

**Predictors of  
Adolescents' Future Smoking Intention  
in Korea**

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**국제보건학과**

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**이 논문을 보건학석사 학위논문으로 제출함**

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**이성규의 보건학석사 학위논문을 인준함**

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# **ABSTRACT**

## **Background**

Cigarette smoking is a leading cause of morbidity and mortality in the world. It has been more important to protect adolescents from smoking rather than to conduct an intervention for adult smokers. To prevent adolescents' smoking, school-based programs have been widely developed and evaluated. However, studies to see whether the programs were effective or not produced mixed results. We proposed a prediction model of adolescents' future smoking intention to identify a high risk group most probable to smoke in the future. With the model, more effective interventions targeting high risk youth groups could be implemented.

## **Objective**

The study was to develop a prediction model for future smoking intention among adolescents, whose age ranged from 13 to 15 year olds in Korea. We explored the

characteristics of adolescents at high risk of initiating smoking and estimated the prediction model' s explanation level through ROC assessment.

## **Methods**

We used the data from the 2004 Korea Global Youth Tobacco Survey (GYTS) and performed chi-square tests and logistic regression analysis to identify relevant variables associated with adolescents' intention for the future smoking. ROC assessment was applied to estimate the explanation level of the Prediction Model.

## **Results**

The identified five determinants for the intention of the future smoking were having previous experience of smoking, having parents who were smokers, having an object with a cigarette brand logo, having closest friends who were currently smokers and having an intention of smoking from a friends' offer. These determinants were explaining 88% in the prediction model.



## **Conclusion**

According to the previous studies, smoking prevention programs in schools are more effective for adolescents than for adults. In recent years, school-based smoking prevention programs have received considerable attention from the health promotion field.

Based on the results, five determinants were identified to predict the future smoking for Korean adolescents. With the predictors of adolescents' intention for the future smoking, the schools in Korea would be able to identify the high risk group for the future smoking instead of implementing a program for all students. A smoking prevention program could be more focused on the high risk group and be more effective.

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**KEY WORDS:** predictors of adolescents' smoking, future smoking intention, smoking prevention programs

## INTRODUCTION

The prevalence of adolescents' smoking in Korea is one of the highest in the world and has steadily increased until 2000(The Korean Association of Smoking and Health, 2004). According to '2006 Adolescent Statistics' from the Korean National Statistical Office, after reaching 35.3% in smoking prevalence among male high school students in 1997 and 10.7% in 2000 for female high school students, fortunately the prevalence has started to decline. The number of male high school smokers has decreased from 35.3% in 1997 to 15.7% in 2005 and the smoking prevalence among female high school students has dropped from 10.7% in 2000 to 6.5% in 2005. However the downward trend has been slowed down since 2004, and in middle school students, the smoking prevalence has started to rise from 2.4% in 2004 to 4.2% in 2005 in males, and from 1.7% to 3.3% in females (The Korean National Statistical Office, 2006). The decline in the smoking rate among adolescents was in part due to the National Health Promotion

Act enacted by Korean government in 1995 on smoking that proclaimed public buildings including schools as tobacco-free places, banned cigarette sales to the minors, restricted direct tobacco advertisements and required a warning label on each cigarette package(Kim HJ et al., 2000). However, despite of the effort of Korean government, the smoking prevalence of the middle school students among 13 to 15 has risen again since 2004.

People who initiated smoking early in life are at greater risk of serious health problems(U.S. Department of Health and Human Services, 1989). According to scientists, one third of those who started smoking as an adolescent would die due to smoking related disease(CDC, 1996). Many researchers reported that adolescent smoking might be a major cause for health problems in later life and also associated with social deviant behaviors, such as drug abuse and anti-social behavior (Graunbaum JA et al., 2000; Miller JW et al., 2007).

One of the most common approaches to reduce smoking rates among adolescents is school-based smoking prevention education. Smoking prevention programs have developed and

became one of the major interests in health promotion. Smoking is highly addictive and has relatively high relapse rate although smokers tried to quit. Most smokers have begun smoking as a teenager. Effective smoking prevention should start from adolescence. It might be more effective and easier for educators to intervene early rather than treating the already addicted smokers later(Fritz DJ, 2000). However, to date, school-based smoking prevention programs have produced mixed results, reported as being effective and other not effective at all. The previous studies reported that the reasons for ineffective programs were due to ineffective or inappropriate teaching method, duration and size of classes for a program(Park E, 2006). Other studies said it might be more effective if educators target high risk group for smoking.

This study was to identify the predictors in future smoking intention among adolescents. Once predictors were identified, educators could design, implement, and evaluate smoking intervention programs for adolescents and contribute to reduce the smoking rate of the middle school students.

According to the ASE model by De Vries and Mudde (De Vries and Mudde, 1998), future health related behaviors including future smoking habit were closely related to current behavioral intention. The current behavior, on the other hand, was determined by past behavioral intention. Behavioral intention regarding a behavior in the future was solely determined by three types of psychosocial mediating factors: Attitudes, Social influences and Self-efficacy. The ASE model has been used in cross-sectional and longitudinal studies to explain adolescents' smoking uptake (De Vries et al., 1995), adolescents' future smoking intention (Markham W.A et al., 2004) and adults' smoking cessation (Willemsen et al., 1996; De Vries & Mudde, 1998). However, according to Markham W.A et al., the strategies to reduce adolescents' smoking based on the ASE model might not be appropriate for all adolescents (Markham W.A et al., 2004).

Using the data from the Global Youth Tobacco Survey (GYTS), carried out among Korean middle school students aged from 13 to 15 in 2004, a cross sectional study was to **a)** seek determinants associated with future smoking intention after 5

years from the date of interview among adolescents, **b)** develop a Prediction Model to identify a high risk group in current non-smoking students and **c)** estimate the Prediction Model' s explanation level with ROC assessment.

# **METHODS**

## **Sample description**

The 2004 Korea GYTS was a cross-sectional school-based survey, which employed a two-stage cluster sample design to produce a nationally representative sample of middle school students aged 13 to 15. For the sampling frame, seventy-five schools were selected and grades 1, 2, and 3 were chosen with 40 or more students in each class.

The first-stage sampling frame included of grades 1, 2, and 3 in all the schools. Schools were selected with a probability proportion to school enrollment size. The second sampling stage was consisted of systematic equal probability sampling (with a random start) of classes from each school that participated in the survey. All classes in the selected schools were included in the sampling frame and all students in the selected classes were eligible to participate in the survey. The overall response rate was 87.66%, with 92.0% (69 of the 75 sampled schools) school response rate and 95.28% (5,940 of

the 6,234 sampled students) student response rate. A comprehensive description of the GYTS methodology has been described elsewhere (Warren CW et al., 2000; Global Tobacco Surveillance System Collaborative Group, 2005).

### **Data collection**

Survey procedures were designed to protect the students' privacy by allowing for anonymous and voluntary participation. The self-administrated questionnaire was used. Students recorded their response directly on an answer sheet that could be scanned by a computer. The questionnaire contained 55 multiple-choice questions, which made up the core part of GYTS. In addition, 30 more questions were added in Korean version. Approximately 40 minutes were allowed for the completion of the questionnaire.

For the purposes of the GYTS in Korea, the country was divided into regions and each region had a regional coordinator. The regions (the regional coordinator and main affiliation) were as follows: Seoul city (Sun Ha Jee, Yonsei University), Jeolla-province (Soyoun Ryu, Chosun University), Kyung-sang



province(Hwangkyun Ryu, Kosin University), and Kangwon province(Choi, Kyungbook University). During the month of September 2004, there were training sessions for each region where field research assistants were instructed on the standard procedure to assure the comparability in data collection. Supporting letters from the Ministry of Health and Ministry of Education were sent to all the principals of the 75 selected schools, inviting them to participate in the GYTS. All 75 schools agreed to participate. Data collection was carried out from October till November in 2004. 10 trained coordinators were administering the questionnaire.

