

Adolescent Smoking Behavior in European Countries: Influences of Belief- and School-Related Factors

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Abstract

Background: Adolescent smoking remains one of the major public health concerns worldwide. Young smokers are highly likely to become adult smokers and develop a wide range of health related problems at different stages of life. Evidence shows that factors such as peer smoking and parental smoking have significant impacts on adolescent smoking, however, there is scant knowledge about the role of adolescents' beliefs and school-related factors, and therefore, hindering us to gain deeper insights for better smoking prevention and control.

Objective: To examine the correlation between cigarette smoking and a set of contextual factors among the adolescents aged 13 - 15 years in six European countries.

Methodology: The data used in this study was drawn from 2011 Global Youth Tobacco Survey (GYTS). Logistic regression was conducted to quantify the effects of the contextual factors, with particular focus on adolescents' beliefs regarding smoking and school-related factors.

Results: On average, the smoking prevalence among the adolescents in the six European countries ranged from 11.7% (Ukraine) to 36.6% (Latvia). The regression results showed mixed effects across these countries in terms of belief- and school-related factors. For example, adolescents who believed that 'smoking was harmful to them' had a lower likelihood of smoking in Croatia (OR: 0.5, 95% CI: 0.26 - 0.96). However, such belief was related to a higher likelihood in Ukraine (OR: 2.12, 95% CI: 0.97 - 4.63). As expected, adolescents who believed that 'second-hand smoking was harmful' had a lower likelihood, and who believed that 'smokers were more attractive' had a higher likelihood. Further, the effects of school discussion on the dangers of smoking was significant only in two countries: Croatia (OR: 0.53, 95% CI: 0.39 - 0.73) and Ukraine (OR: 0.34, 95% CI: 0.17 - 0.7). A positive correlation was identified between smoking and seeing teacher or peer smoking on school premises. Adolescents who planned to continue education after current school program was negatively associated with the likelihood of smoking.

Conclusion: This study enhances the understanding of the effects of adolescents' belief- and school-related factors on adolescent smoking. The implications may support the development of intervention strategies to prevent the adolescent smoking behavior.

Keywords: Adolescent; Smoking; Belief Influence; School Influence

Introduction

As the leading preventable cause of premature deaths, tobacco use is responsible for approximately 7 million deaths each year, including more than 890,000 non-smokers who died from exposure to second-hand smoke [1]. If the current trend continues, tobacco will cause more than 8 million deaths a year by 2030 [2]. Despite substantial effort has been made to prevent and control tobacco use in many areas, such as the development of tobacco-free policies, cessation programs, anti-tobacco mass media campaigns, and actions on tobacco taxation, the total number of smokers is still rising. A study of smoking prevalence and cigarette consumption for 187 countries revealed that the number of daily smokers was increased from 721 million to 967 million in between 1980 and 2012 [3].

Adolescents, who are at a crucial age for smoking initiation and tobacco use establishment, create an enormous challenge for tobacco prevention and control. About 90% adult smokers had their first cigarette, or were already addicted to nicotine, by the age of 18 [4]. In comparison to adults, adolescents require fewer cigarettes and less time to establish a nicotine addiction [5]. Adolescent smoking not only increases the risk of many diseases in a short-term, such as respiratory illness, asthma, and reduced lung function, but also increases the risk of many serious diseases in a long-term, such as lung cancer, heart diseases, and stroke [6,7].

