A Multilevel Study of Smoking among Youths in School at Buriram Province

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Objective: *The purpose of this cross-sectional study was to determine status of smoking among youths in school and to identify both student-level and school-level factors on smoking.*
Material and Method: *A stratified two stage cluster sampling was employed to recruit 2,557 students in grades 10-12 and 30 teachers from 30 high schools in academic years 2010 in Buriram province, using a multilevel logistic analysis.*
Results: *The current smoking status was 9.0% overall, 19.0% and 1.3% for male and female respectively. The results from multilevel logistic analysis revealed that only 10.5% of variation in smoking was associated with difference in school characteristics. The following student-level factors entered into the multilevel logistic regression model according to their importance were self-efficacy-with the moderate and low self-efficacy having a higher risk of smoking compared with high (OR 8.76, 5.80)-alcohol drinking (OR 5.42). Males were more likely to smoke than females (OR 4.56), perceived benefit on non-smoking-with the moderate and low perception having a greater chance of smoking compared with the higher level of perception (OR 2.31, 1.93). School-level factors including type of school, health promoting school policy, student-teacher ratio, proportion of teachers who smoked and availability of cigarettes near the school were also taken into account, but were not related to the status of smoking among the students.*
Conclusion: *The present study confirmed that school factors had no significant relationship to smoking among youths. Strict smoke-free policy at school is recommended. School program should focus more on self-efficacy. Social marketing campaign/ education should focus on friends and family as non-smoking role models.*

Keywords: *Multilevel, Smoking, Youths in school*

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Smoking is one of the most important public health problems. It kills a third to a half of all those who do it and reduces the life expectancy of smokers by 15 years[1]. Smoking is not only harmful to smokers' health but also to those exposed to secondhand smoke, in enclosed spaces. Smokers and those exposed to secondhand smoke are at the same risk of smoking related diseases such as ischemic heart disease, cerebrovascular disease and chronic obstructive pulmonary disease[2]. Smoking is not only the cause of serious illness but also brings great economic and social losses. At present, there are more than one billion smokers worldwide and more than 80 percent live in low-and middle-income countries[3]. Smoking prevalence is rather high in Southeast Asia and the northern and western part of Europe. Nowadays, the tobacco epidemic is shifting to developing countries; 70 percent of the world or 1.1 billion smokers are in developing countries, with over 50 percent in Asia alone[4]. Out of 500 million smokers in Asia, the majority is male[5]. Smoking remains a greater problem in Asia and it is a preventable cause of deadly disease.

The prevalence of smoking in Thailand is a decreasing trend. It has decreased from 32.0% in 1991 to 21.2% in 2007. The decreasing trend that is remarkable in 2006-2007 is that the number of female smokers decreased at twice the amount as the male. However among the young, the uneducated and those residing in rural areas of Northeastern Thailand there has been an increase in the prevalence of smoking when compared with other groups of the population. Buriram

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is one of the provinces located in the southern part of Northeastern Thailand. Even though the prevalence of smoking among those aged 15 years and above declined from 27.37% in 1991 to 21.98% in 2007, prevalence of smoking in this province is still higher than that of the country as a whole[6]. Prevalence of smoking in Thailand among those 15 years and above in 2009 was 23.7% and among those who were 15-24 years 19.8%[7]. Understanding student-level factors and school-level factors as related to smoking among youth of this province may help authorities involved in planning and implementing an intervention program on preventing youth from smoking.

