regarding the specific school from which the participants were recruited were not recorded in order to protect the privacy of the schools and the confidentiality of the individual data collected, particularly given the sensitive nature of the information (e.g., drug use, sexual activity).

Refusal rates for school students and postsecondary students were 5.1% and 1.3%, respectively. Among the 1,936 completed questionnaires, 41 were excluded because of ineligible ages (less than 15 or more than 24 years of age), 3 were excluded because they were incomplete (almost half of the questions were left unanswered), and 13 were excluded due to doubtful responses (e.g., inconsistent or illogical responses), leaving a total of 1,879 useable questionnaires.

2.3. Measures. The survey assessed the following factors: sociodemographics, tobacco use, alcohol and marijuana use, knowledge of HIV/AIDS, sexual behavior, perceived risk of smoking, and activity involvement. For the current study, the following assessments were included.

2.3.1. Sociodemographics. Participants were asked to indicate their age and gender. Employment and marital status were also assessed among the postsecondary school students.

2.3.2. Cigarette Smoking. Participants were asked, "Have you ever smoked a cigarette?" and "How often have you smoked cigarettes over the last month? Have not smoked at all; less than 1 cigarette per week; less than 1 cigarette per day (cpd); 1–5 cpd; 6–10 cpd; 11–20 cpd; or more than a pack a day." These measures were adapted from other international surveys including the European School Survey Project on Alcohol and Other Drugs [39] and the Global Youth Tobacco Survey [40].

2.3.3. Alcohol Use. Participants were asked, "Have you ever had an alcoholic drink (wine, beer, vodka, martini, champaign, other drink containing alcohol)?" and "Have you had an alcoholic drink over the past month?" These questions are adapted from other validated surveys [39, 41, 42]. For the current analysis, we used the latter question to indicate alcohol use given the high prevalence of lifetime use (91.9%) versus past 30-day use of alcohol (64.8%).

2.3.4. Marijuana Use. Participants were asked, "On how many occasions (if any) have you smoked marijuana or hashish - In your lifetime? In the past 12 months? In the past 30 days?" These assessments were adapted from other validated surveys [39, 41, 42]. Given the low prevalence of past 30 day use (1.0%) and past 12 month use (4.3%), lifetime marijuana use (11.1%) was included in the current analyses.

2.3.5. Perceived Risk. Participants were asked, "In your opinion, how much do you think people risk harming themselves (physically, emotionally, or in other ways) if they. . .Smoke cigarettes sometimes? Smoke less than 10 cigarettes daily? Smoke around 10–20 cigarettes daily? Smoke a pack or more daily?" with response options of 1 = *no risk* to 4 = *great risk*. This assessment was adapted from the European School Survey Project on Alcohol and Other Drugs [39]. Given the high internal consistency of the items (Cronbach's alpha = 0.76), these four questions were used as a single measure of perceived risk.

2.3.6. Activity Involvement. Participants were asked about the frequency with which they engaged in several activities. These six items asked, "How often have you done the following: Read fiction literature for entertainment? Engaged in sports or physical exercising? Went to parties, cafes, bars, or disco in the evening? Used the internet to listen to music, play, or chat? Used the internet for educational or work purposes? Went out in the neighborhood street and pass time with neighborhood friends or neighbors?" with response options of 1 = *never* to 5 = *almost every day*. These questions were adapted from the European School Survey Project on Alcohol and Other Drugs [39] and may be indicators of the degree to which social influence on smoking behaviors may be encountered.

2.4. Data Analysis. Participant characteristics were summarized using descriptive statistics. Bivariate analyses were conducted to identify correlates of lifetime cigarette use and, among lifetime smokers, current (past 30 day) cigarette smoking among 15–18-year-old secondary school students and among 18–24-year-old postsecondary school students, respectively. Chi-squared tests were used for categorical variables, and independent samples t-tests were used for continuous variables. Binary logistic regression was used to examine factors associated with lifetime cigarette use and, among lifetime users, current cigarette smoking among 15–18-year-old secondary school students and among 18–24-year-old postsecondary school students, respectively. Drawing from the literature, we forced sociodemographic characteristics and substance use into each of the multivariate regression models. Then, other factors including perceived harm and activity involvement that were associated with cigarette use at the $P < .10$ were entered using backwards stepwise entry. We also explored interaction effects, specifically gender by activity involvement. SPSS 21.0 was used for all data analyses. Statistical significance was set at $\alpha = .05$ for all tests.