Empirical evidence has shown a number of influential factors that are closely related to adolescent smoking behavior; including gender, peer smoking, parental smoking, family income and education level, second-hand smoke exposure, advertising and promotion, taxes on tobacco products, smoking bans, etc. Among these determinants, peer smoking has been reported consistently as one of the most influential factors. For example, Valente, *et al.* [8] reported that peer influence was responsible for 17.9 times higher odds for smoking status of 9th grade students in Hispanic high schools. Another study conducted by Rudatsikira, *et al.* [9] stated that adolescents in Ethiopia whose most of the friends were smokers were 42.2 times more likely to smoke cigarettes. While many factors resulted in similar effects in various adolescent groups (e.g. by different countries), mixed effects were also reported. For example, Van Minh *et al.* [10] found that boys in Vietnam were more likely to smoke cigarettes than girls, while Otten, *et al.* [11] concluded opposite finding in Netherland. In comparison to a large body of studies on the aforementioned risk factors, it is by far few studies were conducted to investigate the effects of adolescents' beliefs regarding smoking and school-related factors on smoking behavior. A study done by Boles and Johnson [12] reported that girls who believed themselves as over or under weight were more likely to smoke. A study on high school students in Hungary by Piko and Kovács [13] described that 'high academic achievement' acted as a protective factor against adolescent smoking.

The aim of the present study, therefore, is to enhance the understanding of adolescents' smoking behavior by further investigating the less studied belief- and school-related factors. Specifically, this study adds values to gain knowledge about the effects of adolescent beliefs, including the attractiveness of smokers, harmfulness of active smoking, and harmfulness of second-hand smoking, and school-related factors, including discussion on dangers of smoking, observation of smoking behavior by teachers and students, and adolescents' future plan (education or work). The population of interest is the European adolescents. According to the World Health Organization (WHO) report on the global tobacco epidemic 2017, the variation of adolescent cigarette smoking prevalence in European countries is quite high, ranging from 2% (Finland and Norway) to 25.7% (Ukraine) among boys, and 3% (Finland and Norway) to 26.3% (Italy) among girls, respectively [14]. Although the adolescent smoking behavior has been investigated in a number of European countries, such as Poland, Germany, Netherland, Iceland, Italy, Scotland [15-18], this study adds new values to six European countries that have not been well studied yet. From the policing perspective, the implications of this study may shed some light on potential smoking prevention interventions.

Methods

Data Source and Participants

The data used in this study were drawn from Global Youth Tobacco Survey (GYTS) 2011. GYTS is a school-based survey, which targets participants who are aged 13 to 15 years. It is an anonymous survey based on self-administered data collection method and the participants complete it voluntarily. For the selection of the sample, the country coordinators firstly identify the grades in the educational system that correspond to the aforementioned age group.

Under a two-stage cluster design, schools are selected with a probability proportional to the enrollment size at the first sampling stage. At the second sampling stage, within the selected schools, classes are chosen randomly with equal probability where all the students are eligible for participation without age restriction. Consequently, some participants are below 13 years and some are above 15 years. According to the statistical analysis by Centers for Disease Control (CDC), to achieve a precision level of $\pm 5\%$ the minimum sample size is 1500 for most of the countries for this two-stage sampling structure [19]. A questionnaire that consists of a set of core questions is asked in all sites along with some unique country-specific questions. The final questionnaire is translated into local languages and the WHO country coordinators do a focus group discussion with the students to make sure they are translated appropriately and the students have a good understanding of the questions [20].

The GYTS 2011 provided survey results of six European countries, including Croatia, Czech Republic, Slovakia, Latvia, Slovenia, and Ukraine. Overall, a total of 22,184 students participated in the survey. However, due to the conflicting answers in some of the individuals' records, we removed these records from the raw dataset. For example, if the student responded that he/she had never tried smoking cigarette, even one or two puffs, and also responded that he/she smoked 2 days during the past 30 days, an inconsistency was realized and this record was removed completely. Table 1 shows the overall response rate, original sample size, final sample size after removing all inconsistent records, and overall smoking prevalence. Among the six European countries, Latvia and Ukraine had the highest (36.6%) and lowest (11.7%) prevalence of adolescent smoking, respectively.

Countries	Original sample size	Final sample size	Overall response rate*	Smoking Prevalence
Croatia	4245	2426	90.1%	32.4%
Czech Republic	3799	2326	83.1%	20.4%
Slovakia	4504	2637	80.6%	23.7%
Latvia	3835	2015	82.2%	36.6%
Slovenia	2039	1212	67.2%	29.0%
Ukraine	3762	2094	91.6%	11.7%

Table 1: Survey sample size and response rate for different countries.