Smoking among the youth is of great concern. At present, laws on smoking have been passed and numerous anti-smoking campaigns have taken place, yet a greater number of youth still smoke. Therefore, understanding different bodies of knowledge related to smoking among youth is crucial to enable family members, teachers and health workers a better understanding of the youth. Having more close friends and family members who smoke, accessibility of tobacco or cigarettes and anti-smoking campaign information, age, sex, alcohol drinking, knowledge of the effect of smoking on health, perceptions and self-efficacy were associated with smoking status[8-14]. In addition to these student-level predictors, the environment at the school that the youth attend such as type of school, health promoting school policy, student-teacher ratio, proportion of teachers who smoke and availability of cigarettes near school were associated with smoking[15-18]. Multilevel modeling is a statistical method that recognizes a hierarchical structure of the unit of analysis which for the purposes of the present study was ordered according to a scale ranging from the individual student to the school levels. Its advantage is that not only does it accommodate the hierarchical nature of data and correct the estimated standard error to allow for clustering of observations within unit[19], but it also allows the identifications of clustering in the outcome.

Objective

The objectives of this cross-sectional study were to determine the status of smoking among youths in school and to identify student-level and school-level factors associated with smoking in Buriram province.

Material and Method

A cross-sectional descriptive study was conducted to assess student-level factors and school-level factors that may influence smoking among high school students in Buriram Province. At the student-level, the predisposing factors were general characteristics (age, sex and alcohol drinking), knowledge on health effects of smoking and smoking laws, perceptions (perceived severity of effect of smoking on health, perceived susceptibility to smoking related diseases, perceived benefits of non-smoking and perceived barriers to quitting cigarettes) and self-efficacy, enabling factors namely accessibility to cigarettes and effect of price on smoking and accessibility of anti-smoking information such as that in the mass media and reinforcing factors, namely proportion of friends and family smoking. School-level factors included type of school, health promoting school policy, student-teacher ratio, proportion of teachers who smoked and cigarette shops near school.

Students who were studying in grade 10-12 and teachers representative in all high schools of Buriram Province in the academic year 2010 were recruited into the present study by employing a stratified two-stage cluster sampling. The schools were grouped according to whether they were secondary and vocational schools. Each group was comprised of public and private schools. Therefore, 2,557 students who were studying in grades 10-12 in 30 high schools in Buriram Province in the academic year 2010 were included in the present study.

Two forms of self-administered questionnaire were created, one for students and one for teachers, the teachers representing the school-level for the purposes of the present study. Questions for students were constructed based on the PRECEDE-PROCEED Model and Global School-Based Student Health Survey, while self efficacy (SEQ-12) was employed to measure smoking refusal self-efficacy using 12 items, derived from a validated instrument[20]. There were 6 parts: 1) student characteristics *i.e.* age, sex, daily allowance, alcohol drinking, 2) smoking status and smoking behavior, 3) accessibility of cigarettes and anti-smoking information, 4) knowledge on health effect and law, 5) perceptions included perceived severity, perceived susceptibility, perceived benefit and perceived barrier and 6) self-efficacy. A score of one was assigned to each question for a correct answer on the knowledge sections. For perceptions and self-efficacy a five-point Likert scale of measurement was applied. Then total scores on knowledge, perceptions and self-efficacy were obtained and classified into 3 groups-good, fair and poor for knowledge[21] and high, moderate and low for perceptions and self-efficacy[17].

The reliability of knowledge, perceptions and self-efficacy instruments were 0.61, 0.95 and 0.98, respectively. Questions for teachers included type of school, health promoting school policy, number of teachers and students in the school, number of teachers who smoked and whether shops selling cigarettes were near the school.

The approval of ethical considerations from the Faculty of Public Health, Mahidol University was obtained before implementing the present study (document proof number MUPH2010-098 dated May 14th 2010). The data were collected by the researcher and assistants after training on data collection procedures and maintaining quality of data control at the site of data collection.

Data editing was started in the field and continued after data entry. The first steps of the analysis were exploratory data analyses and creating cross tabulations, which facilitated the definitions of categorical variables. Descriptive analyses were conducted mainly to understand the data. Univariate analysis was used to screen variables and multilevel logistic regression with random intercept was performed to predict youth smoking. The two-level model with a binary response follows: Y_{ij}, is whether the student currently smokes cigarettes or not, for i^{th} student from j^{th} school. It is a random sample from Bernoulli distribution which $\pi_{ij}(Y_{ij} = 1) = \pi_{ij}(Y_{ij} = 0) = 1 - \pi_{ij}$. Where π_{ij} is probability of smoking and student-level exploratory variable x_{ij} and school-level explanatory variable Z_j. The multilevel logistic analysis with random intercept was performed as follows[19,22,23].