3. Results

In terms of cigarette use, slightly less than one-half (46.1%) had ever smoked (not shown in tables). Males were significantly more likely to have smoked than females (62.2% versus 33.0%; $P < .001$), and postsecondary students (50.6%) were more likely to have smoked than secondary school students (43.8%; $P < .001$). Of all participants, 22.6% reported smoking in the last month before the survey. One-third (33.9%) of males compared with 11.9% of females had smoked in the past 30 days ($P < .001$), and 28.3% of students of 18–24 years had smoked in the past 30 days compared with 17.6% of secondary school students ($P < .001$). Among past 30-day smokers, 15.5% smoked less than 1 cigarette per week, 6.6% smoked less than 1 cpd, 22.4% smoked 1–5 cpd, 20.0% smoked 6–10 cpd, 25.9% smoked 11–20 cpd, and 9.6% smoked more than a pack per day. Daily smoking in the last month was reported by 17.6% of all participants. Again, males (28.6%) were significantly more likely to have smoked daily in the last month than females (7.2%; $P < .001$), and postsecondary school students 18–24 years of age (23.7%) were significantly more likely to be daily smokers than secondary students 15–18 years of age (11.2%; $P < .001$). In terms of perceived risk, participants reported greater risk with greater consumption: smoking sometimes ($M = 2.57$, SD = 0.96), smoking less than 10 cpd ($M = 3.06$, SD = 0.81), smoking around 11–20 cpd ($M = 3.61$, SD = 0.69), and smoking a pack or more daily ($M = 3.79$, SD = 0.59).

3.1. Secondary School Students. Table 1 summarizes bivariate analyses examining differences among lifetime users and nonusers and, among lifetime users, past 30-day cigarette smokers versus nonsmokers across both age groups. In terms of lifetime cigarette use, correlates included older age ($P = .02$), being male ($P < .001$), past 30-day alcohol use ($P < .001$), lifetime marijuana use ($P < .001$), lower perceived risk of smoking ($P < .001$), less often reading fiction ($P < .001$), more often engaging in sports/exercising ($P = .02$), more often going out in the evening ($P < .001$), less often using the Internet for education or work ($P < .001$), and more often spending time with neighbors and friends ($P < .001$). In the multivariate regression model (Table 2), significant predictors of lifetime cigarette use included being male ($P < .001$), consuming alcohol ($P < .001$), lifetime marijuana use ($P < .001$), and lower perceived risk ($P = .001$).

In terms of past 30-day smoking among lifetime cigarette users (Table 1), correlates included older age ($P = .04$), being male ($P < .001$), past 30-day alcohol use ($P < .001$), lifetime marijuana use ($P < .001$), lower perceived risk of smoking ($P < .001$), less often reading fiction ($P = .001$), less often engaging in sports/exercising ($P = .04$), more often going out in the evening ($P = .008$), less often using the Internet for education or work ($P = .005$), and less often spending time with neighbors and friends ($P = .01$). In the multivariate regression model (Table 2), significant predictors of past 30-day cigarette smoking among lifetime cigarette users included being male ($P = .03$), consuming alcohol ($P = .05$), lifetime marijuana use ($P = .003$), lower perceived risk ($P < .001$), less frequently engaging in sports/exercising ($P = .009$), and more often going out in the evenings ($P = .05$). We also explored interaction effects, specifically gender by activity involvement, and found no significant interactions.

3.2. Postsecondary School Students. In terms of lifetime cigarette use among postsecondary school students (Table 1), correlates included being male ($P < .001$), being employed at least part-time ($P < .001$), past 30-day alcohol use ($P < .001$), lifetime marijuana use ($P < .001$), lower perceived risk of smoking ($P < .001$), more often engaging in sports/exercising ($P = .003$), and more often going out in the evening ($P < .001$). In the multivariate regression model (Table 3), significant predictors of lifetime cigarette use included being male ($P = .001$), consuming alcohol ($P < .001$), lifetime marijuana use ($P < .001$), lower perceived risk ($P < .001$), more often going out in the evening ($P = .003$), and using the Internet to listen to music, play, or chat ($P = .02$).

