

Original Investigation

Effectiveness of Antismoking Media Messages and Education Among Adolescents in Malaysia and Thailand: Findings From the International Tobacco Control Southeast Asia Project

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Abstract

Introduction: Finding ways to discourage adolescents from taking up smoking is important because those who begin smoking at an earlier age are more likely to become addicted and have greater difficulty in quitting. This article examined whether anti-smoking messages and education could help to reduce smoking susceptibility among adolescents in two Southeast Asian countries and to explore the possible moderating effect of country and gender.

Methods: Data came from Wave 1 of the International Tobacco Control Southeast Asia Project (ITC-SEA) survey conducted in Malaysia ($n = 1,008$) and Thailand ($n = 1,000$) where adolescents were asked about receiving antismoking advice from nurses or doctors, being taught at schools about the danger of smoking, noticing antismoking messages, knowledge of health effects of smoking, beliefs about the health risks of smoking, smoking susceptibility, and demographic information. Data were analyzed using chi-square tests and logistic regression models.

Results: Overall, significantly more Thai adolescents reported receiving advice from their nurses or doctors about the danger of smoking ($p < .001$), but no country difference was observed for reported antismoking education in schools and exposure to antismoking messages. Multivariate analyses revealed that only provision of antismoking education at schools was significantly associated with reduced susceptibility to smoking among female

Malaysian adolescents ($OR = 0.26$). Higher knowledge of smoking harm and higher perceived health risk of smoking were associated with reduced smoking susceptibility among Thai female ($OR = 0.52$) and Malaysian male adolescents ($OR = 0.63$), respectively.

Conclusions: Educating adolescents about the dangers of smoking in schools appears to be the most effective means of reducing adolescents' smoking susceptibility in both countries, although different prevention strategies may be necessary to ensure effectiveness for male and female adolescents.

Introduction

Tobacco use has been identified by the World Health Organization as the leading cause of death and disability in the world (Murray & Lopez, 1997). This is because more than 4,000 toxic or carcinogenic chemicals have been found in tobacco smoke (Hoffmann & Hoffmann, 1987). Half of all long-term smokers will die from tobacco use. Every cigarette smoked cuts at least 5 min off life on average (Center For Disease Control and Prevention, 1994). Each year, over 430,000 people die in the United States as a result of smoking-related diseases (WHO, 2006). However, over 50 million continue to smoke, including over 3 million teens (Al-Bedah, Qureshi, Al-Guhaimani, & Basahi, 2010).

At present, approximately 500 million of the world's 1.3 billion smokers live in Asia (Kumar, Mohan, & Jain, 1996). It is expected

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that this number will increase significantly over the coming decades as the tobacco industry increasingly shifts its markets to this region with the shrinking markets in the developed Western countries (Flay, 2009; Hsieh, Yen, Liu, & Jeng, 1996; Wakefield, Flay, Nichter, & Giovino, 2003). The health burden from smoking is also expected to shift to low- and middle-income countries (Mackay & Erikson, 2002). There is an urgent need for more research to be conducted to support tobacco control efforts in this region. This article examines whether antismoking messages and education could help to reduce the intention to smoke among adolescents in two Southeast Asian countries: Malaysia and Thailand. Findings from several surveys suggest that smoking among adolescents may be on the rise in Malaysia (Institute for Public Health, 2008; Parkinson et al., 2009). The 2003 Global Youth Tobacco Survey of 13–15-year olds in Malaysia reported the prevalence of current smoking at 19.9% (35.5% of males and 4.3% of females) (Thomas & Perera, 2006). However, the 2006 Malaysian National Health and Morbidity survey reported that among teenagers aged between 13 and 18 years, 15% indicated that they had tried smoking, and another 8% confessed to being regular smokers (Institute for Public Health, 2008). Until recently, Malaysia had few comprehensive tobacco control policies, but on February 9, 2004, the Malaysian government launched a comprehensive national antismoking media campaign called *Tak Nak* (Say No). The objective of this campaign was to reduce the number of smokers, particularly among adolescents, by providing them with accurate information to increase their awareness of, and knowledge about, the danger of smoking.