*Overall response rate = School response rate X Student response rate

Statistical Analysis

The participants were categorized into two groups based on their smoking status of cigarettes: current smoker and never smoker. If the participant smoked a cigarette at least one day during the past 30 days prior to the survey, he or she was considered as a current smoker, whereas if the participant has never tried smoking cigarettes, even a single puff, he or she was considered as a never smoker.

Logistic regression analysis was performed to quantify the effects of specific contextual factors on the likelihood of being a current smoker. The independent variables were categorized into six groups: demographic, family and peer, exposure to second-hand smoke (SHS), marketing and promotion, beliefs regarding smoking, and school-related factors. In detail, the demographic factors included age and gender. Family and peer related factors included: parental smoking status, discussion on the harmful effects of smoking by the family members, and smoking status of participants' close friends. Second-hand exposure included both exposure at home and public places. Marketing and promotions related factors included: owning products that have tobacco brand logo on that and free cigarette offers from the sales representatives. Beliefs-related factors included beliefs in the harmful effects of active and second-hand smoking and the association between attractiveness with smoking cigarettes. School-related factors included discussion on the harmful effects of smoking, observation of smoking activity of teachers and students inside the school premise, and the participants' future plan after finishing school studies. All the regression analyses were performed in IBM SPSS Statistics (version 23).

Results and Discussion

Descriptive Statistics

Table 2 summarizes the country-specific descriptive statistics stratified by gender. On average, the smoking prevalence among boys and girls were 34.0% (Standard Deviation = 12.1) and 35.2% (SD = 12.2), respectively. Approximately 17.0% (SD = 3.0) of students reported that both of their parents were smokers, 21.9% (SD = 5.7) reported that only father was smoker, and another 10.3% (SD = 3.3) reported that only mother was smoker. About 25.4% (SD = 4.7) of students had the experience of discussing the harmful effects of smoking with their family members. Exposure to second-hand smoke was reported 41.5% (SD = 14.2) at home and 63.1% (SD = 21.0) at public places, where Croatia had the highest exposure at both home (62.3%) and public places (83.9%). There were 67.1% (SD = 11.3) students reported that they had at least one close friend smoking. Further, a large percentage of students reported that they had products (e.g. T-shirts, sports bags) with tobacco brand logo and received free samples of cigarettes from sales in the past, with averages of 86% (SD = 3.9) and 93.2% (SD = 1.7), respectively. In particular, 59.8% (SD = 15.3) of students had seen teachers smoking at school premises, whereas 74.3% (SD = 14.9) had seen other students smoking. Almost 96.0% (SD = 2.7) of students expressed their wills to continue education after current program.