## **Study design**

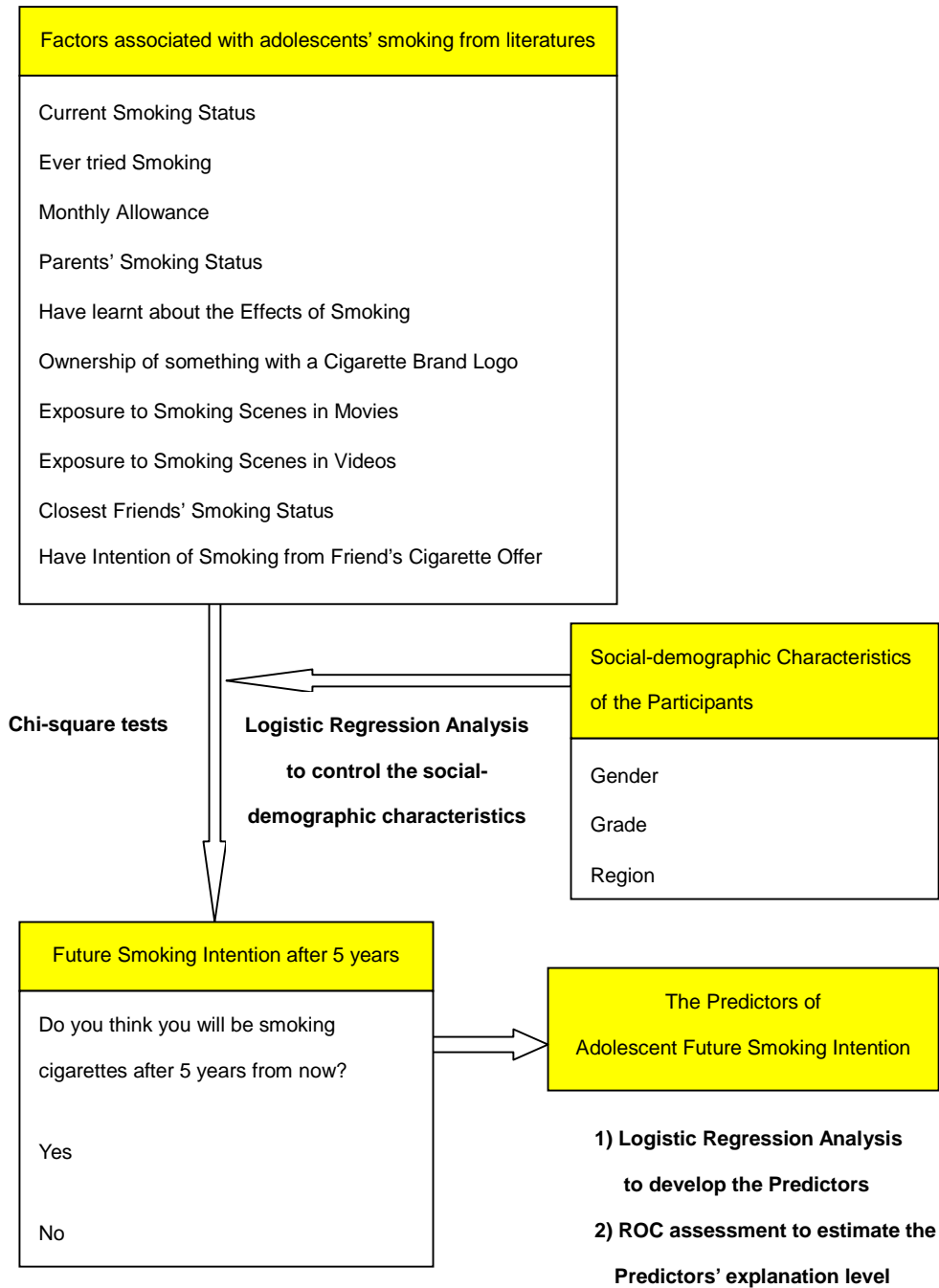
In order to find out the associated determinants with adolescents' future smoking intention, our current study hypothesized and gathered on 10 independent factors associated with 'adolescents' smoking' , identified from the literatures(Kemppainen U et al., 2006; Rice VH et al., 2006; Miller CH et al., 2006; Zhang L et al., 2005; Dalton Ma et al.,

2006; Kim H et al., 2006; Distefan JM et al., 1999; Jonathan B et al, 2006).

Smoking intention after 5 years was selected a dependent factor from the questionnaire. Using the results of the questionnaire, the study estimated the association between the independent factors and the dependent factor. The study then focused on the factors which were shown to have an explanatory link with the dependent factor. With the arranged factors, the study developed the Prediction Model of future smoking intention among adolescents from 13 to 15 in Korean.

<Figure. 1> shows the study design.

**Figure. 1** Study design



## **Hypothesis**

After adjusting the socio-demographic characteristics of the participants, such as gender, grade and region, when middle school students aged 13 to 15 are current smokers, have past experience of smoking, have a higher monthly allowance, have parents who smoke, have not been exposed to the education about the effects of smoking, have something with a cigarette brand logo, have high exposure to smoking scenes in movies or videos, have closest friends who smoke and have an intention of smoking from friends' cigarette offer, then they have a much higher risk of smoking in the next 5 years, compared with students who do not exhibit these factors.

## **Analysis**

Logistic Regression was used to estimate the association between independent factors and future smoking intention among adolescents. Data were analyzed using Stata version 8.2 (Stata corp, College Station, Texas, United States)

The Prediction Model of adolescents' future smoking intention was developed from the independent factors identified as positively associated with smoking intention. The model was then applied to the non-smoker group of the sample to ensure that the conclusions were accurate.

The significance level of statistic analysis was 0.05.

## **Measures**

We collected 10 factors related to adolescents' current smoking from previous studies. They will be analyzed for the link with the dependent factor, adolescents' future smoking intention. The below shows that how 10 factors and the dependent factor were achieved through the sample.

### **Current smoking status**

Information on current smoking status of the participants was collected using the multiple-choice question "During the past 30 days (one month), on the days you smoked, how many cigarettes did you usually smoke?". The response choices were (a) I did not smoke cigarettes during the past 30

days(one month), (b)Less than 1 cigarette per day, (c)1 cigarette per day, (d)2 to 5 cigarettes per day, (e)6 to 10 cigarettes per day, (f)11 to 20 cigarettes per day or (g)More than 20 cigarettes per day. When a student answered ‘a’ , the student was treated as a non-smoker, if students smoke even less than 1 cigarette per day during the past 30 days, they were handled as current smokers.

### **Ever tried smoking**

The experience of smoking were assessed using the multiple-question “Have you ever tried or experimented with cigarette smoking, even one or two puffs?” . The response choices were (a)Yes or (b)No.

### **Monthly allowance**

The participant were asked “In a usual month(30 days) how much pocket money(can be changed to allowance, income, etc) do you get?” with seven possible response choices: (a)I don’ t receive any pocket money(or income, allowance, etc), (b)less than US\$1(change all to your local currency equivalent),

(c) 1 to 5 US\$, (d) 6 to 10 US\$, (e) 11 to 20 US\$, (f) 21 to 30 US\$ or (g) more than 30 US\$. We regrouped the alternatives to 3, less than \$10, \$11 to \$30 and more than \$30.

### **Parents' smoking status**

The responding parents' smoking status were assessed using the multiple-choice question "Do your parents smoke?" with the response choices (a) None, (b) Both, (c) Father only, (d) Mother only or (e) I don't know. We regrouped the alternatives to 3, both of parents, either of them and none.

### **Have learnt about the effects of smoking**

Using the question "During this school year, were you taught in any of your classes about the effects of smoking like it makes your teeth yellow, causes wrinkles, or makes you smell bad?" with the response choices (a) Yes, (b) No or (c) Not sure. When a student answered 'not sure', the student was eliminated.

### **Ownership of something with a cigarette brand logo**

The participants were asked “Do you have something (t-shirt, pen, backpack, etc.) with a cigarette brand logo on it?” . The alternatives were (a)Yes or (b)No.

### **Exposure to smoking scene in movies and videos**

In order to collect the information on the influence from smoking scenes in films, the participants were asked “During the past 30 days(one month), when you watched movies, how often did you see smoking scenes?” and “During the past 30 days(one month), when you watched videos, how often did you see smoking scenes?” with the response choices (a)None, (b)1, (c)2-3, (d)4-5, (e)6-7, (f)8-9, (g)more than 10 or (h)Never watch a video. The alternatives were divided into 3, none, once to 5 times and more than 6 times. When a student answered ‘h’ , the student was eliminated.

### **Closest friends’ smoking status**

The participants were asked “Do any of your closest friends smoke cigarettes?” with four possible alternatives



(a)None of them, (b)Some of them, (c)Most of them or (d)All of them.

### **Have intention of smoking from friends' cigarette offer**

The question "If one of your best friends offered you a cigarette, would you smoke it?" were used to collect the information about intention of smoking from friends' cigarette offer and the response choices were (a)Definitely not, (b)Probably not, (c)Probably yes or (d)Definitely yes. The alternatives were divided in 2 parts. 'a' and 'b' were grouped the answer 'No' and the others, 'probably yes' and 'definitely yes' were treated 'Yes' .