Unlike Malaysia, Thailand has some of the toughest antismoking laws in the world. It is at the forefront of the region's antismoking efforts and has enacted a host of restrictions on the tobacco industry, including bans on cigarette advertisements, bans on smoking in most public places, and bans on cigarette buying by Thai adolescents less than 18 years of age. It also introduced requirements in 2006 for all cigarette packs to include graphic images depicting the ill effects of tobacco on health. According to the National Statistical Office, the number of Thai smokers dropped by 38% from 11.67 million to 9.54 million between 1991 and 2006 due to the government's success in enforcing antismoking laws (Malaysia National News Agency, 2007). The percentage of smokers in the same period in Bangkok fell from 32.3% to 13.9% (Malaysia National News Agency, 2007). Tobacco use among Thai adolescents aged 15–18 years is approximately 5% (Jategaonkar, 2007). However, findings from a recent population-based study indicate that while the percentage of current smokers among adolescents aged between 13 and 17 years in both Malaysia and Thailand is relatively low at 2.4% and 3.2%, respectively, the percent of those experimenting with cigarettes is at 11% (18% males and 3.4% females) and 12% (21% males and 2.6% females), respectively (Hammond et al., 2008).

Smoking prevalence among Asian women in this region is typically low (Mackay & Amos, 2003; Mackay & Erikson, 2002), although some limited data suggests that this may be on the rise among young women (Global Youth Tobacco Survey Collaborative Group, 2002; Mackay & Amos, 2003; Parkinson et al., 2009). The increased smoking among women could reflect either the shift towards modernization and emancipation of women in this region or the specific targeting of women by the tobacco industry as a huge untapped market for its products, or both (Mackay & Amos, 2003; Morrow & Barraclough, 2003). A recent study by

Parkinson et al. (2009), using adolescents' data from the first wave of the International Tobacco Control Southeast Asia (ITC-SEA) survey, showed that female adolescents were less likely to hold positive aesthetic and social acceptability beliefs about smoking compared with their male counterparts, that Thai adolescents were more likely to endorse these beliefs, and that these beliefs were strongly predictive of smoking susceptibility. They also found that noticing antismoking media messages was associated with fewer positive attitudes towards smoking (Parkinson et al., 2009). However, they did not explore whether exposure to antismoking media messages was a protective factor for smoking susceptibility. Past research conducted mainly in Western developed countries suggests that the implementation of antismoking campaigns and advertisements may prevent smoking uptake among adolescents (Wakefield et al., 2003). Specifically, previous studies have found that antismoking campaigns can have a significantly positive effect on the public's health knowledge, which in turn can reduce smoking uptake (Hsieh et al., 1996).

To date, it is also unclear whether antismoking education provided at a more personal level by authority figures such as teachers in schools and doctors in a health setting is effective as a preventive measure against smoking among adolescents living in this region of the world. Evidence on the effectiveness of school-based smoking prevention programs carried out in Western developed countries to date has been rather mixed (Flay, 2009; Lantz et al., 2000; Thomas & Perera, 2006). Nevertheless, in countries such as Malaysia and Thailand where respect for the authorities is paramount, particularly among adolescents, antismoking messages provided at the personal level by teachers and doctors may have greater credibility and, hence, may exert a greater influence on the health-related beliefs, attitudes, knowledge, and behavior of adolescents when compared with the de-personalized messages provided by government mass-media campaigns.

The current study sought to understand whether antismoking advertising and education have a role to play in preventing smoking among adolescents in Malaysia and Thailand.

Objectives

Our objectives were (1) to examine the association of reported exposure to antismoking media messages and education with knowledge of the health effects of smoking, perceived health risk of smoking, and susceptibility to smoking among adolescents, and (2) to explore the possible moderating effect of country and gender.

Methods

Sample and Data Collection Procedures

Data were from the baseline wave of the ITC-SEA project, a cohort survey conducted between January and March 2005 in Malaysia ($n = 1,008$) and Thailand ($n = 1,000$). The ITC project conducts annual national-level surveys to collect information to evaluate the Framework Convention on Tobacco Control (FCTC) policies and other tobacco control activities.