1. A random intercept (null) model for the school level or unconditional random-effect model (null model) with no independent variables was fit to obtain total variation and baseline deviance. Intra-class correlation and between school variance were computed. The random intercept model was $1n\left[\frac{\pi_{ij}}{1 - \pi_{ij}}\right] = \gamma_{00} + \mu_{0j} + e_{ij}$, where γ_{00} is the regression intercept, μ_{0j} and e_{ij} are the residual at school and student level. However, this model provided an intra-class correlation (ρ), $\rho = \frac{\sigma^2_{\mu 0}}{\sigma^2_{\mu 0} + \sigma^2_{eij}}$ where $\sigma^2_{\mu 0}$ is the variance of school level residual μ_{0j}, and $\sigma^2_{eij} = \frac{\pi^2}{3}$ is the variance of student level residual e_{ij}[24].

2. Then a random intercept model was developed. All student-level variables or student-level independent variables were added one by one to the model as a fixed effect by two-level logistic regressions. Non-significant variables determined by deviance were removed until only significant variables that show significant improvement of fit remained in model. The model was $1n\left[\frac{\pi_{ij}}{1 - \pi_{ij}}\right] = \gamma_{00} + \gamma_{p0}x_{pij} + \mu_{0j} + e_{ij}$, where x_{pij} are the p explanatory variables at the student-level.

3. A random intercept model was developed where both student-level variables and school-level variables or school-level independent variables as fixed effect, were added one by one to the model as fixed by two-level logistic regressions. The model was $1n\left[\frac{\pi_{ij}}{1 - \pi_{ij}}\right] = \gamma_{00} + \gamma_{po}x_{pij} + \gamma_{oq}z_{qj} + \mu_{0j} + e_{ij}$, where z_{qj} are the q explanatory variables at the school-level.

4. A cross level model was added when cross level interactions between explanatory school-level variables and those student-level variables were obtained. The model was $1n\left[\frac{\pi_{ij}}{1 - \pi_{ij}}\right] = \gamma_{00} + \gamma_{po}x_{pij} + \gamma_{oq}z_{qj} + \gamma_{pq}z_{qj}x_{pij} + \mu_{pj}x_{pij} + \mu_{0j} + e_{ij}$.

In each step, the likelihood ratio test (Deviance) was used to compare models. This test compared the log likelihood of two models and tested whether they were significantly different at 5% level. If there is a statistically significant difference between the models, the model with the lowest log likelihood (close to zero) provides a better fit.

Results

Of a total of 2,557 students, 9.0% were smokers. Their age ranged from 15 to 19 years with an average of 16.3 years. There were slightly more females (56.6%) than males (43.4%). Alcohol drinking was reported among 37.0%. Knowledge of smoking laws was better than the knowledge on the effects of smoking on health. Only 12.9% were at a good level of knowledge regarding health effects and 56.5% were at a good level regarding knowledge of smoking laws. Among the four components of perception on smoking, perceived benefit of quitting smoking was better than perceived barriers, since 72.5% were at the high level of perceived benefit and 62.2% were at a lower score of perceived barriers. About half (55.8%) were at the high level of perceiving that smoking could make them more susceptible to health risks and only 41.7% were at the high level of perceiving that smoking may cause more serious health problems.

Regarding self-efficacy, an ability of youth to prevent him/her self from smoking, only 7.0% were at the level of low self-efficacy and 67.9% were at the high level. Considering accessibility of tobacco products, a majority (93.8%) responded that cigarettes were easy to access. Some students (41.1%) reported that a change in the price of cigarettes would affect their smoking. A majority (94.6%) had seen a non-

smoking campaign. About half of the students (50.7%) were from smoking families and while students were asked about whether they had close friends who smoked, 67.2% had non-smoking close friends (Table 1 and 2).