	Croatia			Czech Republic			Slovakia			Latvia			Slovenia			Ukraine		
	Boys (%)	Girls (%)	Total (%)	Boys (%)	Girls (%)	Total (%)	Boys (%)	Girls (%)	Total (%)	Boys (%)	Girls (%)	Total (%)	Boys (%)	Girls (%)	Total (%)	Boys (%)	Girls (%)	Total (%)
Parental Smoking																		
None	48.1	46.8	47.4	52.3	51.3	51.8	47.6	46.6	47.1	55.1	54.0	54.5	53.1	54.3	53.8	52.3	49.9	51.0
Both	18.8	21.6	20.3	18.1	19.6	18.9	18.6	18.5	18.5	14.2	15.7	15.0	17.8	15.7	16.7	12.8	11.6	12.1
Father only	17.5	17.8	17.6	18.5	20.3	19.4	25.1	26.3	25.7	20.8	20.9	20.9	14.7	17.5	16.2	29.1	33.0	31.3
Mother only	15.6	13.9	14.7	11.1	8.8	9.9	8.7	8.6	8.6	9.9	9.4	9.6	14.3	12.5	13.4	5.8	5.5	5.6
Exposure to SHS																		
Home	62.0	62.6	62.3	39.4	40.3	39.9	43.5	43.3	43.4	41.7	44.0	42.9	40.4	45.0	42.8	16.1	18.7	17.6
Outdoor	80.4	86.8	83.9	72.6	79.8	76.4	67.1	76.1	71.9	66.0	68.3	67.2	23.8	27.6	25.8	52.6	53.5	53.1
Have family discussion	20.2	20.6	20.4	24.2	29.2	26.8	25.2	26.1	25.7	31.5	33.4	32.5	28.1	24.2	26.0	19.5	21.7	20.7
Close friends' smoking status																		
None of them	27.0	22.5	24.5	27.9	26.8	27.3	24.2	25.7	25.0	29.1	26.9	28.0	40.0	39.6	39.8	54.0	52.2	53.0
At least one	73.0	77.5	75.5	72.1	73.2	72.7	75.8	74.3	75.0	70.9	73.1	72.0	60.0	60.4	60.2	46.0	47.8	47.0
Marketing and promotions																		
Own products with cigarette brand logo	86.9	88.2	87.6	82.1	87.6	85.0	80.5	82.9	81.8	82.6	88.3	85.7	89.8	95.7	92.9	79.5	85.7	83.0
Free cigarette from sales representative	88.6	92.4	90.6	89.9	93.8	92.0	92.9	97.0	95.1	92.7	96.7	94.8	91.6	95.0	93.4	91.2	95.2	93.4
School related factors																		
Saw teachers smoking at school premises	82.9	83.2	83.1	50.0	45.3	47.5	46.7	35.1	40.5	66.9	63.3	65.0	62.0	49.2	55.3	69.4	65.4	67.2
Saw students smoking at school premises	90.5	93.0	91.9	55.8	57.8	56.9	80.2	82.8	81.6	63.7	64.1	63.9	65.0	61.1	62.9	89.1	88.4	88.7
Want to continue education after school	91.5	91.7	91.6	99.0	99.3	99.1	92.1	96.2	94.3	95.5	97.5	96.6	92.1	98.3	95.4	96.5	99.2	98.0

Table 2: Sample characteristics stratified by gender for six European countries.

Logistic Regression Results

Table 3 displays the correlations between adolescents' smoking status and study factors. The findings are discussed in detail as follows.