In terms of past 30-day smoking among lifetime cigarette users (Table 1), correlates included being male ($P < .001$), past 30-day alcohol use ($P = .001$), lifetime marijuana use ($P < .001$), lower perceived risk of smoking ($P < .001$),

Table 1: Participant characteristics and bivariate analyses examining differences between participants who have never smoked versus have smoked cigarettes at some point in their lifetime and between lifetime cigarette users who have smoked versus not smoked in the past 30 days.

Variable	Total	15–18 year olds in secondary school						18–24 years enrolled in a postsecondary school					
		Lifetime cigarette use			Smoked in past 30 days[a]			Lifetime cigarette use			Smoked in past 30 days[a]		
		No	Yes		No	Yes		No	Yes		No	Yes	
	N = 1,879 100.0%	N = 501 56.2%	N = 390 43.8%	P	N = 233 59.7%	N = 157 40.3%[b]	P	N = 471 49.4%	N = 482 50.6%	P	N = 212 44.0%	N = 270 56.0%[c]	P
	M (SD) or N (%)	M (SD) or N (%)	M (SD) or N (%)		M (SD) or N (%)	M (SD) or N (%)		M (SD) or N (%)	M (SD) or N (%)		M (SD) or N (%)	M (SD) or N (%)	
Sociodemographics													
Age (SD)	18.41 (2.38)	16.20 (0.80)	16.32 (0.84)	.02	16.25 (0.79)	16.43 (0.89)	.04	20.48 (1.26)	20.49 (1.29)	.91	20.39 (1.30)	20.56 (1.28)	.16
Gender (%)				<.001			<.001			<.001			<.001
Male	917 (48.8)	182 (36.3)	260 (66.7)		139 (59.7)	121 (77.1)		159 (33.8)	301 (62.4)		110 (51.9)	191 (70.7)	
Female	962 (51.2)	319 (63.7)	130 (33.3)		94 (40.3)	36 (22.9)		312 (66.2)	181 (37.6)		102 (48.1)	79 (29.3)	
Employment (%)[d]		—	—	—	—	—	—			<.001			.20
Unemployed	797 (82.8)							410 (87.0)	379 (78.6)		171 (80.7)	208 (77.0)	
Employed at least part-time	165 (17.2)							61 (13.0)	103 (21.4)		41 (19.3)	62 (23.0)	
Marital status (%)[d]		—	—	—	—	—	—			.46			.06
Not married	924 (96.0)							453 (96.2)	462 (95.9)		207 (97.6)	255 (94.4)	
Married	38 (4.0)							18 (3.8)	20 (4.1)		5 (2.4)	15 (5.6)	
Other substance use													
Alcohol use, past month (%)				<.001			<.001			<.001			.001
No	350 (36.4)	237 (47.3)	64 (16.4)		51 (21.9)	13 (8.3)		242 (51.4)	106 (22.0)		61 (28.8)	45 (16.7)	
Yes	612 (63.6)	264 (52.7)	326 (83.6)		182 (78.1)	144 (91.7)		229 (48.6)	376 (78.0)		151 (71.2)	225 (83.3)	
Marijuana use, lifetime (%)				<.001			<.001			<.001			<.001
No	777 (85.5)	466 (98.9)	289 (83.5)		195 (91.5)	94 (70.7)		448 (96.6)	323 (73.6)		171 (84.2)	152 (64.4)	
Yes	132 (14.5)	5 (1.1)	57 (16.5)		18 (8.5)	39 (29.3)		16 (3.4)	116 (26.4)		32 (15.8)	84 (35.6)	
Psychosocial factors													
Perceived risk (SD)	12.84 (2.47)	13.62 (2.05)	12.68 (2.45)	<.001	13.23 (2.13)	11.80 (2.68)	<.001	13.46 (2.19)	12.25 (2.57)	<.001	13.08 (2.16)	11.56 (2.69)	<.001
Activity involvement (SD)													
Read fiction literature for entertainment	2.92 (1.17)	3.19 (1.27)	2.82 (1.23)	<.001	2.95 (1.21)	2.62 (1.24)	.009	2.99 (1.15)	2.86 (1.18)	.08	2.91 (1.11)	2.82 (1.23)	.40
Engage in sports, physical activity	3.00 (1.41)	3.31 (1.54)	3.55 (1.46)	.02	3.68 (1.39)	3.37 (1.55)	.04	2.86 (1.47)	3.13 (1.34)	.003	3.01 (1.40)	3.23 (1.29)	.08
Go to parties, cafe, bar or disco in the evening	2.68 (1.11)	2.16 (1.05)	2.53 (1.12)	<.001	2.41 (1.07)	2.72 (1.17)	.008	2.43 (1.07)	2.94 (1.10)	<.001	2.67 (1.06)	3.15 (1.08)	<.001
Use the internet to listen to music, play, chat	4.34 (1.17)	4.60 (0.97)	4.58 (1.00)	.79	4.62 (0.95)	4.53 (1.08)	.41	4.24 (1.24)	4.45 (1.08)	.004	4.47 (1.04)	4.44 (1.11)	.79
Use the internet for educational or work purposes	4.12 (1.19)	3.73 (1.26)	3.32 (1.36)	<.001	3.48 (1.24)	3.09 (1.49)	.005	4.17 (1.13)	4.08 (1.22)	.21	4.21 (1.12)	3.97 (1.29)	.03
Pass time w/neighborhood friends/neighbors	3.04 (1.43)	3.43 (1.40)	3.96 (1.34)	<.001	3.82 (1.37)	3.09 (1.49)	.01	2.96 (1.39)	3.12 (1.47)	.09	2.97 (1.42)	3.24 (1.50)	.04