Among the 30 schools recruited into the present study, 83.3% were secondary high schools and the rest were vocational schools. Half of the secondary and vocational schools in Buriram province participated in the health promoting school health program. Teacher's workload was deduced from the student-teacher ratio and in more than half of the schools (53.3%) the teacher was responsible for more than 20 students. Considering current smoking status of teachers in each school, 76.7% had at least one teacher who smoked. According to 66.7% of school representatives, cigarettes were accessible at shops near the schools. Details are shown in Table 3.

The results of multilevel analysis are presented in Table 4. Model 1-3 presented an investigation of the association between student and school factors and current smoking status of students. The model fitting process began with a null model. This was the first multilevel logistic regression (Model 1) which was fit with no variables; this model provided an intra-class correlation (ICC) indicating that 10.5 percent of the variation in smoking status is due to the differences among schools. Model 2 shows the effect of student characteristics (student-level), model 3 shows the effect of both student and school characteristics (school-level) on smoking status of students. The variables presented in model 2 were student characteristics significantly related to current smoking status, namely self-efficacy, proportion of friends smoking, sex, perceived benefit on smoking cessation, alcohol drinking, proportion of family smoking and age. In model 3, school characteristics, namely student-teacher ratio, type of school, cigarette shop near school, proportion of teachers smoking and health promoting school policy were added to test whether they were significantly related to the smoking status. Neither of the school characteristics added to the model were significantly related to smoking status of students. Comparisons of goodness of fit statistics between model 2 containing only student-level factors and model 3 containing student-level factors in model 2 and school-level factors revealed a non-significant change in the-2Log likelihood statistics 1.7 with degree of freedom 5 and p-value = 0.78. Goodness of fit statistics and the non-significant parameters estimate of school-level indicated no reason to retain school characteristics in the model. Therefore, the model that can best explain the relationship between the set of exploratory variables and smoking status was model 2 which contained only student-level factors. From Model 2, odds ratio for each of the student-level factors along with its corresponding 95% confidence intervals are presented in Table 5. It shows that student characteristics had more effect on smoking status in youths than school

Table 1. Number and percentage distribution of predisposing factors among 2,557 students

Predisposing factors	Number	Percent
Age in years		
15	678	26.5
16	742	29.0
17	763	29.8
18	347	13.6
19	27	1.1
Mean ± SD (years)	16.3 ± 1.0	
Sex		
Female	1,447	56.6
Male	1,110	43.4
Alcohol drinking		
No	1,611	63.0
Yes	946	37.0
Knowledge on health effect		
Good	74	2.9
Fair	1,030	40.3
Poor	1,453	56.8
Knowledge on law		
Good	1,445	56.5
Fair	650	25.4
Poor	462	18.1
Perceived severity		
High	1,067	41.7
Medium	1,467	57.4
Low	23	0.9
Perceived susceptibility		
High	1,426	55.8
Medium	1,114	43.6
Low	17	0.7
Perceived benefit		
High	1,855	72.5
Medium	573	22.4
Low	129	5.1
Perceived barrier		
Low	1,590	62.2
Medium	805	31.5
High	162	6.3
Self-efficacy		
High	1,737	67.9
Medium	641	25.1
Low	179	7.0

Table 2. Number and percentage distribution of enabling factors and reinforcing factors among 2,557 students