### **Adolescents' future smoking intention as the dependent factor**

This is the question of the dependent factor. The participant were asked "Do you think you will be smoking cigarettes 5 years from now?" with four responds alternatives (a)Definitely not, (b)Probably not, (c)Probably yes or (d)Definitely yes. The alternatives were divided in 2 parts.

'a' and 'b' were grouped the answer 'No' and the others, 'probably yes' and 'definitely yes' were treated 'Yes' .

# RESULTS

## **Characteristics of the participants**

The socio-demographic characteristics of participants are presented in <Table. 1>.

The total number of participants was 5,940. The number of female students was 3,006(50.6%) with slightly more than the number of male students of 2,934(49.4%). As for the grades, the first grade had the highest proportion of participants with 2,106(36.7%) followed by the third grade with 1,864(32.5%), and the second grade with 1,764 students(30.8%). The number of students living in Seoul was 1,901(32.0%), students living in other metropolitan cities were the highest with 2,156(36.3%), and the students living in cities and provinces were 1,883(31.7%).

**Table. 1** Characteristics of the Participants

<b>Factor</b>	<b>Category</b>	<b>Sample Size(N)</b>	<b>%</b>
Gender	Male	2,934	49.4
	Female	3,006	50.6
Grade	1 <sup>st</sup>	2,106	36.7
	2 <sup>nd</sup>	1,764	30.8
	3 <sup>rd</sup>	1,864	32.5
Region	Seoul	1,901	32.0
	Metropolitan cities	2,156	36.3
	Cities and Provinces	1,883	32.7
Total		5,940	100

※ There were differences of the each factor' s sample size due to non-answered.

### **Future smoking intention after 5 years with the socio-demographic characteristics of the participants**

To define adolescents' future smoking intention, the study analyzed answers of the survey question: 'Do you think you will be smoking cigarettes 5 years from now?' . The alternatives were divided into 4 options: 'definitely not' , 'probably not' , 'definitely yes' and 'probably yes' . For the purposes of the study, the responses were re-categorized to 'Yes' (probably yes or definitely yes) and 'No' (probably no or definitely no). The results with regard to gender, grade and region of the country are presented in <Table. 2>.

The number of the male students who answered 'Yes' was higher with 6.4%, compared with female students with 5.3%( $p < 0.08$ ). The higher the grade, the future smoking intention was increased; positive answer from the first grade students was 3.5%, from the second grade students was 5.5% and from the third grade students was 8.4%( $p < 0.0001$ ). 7.2% of the students living in Seoul said they thought they would be smoking in 5 years, compared with 4.6% of students living in

other metropolitan areas, and 5.9% of the students living in cities and provinces( $p < 0.002$ ).

**Table. 2** Association between the socio-demographic characteristics of the participants and future smoking intention after 5 years

Factor	Category	Sample	Future Smoking Intention		X <sup>2</sup>
		Size(N)	No(%)	Yes(%)	(P-value)
Gender	Male	2,934	2,722(92.7)	186(6.3)	3.05 (0.081)
	Female	3,006	2,842(94.7)	160(5.3)	
Grade	1 <sup>st</sup>	2,094	2,021(96.5)	73(3.5)	44.01 (0.000)
	2 <sup>nd</sup>	1,758	1,661(94.5)	97(5.5)	
	3 <sup>rd</sup>	1,862	1,706(91.6)	156(8.4)	
Region	Seoul	1,897	1,760(92.8)	137(7.2)	12.64 (0.002)
	Metropolitan cities	2,135	2,037(95.4)	98(4.6)	
	Cities and Provinces	1,878	1,767(94.1)	111(5.9)	
Total		5,910	5,564(94.1)	346(5.9)	

### **Association between the selected factors and future smoking intention after 5 years**

We assessed the association of the selected independent factors with future smoking intention after 5 years. Chi-square tests were used. The results are presented in <Table. 3>.

In regard to the first factor of 'current smoking status', 53.6%(n=217) of the current smokers said they believed they will continue smoking after 5 years, and 4.6%(n=248) of the non-smoking students answered that they believed they will be smoking in 5 years from now. The difference among the two groups was significant( $p < 0.0001$ ). It showed that current smokers are more likely to smoke in the future, compared to current non-smokers.

The results of the second factor, 'ever tried smoking', was also significant( $p < 0.0001$ ). 24.3%(n=373) of the students who have already experienced smoking said they believe they will be smoking in 5 years, compared to only 2.3%(n=97) of the students who have never tried smoking.

In relation to the third factor, 'monthly allowance', only 4.9%(n=83) of the students who usually get less than \$10

a month said they believed they will be smokers in 5 years from now, compared to 7.0%(n=171) of the students who get between \$10 and \$30, and 13%(n=220) of the students who get more than \$30 a month. The differences among the three groups were significant( $p<0.0001$ ).

The result of the fourth factor, 'parents' smoking status' was also significant( $p<0.0001$ ). 10.4%(n=339) of the students with either and both of their parents who smoke believed they will be smoking after 5 years, in comparison to 5.2%(n=133) of the students whose parents do not smoke.

According to the fifth factor, 'have learnt about the effects of smoking', 6.8%(n=174) of the students who received such education at schools thought they will be smokers after 5 years, compared to 8.8%(n=274) of the students who have not received smoking prevention education at schools. The difference among the two groups were significant( $p<0.0001$ ).

The result of the sixth factor 'ownership of something with a cigarette brand logo' was also significant( $p<0.0001$ ). 19.6%(n=87) of the students who own something with a cigarette brand logo believed they will be smoking in 5 years



time, however, only 6.9%(n=355) of the students who do not own anything with a cigarette brand logo thought they will be smoking in 5 years.

The results of the seventh and eighth factors, 'exposure to smoking scenes in movies and videos' was also significant ( $p < 0.0001$ ). The percentage of students who thought they will be smoking in 5 years was higher for those who had been exposed highly to smoking scenes in movies and videos compared to the students who had less exposure.

The result of the ninth factor, 'closest friends' smoking status' was also significant ( $p < 0.0001$ ). Only 2.1%(n=68) of the students whose friends do not smoke believed they will smoke after 5 years, compared to 11.6%(n=253) of the students who had some friends that smoke, 37.8%(n=111) of the students whose friends mostly smoke, and 44%(n=44) of the students whose friends all smoke thinking that they will be smoking in 5 years time.

The result of the tenth factor, 'have intention of smoking from friends' cigarette offer' was also significant ( $p < 0.0001$ ). Only 3.1%(n=185) of the students who do not have

intention of smoking from friends' cigarette offer said they will smoke after 5 years, as opposed to 61.7%(n=309) of the students who have intention of smoking from friends' cigarette offer believing that they will be smoking in 5 years.

**Table. 3** Association between the selected factors and future smoking intention after 5 years

Factor	Category	Future Smoking Intention		X <sup>2</sup> (P-value)
		No (%)	Yes (%)	
Current smoking status	No	5,135 (95.4)	248 (4.6)	12e+03
	Yes	188 (46.4)	217 (53.6)	(0.0001)
Ever tried smoking	No	4,117 (97.7)	97 (2.3)	737.68
	Yes	1,161 (75.7)	373 (24.3)	(0.0001)
Monthly allowance	Less than \$10	1,624 (95.1)	83 (4.9)	83.03
	\$11 to \$30	2,283 (93.0)	171 (7.0)	(0.0001)
	More than \$30	1,471 (87.0)	220 (13.0)	
Parents' smoking status	None	2,400 (94.8)	133 (5.2)	50.15
	Either and both	2,928 (90.0)	339 (10.4)	(0.0001)
Have learnt about the effects of smoking	No	2,854 (91.2)	274 (8.8)	7.50
	Yes	2,387 (93.2)	174 (6.8)	(0.006)
Ownership of something with a cigarette brand logo	No	4,813 (93.1)	355 (6.9)	91.68
	Yes	356 (80.4)	87 (19.6)	(0.0001)
Exposure smoking scenes in movies	Not at all	1,411 (94.9)	75 (5.1)	51.00
	1 to 5	3,433 (91.7)	311 (8.3)	(0.0001)
	More than 6	494 (85.5)	84 (14.5)	
Exposure smoking scenes in videos	Not at all	1,373 (95.4)	66 (4.6)	67.43
	1 to 5	3,486 (91.6)	318 (8.4)	(0.0001)
	More than 6	487 (84.4)	90 (15.6)	
Closest friends' smoking status	None of them	3,182 (97.9)	68 (2.1)	708.36
	Some of them	1,936 (88.4)	253 (11.6)	(0.0001)
	Most of them	183 (62.2)	111 (37.8)	
	All of them	56 (56.0)	44 (44.0)	
Have intention of smoking from friends cigarette offer	No	5,182 (96.9)	185 (3.1)	2.1e+03
	Yes	192 (38.3)	309 (61.7)	(0.0001)

### **The analysis for the determinants of future smoking intention after 5 years**

In a multivariate logistic regression to analyze the determinants of future smoking intention among adolescents, after adjusting gender, grade and region of the country, the result is shown in <Table. 4>.