[a] Among lifetime users. [b] 17.6% of total secondary school participants. [c] 28.3% of total post-secondary school participants. [d] Among post-secondary school participants.

Table 2: Multivariate models examining predictors of lifetime use of cigarettes among participants aged 15–18 years in secondary school and current (past 30 days) smoking among lifetime cigarette users.

Variable	Lifetime cigarette use			Smoked in past 30 days*		
	OR	CI	*P* value	OR	CI	*P* value
Sociodemographics						
Age	1.18	0.96, 1.45	.11	1.17	0.85, 1.62	.33
Gender			<.001			.03
Male	Ref	—		Ref	—	
Female	0.38	0.27, 0.53		0.51	0.28, 0.93	
Other substance use						
Consumed alcohol, past 30 days			<.001			.05
No	Ref	—		Ref	—	
Yes	3.95	2.69, 5.80		2.29	1.01, 5.24	
Marijuana use, lifetime			<.001			.003
No	Ref	—		Ref	—	
Yes	5.82	2.20, 15.43		3.19	1.50, 6.82	
Psychosocial factors						
Perceived risk of smoking	0.88	0.81, 0.95	.001	0.81	0.72, 0.91	<.001
Activity involvement:						
Engage in sports, physical activity	—	—	—	0.77	0.63, 0.94	.009
Go to parties, cafe, bar, or disco in the evening	—	—	—	1.28	1.00, 1.65	.05

* Among lifetime cigarette users.

Table 3: Multivariate models examining predictors of lifetime use of cigarettes among participants aged 18–24 years enrolled in a postsecondary school and current (past 30 days) smoking among lifetime cigarette users.

Variable	Lifetime cigarette use			Smoked in past 30 days*		
	OR	CI	*P* value	OR	CI	*P* value
Sociodemographics						
Age	1.04	0.90, 1.18	.62	1.08	0.90, 1.30	.40
Gender			.001			.04
Male	Ref	—		Ref	—	
Female	0.54	0.38, 0.77		0.62	0.38, 0.99	
Employment			.08			.35
Unemployed	Ref	—		Ref	—	
Employed at least part-time	1.47	0.95, 2.30		1.31	0.75, 2.29	
Marital status			.64			.11
Not married	Ref	—		Ref	—	
Married	0.83	0.37, 1.84		2.77	0.78, 9.77	
Other substance use						
Consumed alcohol, past 30 days			<.001			.02
No	Ref	—		Ref	—	
Yes	2.74	1.92, 3.90		2.09	1.15, 3.77	
Marijuana use, lifetime			<.001			.02
No	Ref	—		Ref	—	
Yes	4.43	2.34, 8.42		1.99	1.13, 3.49	
Psychosocial factors						
Perceived risk of smoking	0.82	0.76, 0.89	<.001	0.78	0.71, 0.87	<.001
Activity involvement:						
Go to parties, cafe, bar, or disco in the evening	1.26	1.08, 1.48	.003	1.37	1.10, 1.71	.005
Use the Internet to listen to music, play, or chat	1.22	1.04, 1.42	.02	—	—	—