Factors	Number	Percent
Enabling factors		
Accessibility of cigarettes		
Easy	2,398	93.8
Uneasy	159	6.2
Effect of increasing cigarette price		
Yes	1,050	41.1
No	1,507	58.9
Ever received information from anti-smoking campaign		
No	139	5.4
Yes	2,418	94.6
Reinforcing factors		
Proportion of family smoking		
None	1,262	49.3
0.1-20.0%	412	16.1
20.1-50.0%	805	31.5
> 50.0%	78	3.1
Proportion of friends smoking		
None	1,719	67.2
0.1-20.0%	122	4.8
20.1-50.0%	260	10.2
> 50%	301	11.8

Table 3. Characteristics of 30 schools

School characteristics	Number	Percent
Type of school		
Secondary school	25	83.3
Vocational school	5	16.7
Health promoting school program		
No	15	50.0
Yes	15	50.0
Student-teacher ratio		
≤ 20 per person	14	46.7
> 20 per person	16	53.3
Proportion of teachers smoking		
None	7	23.3
1.0-4.9%	8	26.7
5.0-9.9%	11	36.7
> 10.0%	4	13.3
Cigarette shop near school		
No	10	33.3
Yes	20	66.7

environment in the present study. Students who were at a moderate and low level of self-efficacy were more at risk of being smokers when compared with those at a high level (OR 8.76, 5.80 with 95% CI 4.62-16.62, 3.51-9.58 respectively). Alcohol drinking students were more likely to smoke, 5.42 times more than the non-drinkers (95% CI: 3.54-2.28). Considering the sex of students, males smoked 4.56 times more than females (95% CI: 2.62-7.94). Students who were at low and moderate level of perceived benefit on smoking cessation were more likely to smoke than those at a high level (OR 2.31, 1.93 with 95% CI 1.19-4.44, 1.26-2.98 respectively). The older age group was more likely to smoke. An increase of the risk of smoking was about 20 percent per 1-year increase in the age of student (OR 1.20 and 95% CI: 1.019-1.424). Proportion of friends and family members who smoked, for 1% increase in proportion of friends and family smoking the odds of smoking increased nearly 2% (OR 1.02: 95% CI: 1.012-1.022 of each variable).

Discussion and Conclusion

Prevalence of smoking among youths in the present study was 9.0%, which is lower than a national survey[7]. It can be explained that the present study was conducted among youths in schools, so they were younger than the median age for smokers. However, almost all types of schools in the present study have a non-smoking policy as well as an anti-smoking campaign and half of the schools have implemented a health promotion program, which may be another factor contributing to the lower prevalence

Table 4. Parameter estimates in multi-level logistic model

Effect	Estimate		
	Model 1	Model 2	Model 3
Fixed effect			
Intercept	-2.459	-9.833	-9.629
Student-level			
Self-efficacy (High*)			
Moderate		1.758	1.761
Low		2.170	2.180
Proportion of friend smoking		0.017	0.017
Sex (Female*)			
Male		1.517	1.483
Sex (Female*)			
Male		1.517	1.483
Perceived benefit (High*)			
Moderate		0.659	0.659
Low		0.837	0.813
Alcohol drinking (No*)			
Yes		1.689	1.692
Proportion of family smoking		0.016	0.016
Age in year		0.186	0.183
School-level			
Student-teacher ratio (20 per person*)			
> 20 per person			0.105^{ns}
Type of school (Secondary school*)			
Vocational school			-0.021^{ns}
Cigarette shop near school (No*)			
Yes			-0.237^{ns}
Proportion of teacher smoking			-0.019^{ns}
Health promoting school (Yes*)			
No			0.177^{ns}
Random effect			
$\sigma^2_{\mu 0}$	0.387	0.211	0.175
Intra-class correlation (ICC)	0.105	0.060	0.050
-2Log Likelihood	1,506.844	843.557	841.861