Participants were recruited through face-to-face interviews conducted in households. Households were selected using a

stratified multistage cluster sampling design. The sampling frame was provided by the Department of Statistics and where necessary the cluster quotas were divided among the subclusters or enumeration blocks (Fong et al., 2006; Thompson et al., 2006). Where relevant, one randomly selected adolescent aged between 13 and 17 years was invited to complete a 30-min self-administered handwritten questionnaire. Overall, a cooperation rate of 95% was achieved in Thailand with a combined eligibility and cooperation rate of 58.7%. In Malaysia, however, the rate was much lower with a combined eligibility and cooperation rate of 32.4% (Hammond et al., 2008). Respondents were instructed to complete the survey in a private area to ensure privacy from family members and return it in a sealed envelope to maintain confidentiality. Parental permission and the consent of adolescents were both obtained.

The questionnaire was developed by an international team of tobacco control experts, with different backgrounds (Thompson et al., 2006). The original questionnaire was prepared in English and translated into local Malay and Thai languages. The questionnaire was validated by a back translation process, and cognitive testing of the questionnaire was conducted with a small group of people prior to the survey (Thrasher et al., 2011).

Measures

Sociodemographics. Sociodemographic variables assessed included age, gender, and residence (urban or rural). In Malaysia, the urban and rural classification was based on population and housing year 2000 census data from the Department of Statistics, Malaysia (Population and Housing Census of Malaysia, 2000). In Thailand, urban areas were defined based on municipalities (including the new *tambon* municipalities) (Flood, 2000).

Smoking Behavior. The smoking status variable consisted of the following subgroups: never smokers, ex-smokers, experimenters, and actual (current) smokers. These subgroups were defined based on following three questions: (1) Have you ever smoked a cigarette, even just a few puffs? (2) How many cigarettes have you smoked in your life? (3) Think about last 30 days. How often did you smoke? Never smokers were defined as those who never smoked a cigarette in their lifetime. Those who had smoked a cigarette, even a few puffs and, those smoking less than 100 cigarettes in their life, were defined as experimenters. Actual current smokers were defined as those who smoked more than 100 cigarettes in their lifetime and smoked weekly or more often in the last 30 days, and ex-smokers were defined as those who smoked more than 100 cigarettes in their lifetime but had not smoked in the past 30 days.

Antismoking Media Messages and Education.

Reported antismoking education was assessed using the following two questions: (1) In the past year, has a doctor or nurse talked to you about the danger of smoking? (2) During the last school year, were you taught in any of your classes about the danger of smoking? Adolescents indicated “yes/no” to these two questions. Reported exposure to antismoking media messages was assessed using the following two questions: (a) During the last 30 days, how often have you noticed antismoking media messages (i.e., television, radio, billboard, posters, newspapers, magazines, and movies)? with the following response options: never (0), sometimes (1), and a lot (2); (b) In the last six months,

have you noticed advertising or information that talks about the danger of smoking or encourages quitting in any of the following places—television, radio, posters, billboards, newspaper/magazines, cinema after or before films, discos/karaoke and lounges? to which they responded “yes/no” for each one. The scores for both items were then summed together to produce an index score (range = 0–9) for the composite measure of exposure to antismoking media messages.

Knowledge of the Health Effects of Smoking.

Adolescents were asked whether they knew or believed that smoking causes lung cancer in smokers, lung cancer in nonsmokers, stained teeth, and premature ageing. For each one that they indicated, they were assigned a score of 1, and these scores were summed to give an overall score (0–4) (Yang, Hammond, Driezen, Fong, & Jiang, 2010). The distribution of the index score was highly skewed and so the five-point index score was recoded into two levels by median split (median = 4), no/low knowledge (score <4), and high knowledge (score = 4), for use as an outcome variable.