* Among lifetime cigarette users.

more often going out in the evening ($P < .001$), less often using the Internet for education or work ($P = .03$), and more often spending time with neighbors and friends ($P = .04$). In the multivariate regression model (Table 3), significant predictors of past 30-day cigarette smoking among lifetime cigarette users included being male ($P = .04$), consuming alcohol ($P = .02$), lifetime marijuana use ($P = .02$), lower perceived risk ($P < .001$), and more often going out in the evenings ($P = .005$). We also explored interaction effects, specifically gender by activity involvement, and found no significant interactions.

4. Discussion

The current study documented sociodemographic factors and involvement in differing activities as they relate to smoking initiation and progression among secondary and postsecondary students in Tbilisi, Georgia. Key results indicated that this data reflects previously documented findings regarding sociodemographic correlates of smoking, the connection between perceived risk of smoking and smoking initiation and maintenance, and other substance use in relation to smoking. The more novel findings involved leisure time activity involvement and their relation to cigarette smoking.

As found in prior research [8, 9, 12], males were more likely than females to have smoked cigarettes in their lifetime or in the past 30 days. In addition, among those who had smoked cigarettes in their lifetime, males were more likely to be current smokers. Additionally, postsecondary school students were more likely than secondary school students to have smoked in their lifetime or in the past 30 days. Interestingly, however, within these different age groups, age itself was not correlated with lifetime cigarette use or current smoking, which implies that the contextual factors of these settings may have more of an impact on cigarette smoking than age itself. For example, the postsecondary school settings might involve greater freedom of choice, more influence of older peers, changes in social norms around tobacco and other substance use, greater exposure to tobacco marketing, and greater stress or other mental health issues related to the transition [43, 44]. Our findings also indicated that employment and marital status had little or no impact on smoking behavior in this sample of young adults, few of whom were employed (17.2%) or married (4.0%). These findings warrant further examination to understand the psychosocial factors that do, in fact, vary across contexts and impact smoking in Georgia in order to inform tobacco control interventions and policies in this setting.

One factor consistently found to be associated with cigarette use was perceived risk of smoking, which is a well-established correlate [43, 45]. Social norms regarding smoking and perceived risk of smoking have previously been found to be associated [43, 45]. Given the high prevalence of cigarette smoking nationwide in Georgia, these findings are not surprising. This might suggest two intervention targets to reduce the likelihood of smoking initiation and maintenance among youth in Georgia—increasing the perceived harm of smoking and denormalizing cigarette smoking in Georgian youth. In reference to this latter point, it is important to correct any inflated perceptions of smoking prevalence in Georgian youth as well as develop messaging strategies to reduce the social acceptability of smoking in this population.

Using alcohol and marijuana was also highly correlated with lifetime cigarette use and current smoking among both age groups. This is in line with well-established research in other countries documenting the connection between other substance use and smoking [35, 46]. Interestingly, the most high-risk activity related to smoking was going out to parties, cafes, bars, or discos in the evening for both subgroups of youth. Specifically, we found that going to parties and bars was associated with greater likelihood of smoking maintenance among secondary students and with greater likelihood of lifetime cigarette use and smoking maintenance among postsecondary school students. This might imply that these contexts are conducive to substance use in general and cigarette use specifically. In addition, advertising tobacco products through bars, clubs, cafes, and other venues such as these is a highly utilized strategy of the tobacco industry [47–49]. A large number of cross-sectional studies have reported associations between exposure to tobacco marketing and attitudes toward smoking, susceptibility to smoking, smoking experimentation, or regular smoking among youth [43, 50–52]. Thus, exposure to tobacco advertising through these settings and others frequently occupied by youth should be assessed.