*reference group, ns = non-significant, $\sigma^2_{\mu 0}$ = variance between schools

of smoking among youths in the present study. Since all secondary and vocational schools in Buriram province are rather similar in implementing and controlling cigarette smoking in both teachers and students, school factors were therefore not related to the current smoking of this population in multilevel logistic analysis. Only 10.5 percent of the variation in current smoking status was due to the differences among schools. It does not mean that school context and school environment do not play an important role in smoking among their students. Schools should keep the smoke free policy strictly according to the tobacco control law. From a two-level logistic analysis, student-level and school-level factor in relation to smoking status, school-level was not as important as student-level. The present study showed that self-efficacy in resisting or refusing smoking significantly prevents students from smoking. This finding is similar to other studies[8,25] that support several behavioral theories such as social cognitive theory and theory of planned behavior. Alcohol drinking was the second student characteristic included in the model. Drinkers were more likely to smoke cigarettes at a rate of about 5 times higher than non-drinkers. Smoking and drinking are highly correlated. Youth or adolescent tobacco use and alcohol use share a number of socio-cultural risk factors-

Table 5. Odds ratio and confidence interval of factors related to smoking status

Variables	β	S.E.	OR	95% CI	p-value
Self-efficacy (High*)					
Medium	1.76	0.26	5.80	3.51-9.58	< 0.001
Low	2.17	0.33	8.76	4.62-16.62	< 0.001
Alcohol drinking (No*)					
Yes	1.69	0.22	5.42	3.54-8.28	< 0.001
Sex (Female*)					
Male	1.52	0.28	4.56	2.62-7.94	< 0.001
Perceived benefit (High*)					
Medium	0.66	0.22	1.93	1.26-2.98	0.003
Low	0.84	0.33	2.31	1.20-4.45	0.012
Age in years	0.19	0.09	1.20	1.02-1.42	0.029
Proportion of friends smoking	0.02	0.002	1.02	1.01-1.02	< 0.001
Proportion of family smoking	0.02	0.004	1.02	1.01-1.02	< 0.001

*reference group

including family and peer influences, demographics, advertising, economics and alcohol and tobacco availability and are associated with adolescents' initial and continued tobacco and alcohol use. Sex of students was significantly associated with smoking status. It was revealed from the present study that males of 15-19 years of age are about 5 times more likely to smoke than females of the same age group. Smoking is generally more prevalent among males than female[26,27]. Cultural and social norms especially in the northeastern region of Thailand may contribute to the low smoking prevalence among females. A perceived benefit of non-smoking was significantly related to smoking status when controlling for other student characteristics. Perceived benefits of not smoking was also found in previous studies[28,10]. Youths try their first cigarette as early as 8 years of age. For one year increase of age, the odds of smoking increase by 20 percent. This finding was supported by previous study that age was related to smoking behavior[14,29]. Older students had a higher proportion of smoking, which may be due to the early onset of smoking and another reason is a general conviction that smoking helps ease stress and helps them to forget about their problems. Friends and family have a great influence on making the decision to become a smoker and from the current study it was found that a 1 percent increase in the proportion of friends or family who smoke increases the odds of the students becoming smokers nearly 2 percent. Other observations confirm this fact[26,27] that friends have a great influence on making the decision to become a about smoker. But the most frequent reason for the trying one's first cigarettes was curiosity and the natural characteristic of youths that they are in need and in search of acceptance by their friends and a sense of belonging to a group, thus youths tend to do whatever the friends in the group do to show that they are part of the group. Moreover, there is the influence from family members in which youths imitate their parents' smoking. This fact underlines once again the important role of the family in the development of health behaviors of the child. Together, these findings demonstrate that family and peers exert similar influences on adolescent smoking and drinking. Among youths, parent-youth relationship factors-such as limited or poor quality familial attachments, low levels of parental supervision and strictness, inadequate parental monitoring and lack of parental affection, concern and involvement-have also been related to smoking. Data from the Adverse Childhood Experiences Study have further shown that any one of eight childhood stressors, including verbal, physical, or sexual abuse, significantly increases both a youth's risk of smoking by age 14 and continued tobacco use as an adult. In conclusion, the most important factors contributing to smoking status of youths are characteristics of youths themselves and social behaviors (friends and family). The decision to become a smoker seems to be dependent on what kinds of things an individual wants to do with his or her life. Thus, in addition to school based anti-smoking policies, those directed at individuals are needed.