Variables	Croatia		Czech Republic		Slovakia		Latvia		Slovenia		Ukraine	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Demographic												
Age††	1.57***	1.38 - 1.79	1.46***	1.25 - 1.69	1.31***	1.18 - 1.45	1.57***	1.37 - 1.8	1.49***	1.24 - 1.77	1.85***	1.48 - 2.3
Gender												
- Female†												
- Male	1.44***	1.1 - 1.89	0.5***	0.38 - 0.68	1.03	0.85 - 1.25	0.91	0.68 - 1.21	0.64**	0.43 - 0.97	1.09	0.75 - 1.6
Family and peer												
Parental smoking												
- None†												
- Both	1.84***	1.25 - 2.71	3.94***	2.44 - 6.35	2.31***	1.7 - 3.14	2.52***	1.65 - 3.85	2.08**	1.1 - 3.93	3.86***	2.32 - 6.43
- Father only	1.37	0.93 - 2.01	1.75***	1.18 - 2.59	1.83***	1.42 - 2.36	1.71***	1.21 - 2.43	1.37	0.74 - 2.53	1.08	0.68 - 1.7
- Mother only	1.73**	1.13 - 2.65	2.69***	1.59 - 4.57	2.59***	1.84 - 3.66	2.07***	1.21 - 3.52	2.9***	1.48 - 5.68	3.1***	1.56 - 6.18
Family discussion												
- No†												
- Yes	1.85***	1.33 - 2.56	1.7***	1.22 - 2.36	1.03	0.84 - 1.26	2.45***	1.75 - 3.45	1.85***	1.18 - 2.92	2.36***	1.36 - 4.08
Close friends' smoking status												
- None of them†												
- At least one	20.29***	9.67 - 42.59	81.83***	25.77 - 259.87	4.95***	3.82 - 6.4	65.34***	26.29 - 162.43	112.99***	26.96 - 473.48	22***	10.51 - 46.04
Exposure to SHS												
At home												
- Zero days/week†												
- One or more	1.94***	1.37 - 2.73	1.61**	1.11 - 2.33	1.3**	1.04 - 1.63	1.67***	1.23 - 2.28	1.78**	1.06 - 3	1.76***	1.15 - 2.69
At outdoor public places												
- Zero days/week†												
- One or more	9.99***	4.56 - 21.85	5.52***	3.64 - 8.38	2.41***	1.93 - 3.01	2.8***	2.01 - 3.9	1.91***	1.22 - 2.99	2.8***	1.81 - 4.34
Marketing and Promotions												
Own products with cigarette brand logo												
- No†												
- Yes	2.26***	1.51 - 3.39	4.48***	2.93 - 6.85	2.29***	1.72 - 3.05	2.7***	1.83 - 3.99	2.79**	1.21 - 6.45	2.79***	1.87 - 4.14
Free cigarette from sales representative												
- No†												
- Yes	2.16***	1.34 - 3.48	1.72*	0.97 - 3.04	1.18	0.74 - 1.9	2.03*	0.98 - 4.23	3.49***	1.4 - 8.7	2.5***	1.44 - 4.35
Beliefs regarding Smoking												
Believe that smokers are more attractive												
- Less attractive†												
- More attractive	9.18***	6.51 - 12.97	3.58***	2.66 - 4.82	0.83	0.62 - 1.1	0.87	0.6 - 1.27	1.89**	1.04 - 3.45	0.73	0.48 - 1.1
Believe that smoking is harmful to them												
- No†												
- Yes	0.5**	0.26 - 0.96	0.72	0.33 - 1.54	1.02	0.67 - 1.53	1.05	0.51 - 2.14	0.78	0.28 - 2.14	2.12*	0.97 - 4.63
Believe that SHS is harmful to them												
- No†												
- Yes	0.42***	0.26 - 0.68	0.74	0.44 - 1.24	0.63**	0.43 - 0.91	0.37***	0.21 - 0.65	0.6	0.32 - 1.13	0.85	0.47 - 1.56
School related factors												
Taught about dangers of smoking at school												
- No†												
- Yes	0.53***	0.39 - 0.73	0.96	0.62 - 1.49	1.07	0.86 - 1.33	0.92	0.65 - 1.29	0.97	0.62 - 1.51	0.34***	0.17 - 0.7
Witnessed teachers smoking at school premises												
- No†												
- Yes	1.52**	1.05 - 2.21	1.33*	1 - 1.78	0.98	0.8 - 1.21	1.36**	1.01 - 1.81	1.24	0.83 - 1.85	1.48*	0.96 - 2.29
Witnessed students smoking at school premises												
- No†												
- Yes	1.97**	1.01 - 3.87	1.06	0.79 - 1.43	1.33***	1.09 - 1.64	1.2	0.82 - 1.75	1.92***	1.17 - 3.13	1.25	0.55 - 2.82
Future plant after school education												
- Work†												
- Continue education	0.46***	0.29 - 0.75	0.17*	0.03 - 1.02	0.77	0.44 - 1.35	0.46**	0.24 - 0.88	0.4**	0.16 - 0.98	1.5	0.35 - 6.46

Table 3: Determinants of adolescent smoking - Binary Logistic Regression

OR: Odds Ratio; CI: Confidence Interval

†Reference group; ††Ordinal type variable; *P - value < 0.1; **P - value < 0.05; ***P - value < 0.01

Beliefs regarding Smoking

Three specific factors were examined regarding adolescents' beliefs: smokers were more attractive, active smoking was harmful to them, and second-hand smoking was harmful to them. Adolescents from Croatia, Czech Republic, and Slovenia who believed that smoking cigarettes would make them more attractive appeared to be more likely to smoke (OR: 9.18, 3.58, 1.89, respectively). As expected, adolescents who believed that second-hand smoke would harm them were less likely to be a smoker in all the six countries, but it was significant only in three countries: Croatia, Slovakia, and Latvia. Further, unexpectedly, the factor 'believe that active smoking was harmful to them' was significant only in two countries, Croatia and Ukraine, and the effects were opposite. Adolescents in Croatia who believed that active smoking had negative effects on health were less likely to smoke cigarettes (OR: 0.5), but in Ukraine, those who had the same belief were more likely of being smokers (OR: 2.12). Because smoking behavior is influenced by multi-dimensional factors (e.g. personal, social, cultural, and political), there is a need for future studies to conduct more comprehensive investigations for understanding how adolescents' beliefs affecting their smoking behavior in specific context.