We also found that using the Internet to listen to music, play, or chat was associated with greater lifetime cigarette use among postsecondary school students. This may indicate social influence on smoking among young adults; alternatively, this type of Internet use may also indicate a potential for online tobacco advertising. Related to this latter point, new media offers the tobacco industry a powerful and efficient channel for promoting cigarettes and other tobacco products that has largely gone unregulated to date [53]. Evidence of tobacco promotion through online media is emerging, with YouTube, Facebook, and Twitter being prominent sources for tobacco advertising that also has broad reach to youth globally [53]. Assessments of exposure to online tobacco advertising may help distinguish the sources of influence on tobacco use related to Internet use for pleasure.

Engaging in sports and physical activity was associated with reduced likelihood of continued smoking among secondary school students. This suggests that the consistent engagement in physical activity may reduce the likelihood of using cigarettes frequently or continuously, which has been documented in other countries previously [32, 33]. This is likely due to concerns regarding the capacity to engage in these activities if physical functioning is compromised or to social norms among peers being less supportive of smoking [32, 33]. Interestingly, research in other countries has also indicated that athletes often have higher smoking rates [54, 55]. Further examination is needed to understand the role of engaging in physical activity and the potential for greater peer influence in the context of team versus individual sports.

The current findings have important implications for research and practice. In terms of research, this study suggests

the need for more research regarding correlates of smoking among youth in Georgia, given the relatively limited scope of factors included in this dataset. Specifically, examining the contextual factors in the two differing school settings (i.e., secondary and postsecondary schools) and the differences among males and females that might contribute to smoking initiation and maintenance are critical. Moreover, the social norms and potential exposure to tobacco marketing should be examined in these differing contexts and how different groups are targeted. Regarding practice, policies involved in the FCTC, particularly those impacting the social norms of smoking (e.g., public smoke-free policies, regulation of tobacco advertising), may influence smoking initiation and maintenance among youth. Moreover, practitioners should understand the relationship between other substance use and smoking behaviors and systematically monitor health behaviors in clinical encounters. Additionally, addressing these behaviors concurrently may prove to be beneficial. Finally, it is important to recognize that smoking prevalence is high among youth in Georgia, and thus, early intervention is critical to address nicotine dependence and smoking-related morbidity and mortality.

4.1. Limitations. This study has some limitations. First, this sample was recruited through secondary and postsecondary school students living in Tbilisi, and, thus, we cannot infer how reflective this sample is of the larger youth population in Georgia. Relatedly, we also did not record the school of attendance as a variable. This was done in order to ensure maximum confidentiality of the data given the sensitive nature of the questions (e.g., history of drug use, sexual behavior) and to provide the maximum protection of the schools who participated in the study. It is important to note the large number of school involved (i.e., 24 secondary schools and 13 universities and/or vocational-technical training schools) and thus the greater generalizability of the sample to the larger Tbilisi 15–24-year-old population and potentially the larger population within this age range in Georgia. Despite these strategies, we are uncertain of the extent to which the lifetime and current smoking prevalence accurately reflects actual national or citywide estimates among this population. Second, because of the cross-sectional nature of this study, we cannot determine the directionality of the relationships documented. Furthermore, this was a secondary data analysis of a study examining factors relevant to HIV Prevention. The dataset was not intended to exhaustively assess correlates of tobacco use. Therefore, several important factors potentially related to tobacco use were not assessed, including parental smoking, exposure to tobacco advertising, exposure to secondhand smoke, peer tobacco use, and several other important factors. In addition, the lack of a significant finding regarding the association between marital status, employment, and tobacco use among the postsecondary student population may be due to the relatively small proportions of participants reporting being married or employed. Relatedly, the lack of significant interactions documented in relation to gender may have been due to the small number of females in the cells of current cigarette smokers in both age groups (36 in the 15–18-year-old female group and 79 in the 18–24-year-old female group). Finally, the way in which we operationalized the alcohol and marijuana variables has limitations. However, we examined alternative operationalizations (e.g., continuous variables), and these alternatives did not yield significantly different findings. Despite these limitations, these findings are novel and important as a basis for future research in this area, particularly given the dearth of published research on youth smoking in Georgia.

5. Conclusions

Future research should examine contextual factors in secondary and postsecondary schools that impact smoking among Georgian youth. Specifically, factors impacting differential rates of smoking among males and females, the social norms of smoking and other substance use, and the impact of leisure time activity involvement on smoking initiation and maintenance should be examined further. In addition, interventions and policies that might impact attitudes toward smoking and social norms regarding smoking should be investigated and considered.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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