The participants who are current smoker will be on average 1.7 times(95% Confidence Interval[CI], 1.13-2.51) more likely to be smokers after 5 years from now, compared to those who do not currently smoke. Those students who have past smoking experience are on average 2.9 times(95% CI, 2.09-4.05) more likely to possess future smoking intention than the students who do not have any smoking experience.

In regard to ‘closest friends’ smoking status’ , those who answered that they have some friends who smoke were on average 2.2 times(95% CI, 1.54-3.11) more likely to have future smoking intention, those who said most of their friends smoke were 3.4 times(95% CI, 2.00-5.71) more likely, and those whose friends were all said to be smokers were 2.1 times (95% CI, 0.97-4.60) more likely to have future smoking

intention, compared to the participants who do not have any friends that smoke.

Students who have intention of smoking from friends' cigarette offer are on average 20.8 times(95% CI, 15.06-28.59) more likely to smoke after 5 years, compared to students who do not have intention of smoking from friends' cigarette offer.

In regard to the factor 'parents' smoking' , those who have either and both parents who smoke are on average 1.9 times(95% CI, 1.43-2.61) more likely to smoke after 5 years compared to those students whose parents do not smoke.

Students who own something with a cigarette brand logo are on average 1.5 times(95% CI, 1.02-2.33) more likely to smoke after 5 years compared to students who do not own anything with a cigarette brand logo.

Students who have a monthly allowance of over \$30 are on average 1.2 times(95% CI, 0.85-1.81) more likely to smoke after 5 years compared to those who received less than \$10 a month.

Students who have learnt about the effects of smoking are less likely to smoke than those who have not received such

education. According to 'exposure to smoking scenes in movies', those students who are highly exposed are 1.1 times (95% CI, 0.70-1.56) more likely to smoke after 5 years. The same applies to the exposure on video, higher the exposure, more likely you are to smoke in the future.

To define how well the predict variables explain the adolescents' future smoking intention, the study used ROC curve, and the result is shown in <Figure. 2>.

As it is shown in Figure 3, under the control of participants' gender, grade and region, the 10 determinant factors can explain 92% of adolescents' future smoking intention.

**Table. 4** The determinants of future smoking intention

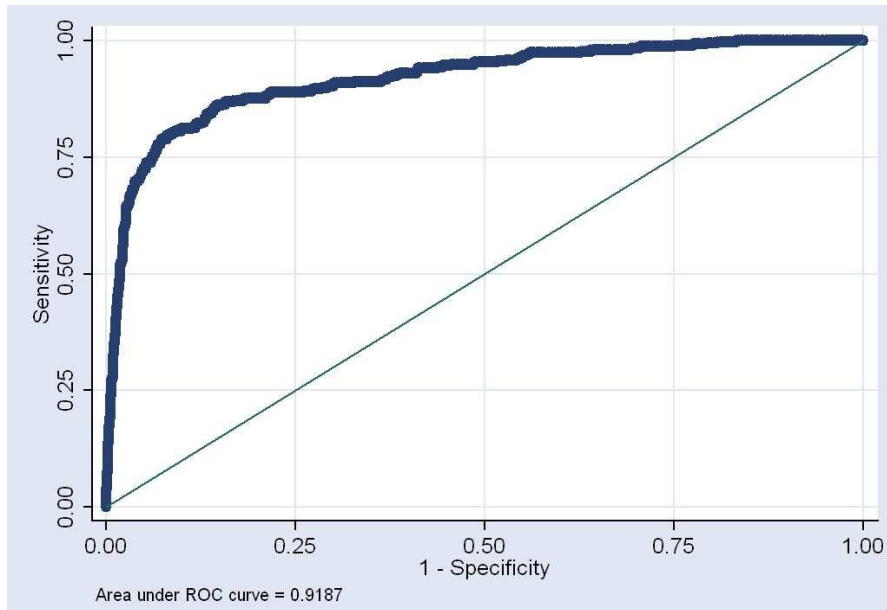
<b>Factor</b>	<b>Category</b>	<b>OR</b>	<b>CI (95%)</b>
Gender	Male	Referent	
	Female	0.67	0.50-0.88
Grade	1st	Referent	
	2nd	1.06	0.74-1.52
	3rd	1.00	0.70-1.44
Region	Seoul	Referent	
	Metropolitan Cities	0.99	0.70-1.40
	Cites and Provinces	1.00	0.71-1.42
Current smoking status	No	Referent	
	Yes	1.68	1.13-2.51
Ever tried smoking	No	Referent	
	Yes	2.91	2.09-4.05
Monthly allowance	Less than \$10	Referent	
	\$11-\$30	1.24	0.85-1.81
	More than \$30	1.45	0.98-2.13
Parents' smoking status	None	Referent	
	Either and More	1.93	1.43-2.61
Have learnt about the effect of smoking	No	Referent	
	Yes	0.89	0.67-1.18

**Table. 4 Continue**

<b>Factor</b>	<b>Category</b>	<b>OR</b>	<b>CI (95%)</b>
Ownership of something with a cigarette brand logo	No	Referent	
	Yes	1.54	1.02-2.33
Exposure smoking scenes in movies	Not at all	Referent	
	1 to 5	1.05	0.70-1.56
	More than 6	0.94	0.52-1.68
Exposure smoking scenes in videos	Not at all	Referent	
	1 to 5	1.06	0.73-1.61
	More than 6	1.26	0.69-2.30
Closest friends' smoking status	None of them	Referent	
	Some of them	2.18	1.54-3.11
	Most of them	3.37	2.00-5.71
	All of them	2.11	0.97-4.60
Have intention of smoking from friends' cigarette offer	No	Referent	
	Yes	20.75	15.06-28.59



**Figure. 2** ROC curve of the predictive factors to estimate the amount of the explanation level



**The analysis for the determinants of the non-smoking group' s future smoking intention after 5 years**

There was a casual link between the factor 'current smoking status' and future smoking intention. In order to discover a more powerful explanation level, the study carried out the multiple logistic regressions again among participants who are not current smokers. The result of the procedure is shown in <Table. 5> and <Figure. 3> shows the level of explanation(88%).

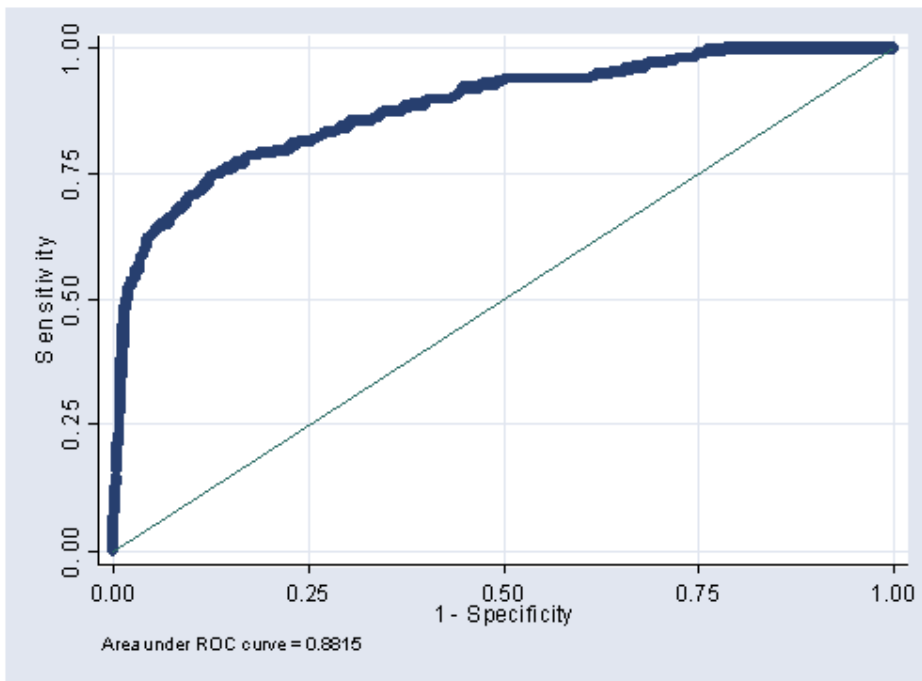
**Table. 5** The determinants of the non-smoking group' s future smoking intention