Perceived Health Risk of Smoking. Perceived health risk of smoking (Yang et al., 2010) was assessed using the following two statements: (1) Smoking is harmful to smokers; (2) Smoking is harmful to nonsmokers. Each of these items had four response options: (1) definitely not, (2) probably not, (3) probably yes, and (4) definitely yes. Each item was recoded into a 0–3 score and summed to give an overall index score (0–6). The distribution of the index score was highly skewed, and so it was recoded into a dichotomous item by median split (median = 6), no/low (score <6), and high (score = 6) for use as an outcome variable.

Susceptibility to Smoking. This item was created based on two questions asked of never smoked adolescents: (1) If one of your best friends offered you a cigarette, would you smoke it? (2) At any time during the next year, do you think you will smoke a cigarette? Both of these questions had four response options: (1) definitely not, (2) probably not, (3) probably yes, and (4) definitely yes. Adolescents were considered susceptible if they gave any response other than “definitely not” to both (Pierce, Choi, Gilpin, Farkas, & Merritt, 1996).

Weight Construction and Data Analysis. A complex weighting procedure was employed to correct the estimates for sampling bias so that we can make population inferences. This involved household weight being constructed for each household in the sample, within its “pseudo-PSU,” namely urban or rural part of the each state (Malaysia) or province (Thailand). Following this, individual weight for everyone within his or her household was constructed. Then, the product of household weight and individual weight within the household was raised to the national level, and finally, the weights were rescaled to national sample size for pooled analysis (International Tobacco Control South-East Asia Survey, 2005).

Overall, 2,008 adolescents (smokers and nonsmokers) were included from Malaysia and Thailand in the baseline descriptive analysis. Point estimates (e.g., frequency and means) were computed using weighted data. Data were analyzed using chi-square tests, binary logistic regression, and multiple logistic regression to examine the association of antismoking messages and

education with knowledge of health effects, perceived health risk of smoking, and susceptibility to smoking. Odds ratios (OR) and adjusted odds ratios (Adj. OR) and 95% confidence intervals (CI) were calculated where appropriate. Significance was set at $p < .05$. All analyses were conducted on weighted data using the Complex Sample feature in SPSS to account for survey design. SPSS 15 was used for all analyses. Interaction terms between predictors and country/gender were also created to test for moderating effects.

Results

In total, 2,008 adolescents (Malaysia = 1,008 and Thailand = 1,000) were surveyed. Table 1 presents the sample characteristics of adolescents from Malaysia and Thailand. Thai adolescents were significantly younger than Malaysian adolescents (71% vs. 56% in the 13–15 aged range, $p < .001$). The majority of the respondents in both countries were nonsmokers (84% in Malaysia and 85% in Thailand). The gender distribution was similar for both countries, but the majority of the Malaysian adolescents were from the urban areas (59%), while Thai adolescents were

mainly from the rural areas (74%). Overall, significantly more adolescents from Thailand than Malaysia were advised by their health professionals about the danger of smoking (32% vs. 22%, $p < .001$), but the proportion of those taught in schools about the danger of smoking was not significantly different across the two countries (69% vs. 72%, $p = .44$). However, the proportion of adolescents reporting that they noticed a high level of antismoking messages was marginally higher in Malaysia than in Thailand (75% vs. 70%, $p = .180$). The mean level of knowledge of the health effects of smoking was significantly higher among Thai adolescents (3.34 vs. 3.58 for Malaysia and Thailand respectively, $p < .001$), but the mean level for the perceived health risk of smoking was significantly higher among Malaysian adolescents (5.40 vs. 4.98 for Malaysia and Thailand respectively, $p < .001$). About 15% of the adolescents in Malaysia and 14% in Thailand reported that they were susceptible to smoking.