School-related factors

Four school-related factors were examined: school-based discussion on the dangers of smoking, observation of smoking by teachers and students respectively, and adolescents' future plan to continue education. Discussing the dangerous consequences of smoking at school is expected to facilitate prevention of adolescent smoking behavior, and as expected, the odd ratios indicated a negative association between school discussion and adolescent smoking in all the six countries except Slovakia. However, the effect of such discussion was found statistically significant only in two countries: Croatia (OR: 0.53) and Ukraine (OR: 0.34).

The result showed that seeing teachers and students smoking inside the school premises was associated with a higher likelihood of adolescent smoking. Specifically, the effect by seeing teacher smoking had significant influence in four countries: Croatia, Czech Republic, Latvia, and Ukraine (OR: 1.52, 1.33, 1.36, and 1.48 respectively), while the effect by seeing student smoking had significant influence in three countries: Croatia, Slovakia, and Slovenia (OR: 1.97, 1.33, 1.92, respectively). Policies on tobacco-free environment have been enacted in several countries at various settings (e.g. Costa Rica, New Zealand, Austria) as a very important intervention to reduce the effect of peer smoking. This finding suggests a need for developing tobacco-free environment in those affected countries.

Meanwhile, it was interesting to note that adolescents who planned to continue their education after the current school program were less likely to smoke than those who planned to work. The effect of this factor was found significant in four countries: Croatia, Czech Republic, Latvia, and Slovenia (OR: 0.46, 0.17, 0.46, and 0.4 respectively).

Further, in addition to the above primary findings, we also summarize the effects of some well-established factors for these six European countries.

Demographic factors

Age remained a statistically significant factor across all the six countries. A positive association was identified between age and the likelihood of smoking among adolescents. The country-specific odds ratio ranged from 1.31 to 1.85. In previous work, Christophi, *et al.* found that adolescents aged 17 years or older were 15.5 times more likely to smoke cigarettes than the adolescents aged 12 years or younger [21]. Similar findings were also reported by other studies [10,11,22].

The effects of gender were mixed. Among the six countries, gender was found to be a significant factor in three countries: Croatia, Czech Republic, and Slovenia. In Croatia, boys were more likely to smoke than girls (OR: 1.44), whereas in the other two countries (Czech Republic, Slovenia), girls were more likely to smoke than boys (OR: 0.50, OR: 0.64). Previous studies have also shown mixed effects of gender on adolescent smoking behavior. Hublet, *et al.* (2006) and Otten, *et al.* (2009) found that girls in Norway, Sweden, Belgium, Austria, Finland, and Netherland were more likely to smoke than boys [11,23] while some studies concluded that boys had a higher prevalence of cigarette smoking than girls [9,10,24,25]. Meanwhile, studies also found that in some countries, for example US and Australia, gender's influence was not statistically significant in adolescent smoking [22,26].

Family and peer influence

The effects of parental and peer smoking were significant across all the six countries. Among all the studied factors, peer influence has been identified as the most influential risk factor associated with adolescent smoking. Similar conclusion was also acknowledged by prior studies [9,22,26-28]. Regarding parental smoking, our results demonstrated that mothers' smoking behavior was more influential to their children than fathers'. This finding might be explained by the parent-child relationship. Evidence shows that mothers usually have stronger bonding with children, who also have more dominant influence than fathers.