<b>Factor</b>	<b>Category</b>	<b>OR</b>	<b>CI (95%)</b>
Gender	Male	Referent	
	Female	0.89	0.54-1.48
Grade	1st	Referent	
	2nd	0.88	0.46-1.69
	3rd	1.40	0.74-2.65
Region	Seoul	Referent	
	Metropolitan Cities	0.66	0.36-1.21
	Cities and Provinces	0.73	0.40-1.33
Ever tried smoking	No	Referent	
	Yes	2.9	1.70-4.96
Monthly allowance	Less than \$10	Referent	
	\$11-\$30	0.59	0.30-1.14
	More than \$30	1.15	0.61-2.20
Parents' smoking status	None	Referent	
	Either and More	1.4	0.83-2.38
Have learnt about the effects of smoking	No	Referent	
	Yes	0.89	0.53-1.48

**Table. 5 Continue**

<b>Factor</b>	<b>Category</b>	<b>OR</b>	<b>CI (95%)</b>
Ownership of something with a cigarette brand logo	No	Referent	
	Yes	1.52	0.76-3.03
Exposure smoking scenes in movies	Not at all	Referent	
	1 to 5	1.09	0.53-2.23
	More than 6	0.81	0.28-2.34
Exposure smoking scenes in videos	Not at all	Referent	
	1 to 5	0.94	0.44-2.00
	More than 6	1.19	0.42-3.41
Closest friends' smoking status	None of them	Referent	
	Some of them	4.64	2.17-9.93
	Most of them	19.38	7.71-48.69
	All of them	12.92	2.86-58.33
Have intention of smoking from friends' cigarette offer	No	Referent	
	Yes	38.9	22.87-66.15

**Figure. 3** ROC curve of the predictive factors without the ones of current smokers to estimate the amount of the explanation level



## **Development of the Prediction Model of future smoking intention among Korean adolescents**

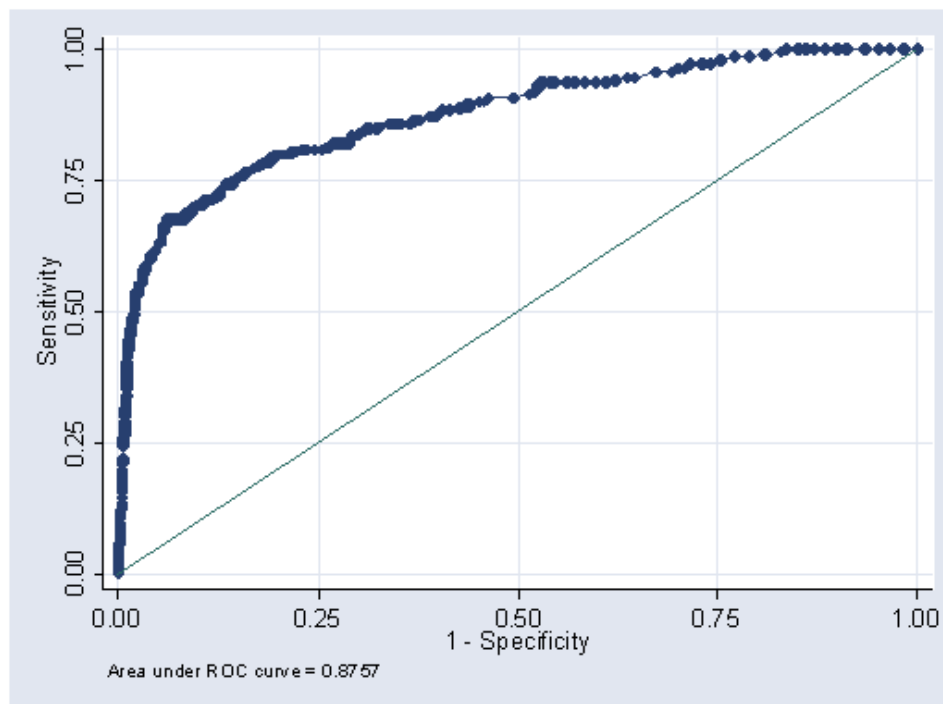
According to the results above, the study has suggested the Prediction Model below, which can be used to identify the high risk group of future smokers among Korean middle school students.

The determinants below were selected as the predictors of adolescents' future smoking intention after the analysis. The procedure for selection in regard to the determinants was that they exhibited an association with the future smoking intention of adolescents.

In conclusion, the determinants; (a) 'have experience of smoking' , (b) 'have parents who smoke' , (c) 'have something with a cigarette brand logo' , (d) 'have closest friends who currently smoke' and (e) 'have intention of smoking from friends' cigarette offer' have been selected as the predictors for the Prediction Model. The explanation level in regard to future smoking intention using the Prediction Model was 88% <Figure. 4>. Moreover, <Figure. 5> showed how well each determinant of the Prediction Model to explain the

adolescents' future smoking intention through the ROC assessment. The level of the determinant, 'have intention of smoking from friends' cigarette offer' was the highest(79%), followed by 'have closest friends who currently smoke' (73%), 'have experience of smoking' (70%), 'have parents who smoke' (61%) and 'have something with a cigarette brand logo' (58%).

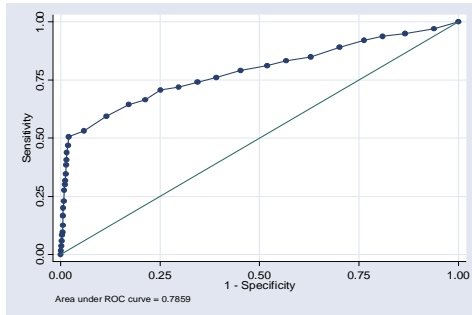
**Figure. 4** ROC curve of the Prediction Model



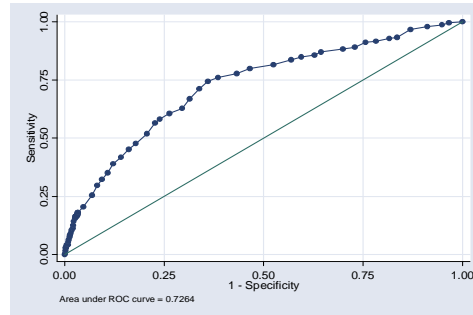
**Figure. 5** ROC curves of the each determinant

- 1) 'have intention of smoking from friends' cigarette offer'
- 2) 'have friends who currently smoke'
- 3) 'have experience of smoking'
- 4) 'have parents who smoke'
- 5) 'have something with a cigarette brand logo'

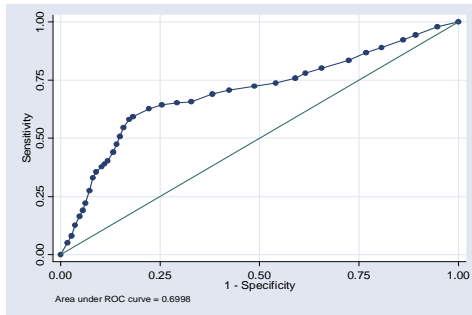
1)



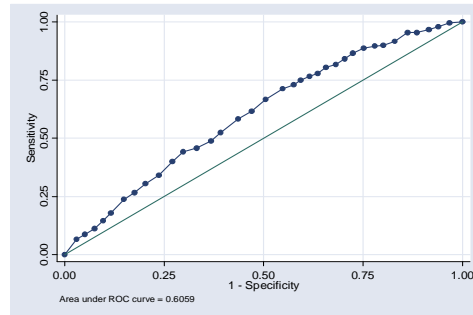
2)



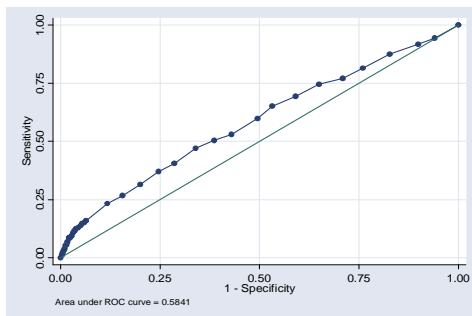
3)



4)



5)





# DISSCUSION

## **Summary of rationale**

Until 2004, the smoking rate among both male and female high school students in Korea, has been gradually declined due to the National Health Promotion Act since 1995 that proclaimed public buildings including schools as tobacco-free places, banned selling cigarette to people under 19 years of age, restricted direct tobacco advertisement and required inscription of a warning on the outside of cigarette packages. In addition, the year of 2001 was designated as the year of ‘Adolescent Smoking Prevention’ and smoking prevention demonstration programs were carried out in schools(Kim HJ et al., 2000). However, since 2004, for the middle school students among 13 to 15, the smoking rate has increased again and for the high school students, the decline trend of smoking rate has been weak(Korean National Statistical Office, 2006).