Suggestions

1. At the policy level, although school factors

were not related to student smoking status, schools should keep the smoke free policy strictly according to the tobacco control law. Moreover, student's self-efficacy and perceived benefit are the major factors that are related to student smoking; the school program should focus and strengthen self-efficacy and perception of benefit of smoking cessation

2. School should set up a special program/ activity for students *e.g.*, youth groups against tobacco or friends help friends groups and groups for parents to help them be good models for the students.

3. Social marketing campaigns should focus on friends and family as non-smoking role models for youth.

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Potential conflicts of interest

None.

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การวิเคราะห์พหุระดับการสูบบุหรี่ของวัยรุ่นในโรงเรียน จังหวัดบุรีรัมย์

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วัตถุประสงค์*: การศึกษาภาคตัดขวางนี้มีวัตถุประสงค์เพื่อประเมินการสูบบุหรี่ของเยาวชนในสถานศึกษา ตลอดจนปัจจัยระดับนักเรียนและระดับโรงเรียนที่มีความสัมพันธ์กับการสูบบุหรี่*

วัตถุและวิธีการ*: สุ่มตัวอย่างนักเรียนมัธยมศึกษาชั้นปีที่ 4-6 และ อาชีวศึกษาชั้นปีที่ 1-3 จำนวน 2,557 คน และอาจารย์ จำนวน 30 คน ในปีการศึกษา พ.ศ. 2553 ของจังหวัดบุรีรัมย์ ด้วยวิธีการการสุ่มตัวอย่างแบบชั้นภูมิสองขั้นตอน และใช้การวิเคราะห์พหุระดับ*

ผลการศึกษา*: เยาวชนในสถานศึกษา 9.0% สูบบุหรี่ในปัจจุบัน การสูบบุหรี่ในเยาวชน ชาย และ หญิง 19.0% และ 1.3% ตามลำดับ ลักษณะโรงเรียนมีความผันแปรต่อการสูบบุหรี่ 10.5% ปัจจัยในระดับนักเรียนที่สำคัญต่อการสูบบุหรี่ตามลำดับ คือ ความรู้สึกมีคุณค่าในตนเองในระดับต่ำและปานกลางมีความเสี่ยงต่อการสูบบุหรี่มากกว่าเมื่อเทียบกับระดับสูง (OR 8.76, 5.80) การดื่มเครื่องดื่มแอลกอฮอล์ (OR 5.42) เพศชายมีแนวโน้มที่จะสูบบุหรี่มากกว่าเพศหญิง (OR 4.56) การรับรู้ถึงประโยชน์ของการไม่สูบบุหรี่ในระดับต่ำและปานกลางมีโอกาสที่จะสูบบุหรี่สูงกว่าระดับสูง (OR 2.31, 1.93) ขณะที่ปัจจัยระดับโรงเรียน ได้แก่ ชนิดของโรงเรียน นโยบายโรงเรียนส่งเสริมสุขภาพ อัตราส่วนนักเรียนต่อครู ครูที่สูบบุหรี่ และการมีร้านขายบุหรี่ใกล้โรงเรียนไม่มีความสัมพันธ์กับการสูบบุหรี่*

สรุป*: ถึงแม้ปัจจัยระดับโรงเรียนจะไม่มีผลต่อการสูบบุหรี่ แต่ยังคงต้องเน้นนโยบายโรงเรียนปลอดบุหรี่ โปรแกรมโรงเรียนควรจะมุ่งเน้นในการพัฒนาให้นักเรียนถึงความรู้สึกในคุณค่าของตนเอง สำหรับโปรแกรมทางสังคมควรเน้นเกี่ยวกับเพื่อนและครอบครัวในการเป็นแบบอย่างของการไม่สูบบุหรี่*