Family discussion about the harmful effects of smoking had an interesting outcome on adolescents' smoking behavior. In five countries, excluding Slovakia, the likelihood of smoking cigarettes was significantly higher among adolescents who had family discussion about smoking harmfulness compared to those adolescents who had not experienced such discussion (OR: 1.7 to 2.45). A study in Timor-Leste also showed similar findings [29]. One probable explanation might be that family members of the smoker adolescents are more concern about their health and discuss more frequently about the detrimental effects of smoking.

Second-hand smoke exposure

Adolescents who were frequently exposed to second-hand smoke (SHS) were more likely to smoke cigarettes compared to those adolescents who were not exposed to SHS. Previous studies also reported a positive correlation between SHS exposure and adolescent smoking [22,30]. In this study, we examined the influences of SHS exposure at home and at public places. The results showed that the effect of exposure to SHS at public places (OR: 1.91 - 9.99) was more influential than that at home (OR: 1.3 - 1.94). This finding suggests that public-place-targeted policies therefore may play a very important role in reducing the smoking prevalence in these countries, such as smoking bans at parks, restaurants, and school environment.

Marketing and promotions

Researchers have consistently implicated tobacco marketing activities as an important catalyst in the smoking initiation process [31]. Our finding revealed that involving in tobacco product promotions by obtaining items of clothing, sports bags, or other products with tobacco brand logo on that was a significant factor related to adolescent smoking in all the six countries (OR: 2.26 - 4.48). The other marketing factor, free cigarette samples from the sales representative was also a significant factor in the six countries (OR: 1.72 - 3.49), except Slovakia. Similar findings were also reported by Biener and Siegel [32]; their explanation of these effects was that promotional items and the images that they represented through advertising were particularly attractive to adolescents who were looking for identity. From the policing perspective, it is of great significance to better manage those marketing and promotion activities (e.g. images displayed on the products and free sample distribution) for young people.

Conclusion

The present study investigates specific contextual factors of adolescent smoking behavior in six European countries. In addition to the well-established risk factors, including age, peer smoking, parental smoking, exposure to second-hand smoke, and marketing and promotion, our findings reveal that different beliefs regarding smoking image and harmfulness, school-based discussion, teacher and peer smoking on school premises, as well as adolescents' future plan on education may also play a significant role in affecting adolescent smoking behavior. These findings provide valuable information toward gaining insights of the heterogeneity in adolescent smoking behavior across various countries and supporting development of more effective tobacco policies to prevent adolescent smoking.

Bibliography

1. WHO. "Tobacco Fact Sheet" (2017).
2. M Ezzati and AD Lopez. "Estimates of global mortality attributable to smoking in 2000". *Lancet* 362.9387 (2003): 847-852.
3. M Ng., *et al.* "Smoking prevalence and cigarette consumption in 187 countries, 1980-2012". *Journal of the American Medical Association* 311.2 (2014): 183-192.