Although school-based smoking prevention programs has received considerable attention from the health promotion

field to reduce adolescents' smoking, the previous studies suggested the results of school-based programs were not effective due to several problems in the programs, such as teaching methods, class time and size of classes (Park E, 2006).

In order to properly design, implement and evaluate effective adolescent smoking intervention programs, there is a need to identify predictors and characteristics of adolescents' future smoking intention. Afterward, with the predictors, the school-based smoking prevention programs can solve the problems suggested by the previous studies and can be effective.

Thus, to find out the predictors of adolescents' future smoking intention, we examined the following important scientific questions: **a)** What determinants are associated with future smoking intention after 5 years among current non-smoking adolescents, and **b)** How well the Prediction Model can predict adolescents' future smoking intention.

## **Summary of results**

Regarding the first aim, our study has identified 5 determinants associated with adolescents' future smoking intention in 5 years. Having previous experience of smoking, having parents who smoke, having something with a cigarette brand logo, having friends who are current smokers and having intention of smoking from friends' cigarette offer were positively associated with future smoking intention among adolescents in Korea.

Regarding the second aim, the determinants as the predictors were responsible for explaining adolescents' future smoking intention with 88%.

## **Review of methods**

According to the ASE model of De Vries and Mudde, behavioral intention regarding behavior in the future is solely determined by Attitudes, Social influences and Self-efficacy(De Vries and Mudde, 1998). The ASE model has been used to study future behavior intentions, such as adolescent future smoking intention(Markham W.A et al., 2004).

Unlike the previous studies, using the data from the Global Youth Tobacco Survey(GYTS), carried out in 2004 among Korean middle school students aged from 13 to 15, we got more than 6,000 sampled students' data. The sample size was much bigger compared to the previous studies. Selection bias can be possible, but through a two-stage cluster sample design to produce a nationally representative sample of middle school students aged 13 to 15, the amount of bias, if any, to be minimal. With a nationally representative sample, the result, the Prediction Model, of the study could be also generalized to Korean middle school students.

The almost prior studies in regard to adolescents' smoking were progressed to study the difference between current smokers and non-smokers, and the dependent factor was the state of current smoking, but in this study, the dependent factor was future smoking intention. However, the data of future smoking intention was collected through the cross-sectional survey, so the result of the study has limitation of cross-sectional study.

## **Comparison of results with previous researches**

Future smoking intention in regard to gender, grade and region as the socio-demographic characteristics of participants, was researched and through the statistics analysis, the difference among three groups of grade and also three groups of region were significant (Grade  $P < 0.0001$ , Region  $P < 0.002$ ). However, the difference of the future smoking intention with gender was not significant ( $P < 0.08$ ), although some of previous studies suggested that there was significant difference by gender in risk for smoking. Whereas Dalton MA et al. indicated that there was no association between gender and adolescents' smoking (Dalton MA et al., 2006). Kim H et al., also suggested that male high school students tended to smoke more than female high school students among 16 to 18 in Korea, but this difference was not significant for middle school students among 13 to 15 (Kim H et al., 2006). The result of the study implicates that future smoking intention in 5 years between male middle school students and female middle school students aged from 13 to 15 in Korea is not different, so it could lead to increase the prevalence of females' smoking in the future in

Korea.

Exposure of adolescents to smoking scenes in videos or films and its influence in adolescents' smoking have been documented numerous times in the literatures(Sargent JD, 2006; Dalton MA et al., 2002; Sargent JD et al., 2001). Although only a few researches progressed, to date, to study association between exposure to movie smoking and adolescent smoking initiation in the future, Sargent JD has reported with his study in 2006 that smoking scenes in movies increased intent to smoke in the future for European adolescents(Sargent JD, 2006). Thompson and Gunther have also reported that adolescents who were not restricted from viewing R-rated movies were on average 3.3 times more likely to initiate smoking compared to adolescents who had total restriction(Thompson EM et al., 2007) and Dalton MA et al. claimed parental rules and monitoring of adolescents' movie viewing may have a protective influence on adolescents' risk for early initiation of tobacco(Dalton MA et al., 2006). In the present study, the chi-square tests to discover the association between exposure of smoking scenes in movies and

adolescents' future smoking intention, showed the significant association. However, unlike the previous studies, after adjusting confounding factors, the association in Korean adolescents was not significant.

We also found that ownership of something with a cigarette brand logo was associated with 1.54 odds(95% Confidence Interval[CI], 1.02-2.33) of future smoking intention, compared to not owning something with a cigarette brand logo. Previous studies on predictors of current smoking among adolescents have also demonstrated this in several settings(Sargent JD et al., 1997; Sargent JD et al., 2000; Sargent JD et al., 2000). Sargent JD and his colleagues reported through their study in 1997, the adolescents' ownership of something with a cigarette brand logo was strongly associated with initiation and maintenance of smoking behavior(OR=4.1, 95% CI 3.1-5.5)(Sargent JD et al., 1997). The results above tells us the reason why tobacco firms are increasingly targeting young people with cigarette promotional items(CPI) in order to influence their future intention of picking up smoking practice.

Having learnt about the effects of smoking was not associated with the future smoking intention in this study. Through the education, students must decide not to smoke in the future, but the difference of future smoking intention between the students who had anti-smoking programs and the other students who did not participate in the programs was not significant. Park E has reported that the school-based smoking prevention programs have not influenced adolescents' smoking behavior as much as anticipated (Park E, 2006), whereas Kim H et al. indicated, through his study in Korea, that knowledge about the health hazard of smoking was found to be strongly related to adolescents' smoking

Our study also found that having prior experiment of smoking, having parents who smoke, having friends who smoke and having intention of smoking from friends' cigarette offer were also strongly associated with future smoking intention. The strong association between current smoking and these variables have been described elsewhere (Kemppainen U et al., 2006; Kim H et al., 2006; Sargent JD et al., 2001; Conley Thomson C et al., 2005).



De Vries et al, have reported from a longitudinal study that parental and peer smoking predicted future smoking almost to the same level(De Vries et al., 2003). Rice et al. reported in their study ‘ Predictors of Arab American adolescent tobacco use’ that tobacco use among friends and family members appeared to have a sustaining effect for current smoking(Rice VH et al., 2006). We examined these environmental factors also influence to adolescents’ future smoking intention. Miller CH et al. conducted a study to identify principal risk factors for the initiation of adolescents’ smoking and found that prior experimentation and having friends who smoke were among the principal predictors of smoking risk(Miller CH et al., 2006).

A possible explanation for these results is that adolescents are their beginning social activities in which they are vulnerable to environmental influences. They tend to explore themselves and their environment by making new friends. However, without appropriate refusal skills and stable norms, they are particularly susceptible to peer pressure and influence(Zhang L et al., 2005).

In the study of Zhang L et al., adolescents' smoking was positively related to the amount of pocket money per week, which suggests that the availability of money is a risk factor for adolescent tobacco use. Pocket money provides the ability to purchase cigarettes(Zhang L et al., 2005). This result is consistent with another research finding, which had found that students with more pocket money per week were more likely to be smokers than students with less pocket money(Rissel et al., 1999). And also, Kim H suggested that monthly allowance was significant factor for Korean adolescents' smoking(Kim H et al., 2006). However, our result indicated that monthly allowance, the ability to purchase cigarettes, were not associated with future smoking intention. It means that when adolescents in Korea think of future smoking, the current ability to purchase cigarettes is not important.

## **The Prediction Model**

The Attitudes-Social influences-Efficacy(ASE) model has been used in cross-sectional studies to predict the future behavior regarding health, such as adolescent smoking

uptake(De Vries et al. 1995). Unlike the previous studies, we developed a prediction model with collecting variables associated with adolescents' smoking. In the middle of the 10 selected variables through reviewing the literatures, after logistic regression analysis, we discovered 5 determinants of a prediction model; previous experience of smoking, having parents who smoke, ownership of something with a cigarette brand logo, having closest friends who are current smokers and having intention of smoking from friends' cigarette offer.

Under the control of participants' gender, grade and region, the determinants of the Prediction Model can explain 88% of the future smoking intention of current non-smoking adolescents(n=5,383).

Through the ROC assessment between each determinant of the Prediction Model and future smoking intention, we investigated the explanation level of the each determinant.

'Having intention of smoking from friend' s cigarette offer' had the highest level of explanation with 79% to predict future smoking intention of non-smoking adolescents. 'Having friends who currently smoke' had 73% of explanation level,

‘having experience of smoking’ has 70%, ‘having parents who smoke’ had 61% and ‘have something with a cigarette brand logo’ has 58%.

These findings supported the assertion from previous studies that adolescent smoking interventions should not be confined to the classroom. It should extend across the school and into the community(Zhang L et al., 2005). This approach has played a critical part in the success of Finland’ s large-scale, long-term intervention to reduce the prevalence of smoking among youth(Vartianen et al. 1994, 1998)

## **Practical use of the Prediction Model**

The findings, the Predictors of adolescents’ future smoking intention from this study would underpin the school-based smoking prevention programs. Before planning and applying smoking intervention programs to total adolescents, schools or organizations for tobacco control are recommended to conduct the survey to identify the Prediction Model’ s determinants. Through the survey, the high risk group of the students will be selected and then the programs can be

intensive and well focus on the adolescents who have future smoking intention.

The previous studies suggested the reasons why the school-based smoking prevention programs could not affect to adolescents' future smoking intention. Brevity of the programs because of the regular curriculum and non-interactive delivery methods caused inefficiency of the programs.

Based on the result of this study, author suggest firstly, schools should conduct the survey with the Prediction Model, secondly, identify the high risk group of future smoking from the whole students to select participants for the smoking intervention programs, finally, pay attention to small groups of adolescents who are more likely to smoke in the future. Through these steps, possibly the current problems of the school-based smoking prevention programs, such as brevity of the programs and non-interactive delivery methods, can be eliminated.

Furthermore, through the practical use of the Prediction Model at schools, it would also be valuable for future research to trace the adolescents who were included in the high risk

group of future smoking and analyzes the real effect of the Prediction Model.

## CONCLUSION

According to the previous studies, smoking prevention programs in schools are more effective for adolescents than for adults, thus, to date, the school-based smoking prevention programs are recognized as one of the best ways to reduce adolescents' smoking. However, due to brevity of the programs caused by regular curriculums and non-interactive delivery methods because of size of classes, and not enough time to educate, the effect of smoking intervention programs is less than we expect. In order to improve the effect of the school-based smoking prevention programs, we found out the predictive factors to extract the students who have intention of future smoking, using the data of the Korean GYTS carried out in 2004.

Having previous experience of smoking, having parents who smoke, having something with a cigarette brand logo, having friends who are currently smokers and having intention of smoking from friends' cigarette offer were characteristics of adolescents who have high risk of initiating smoking in the

future. These determinants were explaining 88% in the Prediction Model.

With the predictors of adolescents' future smoking intention, the schools in Korea can select the high risk group of future smoking before doing programs for all adolescents, and then the smoking prevention programs will be so intensive and pay attention to the adolescents of high risk groups. We expect that the intensive school-based smoking prevention programs after using the prediction model can reduce adolescents' future smoking.



## REFERENCE

- The Korean Association of Smoking and Health. 2004  
Smoking rate of Korean middle school and high school  
students, 2004
- Korean National Statistical Office. 2006 Adolescent Statistics,  
2006
- Fritz DJ. Adolescent smoking cessation: how effective have  
we been? J Pediatr Nurs 2000;15:299-306
- Kim HJ, Park TG, Jee SH et al. Analysis of Socioeconomic  
Costs of smoking and Development of National Strategy  
for tobacco control in Korea. Seoul: Yonsei University,  
2000
- U.S. Department of Health and Human Services. Reducing the  
health consequences of smoking. Twenty five years of  
progress: a report of the surgeon general. Washington, DC:  
U.S. Government Printing Office, 1989
- Centers for Disease Control and Prevention (CDC). Projected  
smoking related deaths among youth. Morbidity &  
Mortality Weekly report 1996;45:971-974

- Graunbaum JA, Kann L, Kinchen SA, Ross JG, Gowda VR, Collins JL, Kolbe LJ. Youth risk behavior surveillance: National Alternative High School Youth Behavior Survey, United States, 1998. *J School Health* 2000;70; 5-1
- Miller JW, Naimi TS, Brewer RD, Jones SE. Binge drinking and associated health risk behaviors among high school students. *Pediatrics* 2007;119:76-85
- Park E. School-based smoking prevention programs for adolescents in South Korea: a systematic review. *Health Education Research* 2006;21(3):407-415
- Thomas R and Perera R. School-based programmes for preventing smoking. *Cochrane Database Syst Rev* 2006; 3:CD001293
- De Vries, H. and Mudde, A.N. Predicting stage transitions for smoking cessation applying the attitude-social influences-efficacy model. *Psychological Health* 1998;13:369-385
- Markham W.A, Aveyard P, Thomas H et al. What determines future smoking intentions of 12 to 13-year-old UK

- African-Caribbean, Indian, Pakistani and white young people? *Health Education Research* 2004;19(1):15-28
- De Vries, H., Backbier, E., Kok, G. and Dijkstra, M. The impact of social influences in the context of attitude, self-efficacy, intention and previous behaviors as predictors of smoking onset. *Journal of Applied Social Psychology* 1995;25:237-257
- Willemsen, M.C., De Vries, H., van Breukelen, G. and Oldenburg, B. Determinants of intention to quit smoking among Dutch employees: the influence of the social environment. *Preventive Medicine* 1996;25:195-202
- Warren CW, Riley L, Asma S et al. Tobacco use by youth: a surveillance report from the Global Youth Tobacco Survey project. *Bull World Health Organ* 2000;78:868-870
- Global Tobacco Surveillance System Collaborative Group. Global Tobacco Surveillance System (GTSS): purpose, production, and potential. *J Sch Health* 2005;75:15-24
- Kemppainen U, Tossavaunen K, Vartiainen E, Jokela V, Puska P, Pantelejev V, Uhanov M. Environmental factors as predictors of smoking among ninth-grade adolescents in

- Pitkaranta(Russian Karelia) and in eastern Finland. Res Nurs Health. 2006;29(6):543-55
- Rice VH, Weglicki LS, Templin T. Predictors of Arab American Adolescent Tobacco Use. Merrill Palmer Q (Wayne State Univ Press). 2006;52(2):327-342
- Miller CH, Burgoon M, Grandpre JR, Alvaro EM. Identifying principal risk factors for the initiation of adolescent smoking behaviors: the significance of psychological reactance. Health Commun. 2006;19:241-52
- Zhang L, Wang WF, Zhou G. A cross-sectional study of smoking risk factors in junior high school students in Henan, China. Southeast Asian J Trop Med Public Health. 2005;36(6):1580-4
- Dalton MA, Adachi-Mejia AM, Longacre MR et al. Parental rules and monitoring of children's movie viewing associated with children's risk for smoking and drinking. Pediatrics. 2006;118(5):1932-42
- Kim H, Kim EK, Choi ES, et al. The determinants of adolescent smoking by gender and type of school in Korea. J Prev Med Pub Health 2006;39:379-88

Distefan JM, Gilpin E, Sargent JD, Pierce JP. Do movie stars encourage adolescents to start smoking? evidence from California. *Prev Med* 1999;28:1-11

Jonathan B. Bricker, Arthur V. Peterson Jr., M. Robyn Andersen, et al. Close friends', parents' and older siblings' smoking: Reevaluating their influence on children's smoking. *Nicotine and Tobacco research* 2006;8(2):217-226

Sargent JD. Smoking in films and impact on adolescent smoking: with special reference to European adolescents. *Minerva Pediatr* 2006;58:27-45

Dalton MA, Ahrens MB, Sargent JD, Mott LA, Beach ML, Tickle JJ. Relation between parental restrictions on movies and adolescent use of tobacco and alcohol. *Eff Clin Pract* 2002;5:1-10