4. J Mackay, *et al.* "The Tobacco Atlas. American Cancer Society". Atlanta, Georgia, USA (2006).
5. J Inchley and D Currie. "Growing up unequal: gender and socioeconomic differences in young people's health and well-being". Health Behaviour in School-Aged Children (HBSC) Study: International Report from 2014/2013.
6. U S Department of Health and Human Services. "Reducing the health consequences of smoking. 25 years of progress". A Report of the Surgeon General (1989): 140-161.
7. U S Department of Health and Human Services. "The health consequences of smoking-50 years of progress: a report of the Surgeon General". Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health (2014).
8. TW Valente, *et al.* "A comparison of peer influence measures as predictors of smoking among predominately Hispanic/Latino high school adolescents". *Journal of Adolescent Health* 52.3 (2013): 358-364.
9. E Rudatsikira, *et al.* "Prevalence and determinants of adolescent tobacco smoking in Addis Ababa, Ethiopia". *BMC Public Health* 7.1 (2007): 176.
10. H Van Minh, *et al.* "Effects of individual characteristics and school environment on cigarette smoking among students ages 13-15: A multilevel analysis of the 2007 Global Youth Tobacco Survey (GYTS) data from Vietnam". *Global Public Health* 6.3 (2011): 307-319.
11. R Otten, *et al.* "A Prospective Study of Perception in Adolescent Smoking". *Journal of Adolescent Health* 44.5 (2009): 478-484.
12. SM Boles and PB Johnson. "Gender, weight concerns, and adolescent smoking". *Journal of Addictive Diseases* 20.2 (2001): 5-14.
13. BF Piko and E Kovács. "Do parents and school matter? Protective factors for adolescent substance use". *Addictive Behaviors* 35.1 (2010): 53-56.
14. World Health Organization (WHO). "WHO report on the global tobacco epidemic 2017" (2018).
15. Z Harakeh, *et al.* "Association between personality and adolescent smoking". *Addictive Behaviors* 31.2 (2006): 232-245.
16. M. Morgenstern, *et al.* "Smoking in movies and adolescent smoking: cross-cultural study in six European countries". *Thorax* 66.10 (2011): 875-883.
17. ML Goniewicz and W Zielinska-Danch. "Electronic cigarette use among teenagers and young adults in Poland". *Pediatrics* 130.4 (2012): e879-e885.
18. R Hanewinkel and JD Sargent. "Exposure to smoking in internationally distributed American movies and youth smoking in Germany: a cross-cultural cohort study". *Pediatrics* 121.1 (2008): e108-e117.
19. CW Warren, *et al.* "Global youth tobacco surveillance, 2000-2007". *Morbidity and Mortality Weekly Report. Surveillance Summaries (Washington, DC 2002)* 57.1 (2008): 1-28.
20. T Erguder, *et al.* "Evaluation of the use of Global Youth Tobacco Survey (GYTS) data for developing evidence-based tobacco control policies in Turkey". *BMC Public Health* 8.1 (2008): S4.
21. CA Christophi, *et al.* "Main determinants of cigarette smoking in youth based on the 2006 Cyprus GYTS". *Preventive Medicine* 48.3 (2009): 232-236.
22. M Wen, *et al.* "Social contexts of regular smoking in adolescence: Towards a multidimensional ecological model". *Journal of Adolescence* 32.3 (2009): 671-692.

23. A Hublet, *et al.* "Smoking trends among adolescents from 1990 to 2002 in ten European countries and Canada". *BMC Public Health* 6.1 (2006): 280.
24. AS Muula. "Prevalence and determinants of cigarette smoking among adolescents in Blantyre City, Malawi". *Tanzania Journal of Health Research* 9.1 (2007): 48-53.
25. HY Hussain and BA Abdul Satar. "Prevalence and determinants of tobacco use among Iraqi adolescents: Iraq GYTS 2012". *Tobacco Induced Diseases* 11.1 (2013): 14.
26. AB Kelly, *et al.* "The influence of parents, siblings and peers on pre- and early-teen smoking: A multilevel model". *Drug and Alcohol Review* 30.4 (2011): 381-387.
27. ST Leatherdale, *et al.* "A multi-level analysis examining how smoking friends, parents, and older students in the school environment are risk factors for susceptibility to smoking among non-smoking elementary school youth". *Prevention Science* 7.4 (2006): 397-402.
28. R Otten, *et al.* "Parental smoking and adolescent smoking stages: the role of parents' current and former smoking, and family structure". *Journal of Behavioral Medicine* 30.2 (2007): 143-154.
29. D Ribeiro Sarmiento and D Yehadji. "An analysis of global youth tobacco survey for developing a comprehensive national smoking policy in Timor-Leste". *BMC Public Health* 16.1 (2015): 65.
30. D Griesbach, *et al.* "Adolescent smoking and family structure in Europe". *Social Science and Medicine* 56.1 (2003): 41-52.
31. Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. "Preventing Tobacco Use Among Young People: A Report of the Surgeon General". Atlanta, Ga (1994).
32. L Biener and M Siegel. "Tobacco marketing and adolescent smoking: more support for a causal inference". *American Journal of Public Health* 90.3 (2000): 407-411.

Volume 7 Issue 6 June 2018

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