Sargent JD, Beach ML, Dalton MA, Mott LA, Tickle JJ, Ahrens MB, Heatherton TF. Effect of seeing tobacco use in films on trying smoking among adolescents: cross sectional study. *BMJ* 2001;323:1394-7

- Thompson EM, Gunther AC. Cigarettes and cinema: does parental restriction of R-rated movie viewing reduce adolescent smoking susceptibility? *Journal of Adolescent Health* 2007;40:180.e1-181.e6
- Sargent JD, Dalton MA, Beach M, Bernhardt A, Pullin D, Stevens M. Cigarette promotional items in public schools. *Arch Pediatr Adolesc Med* 1997;151:1189-96
- Sargent JD, Dalton M, Beach M. Exposure to cigarette promotions and smoking uptake in adolescents: evidence of a dose-response relation. *Tob Control* 2000; 9:163-8
- Sargent JD, Dalton M, Beach M, Bernhardt A, Heatherton T, Stevens M. Effect of cigarette promotions on smoking uptake among adolescents. *Prev Med* 2000;30:320-7
- Sargent JD, Dalton M. Does parental disapproval of smoking prevent adolescents from becoming established smokers? *Pediatrics* 2001;108:1256-62
- Conley Thomson C, Siegel M, Winickoff J, Bierner L, Rigotti NA. Household smoking bans and adolescents' perceived prevalence of smoking and social acceptability of smoking. *Prev Med* 2005;41:349-56

- De Vries H, Engels R, Kremers S, Wetzels J, Mudde A. Parents' and friends' smoking status as predictor of smoking onset: findings from six European countries. *Health Educ Res* 2003;18:627-36
- Rissel C, McLellan L, Bauman A. Factors associated with delayed tobacco uptake among Vietnamese/Asian and Arabic youth in Sydney, NSW. *Aust NZ J Public Health* 1999;24:22-28
- Vartiainen E, Puska P, Jousilahti P et al. Twenty-year trends in coronary risk factors in North Karelia and in other areas of Finland. *Int J Epidemiol* 1994;23:495-504
- Vartianinen E, Paavola M, Mcalister A, Puska P. Public Health Briefs-fifteen-year follow-up of smoking prevention effects in the North Karelia Youth Project. *Am J Public Health* 1998;88:81-85

## KOREAN ABSTRACT(국문요약)

### 청소년 미래흡연의지 예측모형에 관한 연구

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2004년 이후 우리나라의 중학생 흡연율은 다시 증가추세를 보이고 있고 많은 선행연구를 통해 청소년기 흡연이 건강뿐 아니라 비행, 약물중독과 같은 사회적 문제도 야기시킨다고 보고되고 있다. 담배로 인한 피해를 줄이기 위해서는 중독으로 인해 금연이 쉽지 않은 성인기보다 청소년기 흡연예방활동의 효과가 더욱 크고 대부분의 성인이 처음 담배를 접하는 시기가 청소년기라는 것을 감안한다면 청소년을 대상으로 한 효율적인 흡연예방교육은 반드시 필요한 것이다. 하지만 최근 학교를 중심으로 진행되는 흡연예방프로그램에 대한 연구결과를 보면 교육의 효과가 기대에 미치지 못한다는 지적들을 볼 수 있다. 본 연구는 효과적인 흡연예방교육의 진행을 위해 선행연구에서 주로 지적하는 모든 학급, 모든 학생을 대상으로 실시하는 흡연예방교육의 문제점을 보완하고 프로그램 효과의 극대화를 위한 방법으로 ‘청소년 미래흡연의지 예측요인’을 밝혀 미래흡연 고위험 집단을 찾아 내고자 하였다.

청소년의 미래흡연의지에 어떤 요인들이 영향을 미치는지 찾아내기 위해 ‘청소년 흡연’과 관련성이 있는 요인들을 문헌고찰을 통해



선정하였다. 현재흡연상태, 흡연경험유무, 용돈수준(월), 부모의 흡연상태, 흡연교육참여 여부, 담배브랜드가 새겨진 상품소유 유무, 영화 속, 비디오 속 흡연장면 노출 정도, 친구의 흡연상태, 친구의 흡연권유에 대한 순응으로 10 개의 요인들을 독립변수로 선정하였다. 2004 년에 우리나라 13 세에서 15 세 중학생들을 대상으로 실시한 ‘세계청소년흡연조사’의 설문자료를 이용하여 선정한 독립변수들과 5 년 후 미래흡연의지 간의 관련성을 분석하였다. 현재흡연상태가 미래흡연의지에 영향을 미칠 것이라는 가정아래 연구대상자 중 비흡연자만을 선별하고 종속변수와 독립변수 간의 개별적 관련성 연구를 통해 가장 큰 상관관계가 컸던 흡연경험유무, 친구의 흡연상태, 친구의 흡연권유에 대한 순응, 부모의 흡연상태 및 담배회사 로고가 새겨진 물건소유 유무를 이용해서 예측모형을 개발하고 ROC 곡선을 이용해 예측요인들의 청소년 미래흡연의지 예측수준을 평가하였다. 그 결과 5 년 후 흡연의지에 대한 모형의 예측 정도는 88%였다.

예측모형을 이용해 일선학교에서는 흡연예방교육을 실시하기 전 사전설문을 실시하고 이를 토대로 전체 학생 중 미래흡연의 고위험 집단을 선별하여 이들을 대상으로 하는 집중적인 흡연예방교육이 가능하게 될 것이고 이는 최근 제기되는 학교 내 흡연예방교육의 문제점을 어느 정도 해소할 수 있을 것을 생각된다. 또한 미래흡연 고위험군을 대상으로 실시한 예방교육을 통해 실질적인 흡연율 감소를 기대할 수 있을 것이다.

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핵심단어 : 청소년 흡연예측요인, 미래흡연의지, 청소년흡연예방교육

# APPENDIX

## The questionnaires for the factors

### 1) Current smoking status

“During the past 30 days (one month), on the days you smoked, how many cigarettes did you usually smoke?”

- a. I did not smoke cigarettes during the past 30 days
- b. Less than 1 cigarette per day
- c. 1 cigarette per day
- d. 2 to 5 cigarettes per day
- e. 6 to 10 cigarettes per day
- f. 11 to 20 cigarettes per day
- g. More than 20 cigarettes per day

### 2) Ever tried smoking

“Have you ever tried or experimented with cigarette smoking, even one or two puffs?”

- a. Yes
- b. No

### 3) Monthly allowance

“In a usual month (30 days) how much pocket money (can be changed to allowance, income, etc) do you get?”

- a. I don’ t receive any pocket money(or income, allowance, etc)

- b. less than US\$1 (change all to your local currency equivalent)
- c. 1 to 5 US\$
- d. 6 to 10 US\$
- e. 11 to 20 US\$
- f. 20 to 30 US\$
- g. more than 30 US\$

**4) Parents' smoking status**

“Do your parents smoke?”

- a. None
- b. Both
- c. Father only
- d. Mother only
- e. I don' t know

**5) Have learnt about the effects of smoking**

“During this school year, were you taught in any of your classes about the effects of smoking like it makes your teeth yellow, causes wrinkles, or makes you smell bad?”

- a. Yes
- b. No
- c. Not sure

**6) Ownership of something with a cigarette brand logo**

“Do you have something (t-shirt, pen, backpack, etc.) with a cigarette brand logo on it?”

- a. Yes
- b. No

**7) Exposure to smoking scenes in movies**

“During the past 30 days (one month), when you watched movies, how often did you see smoking scenes?”

- a. None
- b. 1
- c. 2 - 3
- d. 4 - 5
- e. 6 - 7
- f. 8 - 9
- g. more than 10
- h. Never watch a movie

**8) Exposure to smoking scenes in videos**

“During the past 30 days (one month), when you watched videos, how often did you see smoking scenes?”

- a. None
- b. 1
- c. 2 - 3
- d. 4 - 5
- e. 6 - 7
- f. 8 - 9
- g. more than 10
- h. Never watch a video

**9) Closest friends' smoking status**

“Do any of your closest friends smoke cigarettes?”

- a. None of them
- b. Some of them
- c. Most of them
- d. All of them

**10) Have intention of smoking from friends' cigarette offer**

“If one of your best friends offered you a cigarette, would you smoke it?”

- a. Definitely not
- b. Probably not
- c. Probably yes
- d. Definitely yes

**11) Adolescents' future smoking intention**

(The dependent question)

“Do you think you will be smoking cigarettes 5 years from now?”

- a. Definitely not
- b. Probably not
- c. Probably yes
- d. Definitely yes