Table 2 presents the results for the univariate and multivariate association between antismoking messages/education and the knowledge of the health effects of smoking. A significant country-interaction effect was found with the advice of health professionals, but there was no evidence of the

Table 1. Sample Characteristics of Adolescents in Malaysia and Thailand

Variables	Malaysia N = 1,008	Thailand N = 1,000	Chi-square p-value
Age group			
13–15 years	55.9%	71.4%	
16–17 years	44.1%	28.6%	<.001
Gender			
Male	50.9%	50.7%	
Female	49.1%	49.3%	.941
Residential			
Urban	58.8%	26.2%	
Rural	41.2%	73.8%	.036
Nurse or doctor talked about danger of smoking			
No	64.0%	63.3%	
Yes	22.3%	31.8%	
Not visited	13.7%	4.9%	<.001
Last year, taught about danger of smoking in your class			
No	31.0%	28.2%	
Yes	69.0%	71.8%	.444
Noticed antismoking media messages			
No or low	5.5%	7.6%	
Average	19.2%	22.0%	
High	75.4%	70.4%	.180
Knowledge of health effects of smoking			
Mean (SE)	3.34 (0.06)	3.58 (0.02)	<.001
Perceived health risk of smoking			
Mean (SE)	5.40 (0.08)	4.98 (0.07)	<.001
Smoking status			
Never smokers	84.3%	84.6%	
Experimenters	10.4%	11.6%	
Current smokers	2.4%	3.3%	
Others	2.9%	0.5%	.016
Never smokers			
Susceptibility to smoking	N = 839	N = 833	
No	85.0%	86.4%	
Yes	15.0%	13.6%	.532

Note. All presented data are weighted. CI = confidence interval; OR = odds ratio; Adj. OR = adjusted odds ratio.

Table 2. Logistic Regression Results Showing the Association of Antismoking Messages and Education With Knowledge About the Health Effects of Smoking Among Adolescents in Malaysia and Thailand

Predictors	Knowledge of health effects of smoking			
	Malaysia		Thailand	
	Univariate	Multivariate	Univariate	Multivariate
	OR (95% CI) (N = 950)	Adj. OR (95% CI) (N = 937)	OR (95% CI) (N = 896)	Adj. OR (95% CI) (N = 896)
Sociodemographics and smoking behavior				
Age group				
13–15 years	1	1	1	1
16–17 years	1.42 (0.96, 2.09)	1.44 (0.98, 2.13)	1.33 (0.98, 1.80)	1.46 (1.01, 1.12)*
Gender				
Male	1	1	1	1
Female	0.94 (0.61, 1.45)	0.75 (0.50, 1.12)	1.70 (1.15, 2.51)**	1.55 (1.04, 2.32)*
Urban or rural				
Urban	1	1	1	1
Rural	0.92 (0.61, 1.38)	0.97 (0.65, 1.45)	1.00 (0.71, 1.41)	1.01 (0.69, 1.48)
Smoking status				
Never smokers	1	1	1	1
Experimenters	0.61 (0.26, 1.44)	0.48 (0.23, 0.99)*	1.64 (0.69, 3.90)	0.95 (0.54, 1.67)
Current smokers	0.56 (0.15, 2.07)	0.45 (0.14, 1.43)	0.91 (0.19, 4.51)	0.60 (0.26, 1.43)
Others	0.44 (0.15, 1.28)	0.46 (0.15, 1.44)	0.72 (0.25, 2.08)	0.36 (0.12, 1.05)
Antismoking messages or education				
Nurse or doctor talked about danger of smoking				
No	1	1	1	1
Yes	0.91 (0.63, 1.33)	0.79 (0.53, 1.16)	1.62(1.09, 2.43)*	1.46 (0.91, 2.34)
Last year, taught about danger of smoking in your class				
No	1	1	1	1
Yes	2.14 (1.43, 3.20)***	2.06 (1.43, 2.97)***	1.86 (1.27, 2.72)**	1.59 (1.06, 2.38)*
Noticed antismoking media messages	1.73 (1.13, 2.63)*	1.66 (1.13, 2.44)*	1.50 (1.05, 2.15)*	1.36 (0.96, 1.93)

Note. All the data are weighted. CI = confidence interval; OR = odds ratio; Adj. OR = adjusted odds ratio; * $p < .05$, ** $p < .01$; *** $p < .001$.

gender interaction effect, and thus, the results were presented stratified by country. Both antismoking media messages and education from health professionals and schoolteachers were significantly and positively associated with knowledge of health effects of smoking in Thailand, but after controlling for the other covariates, only school education remained significant (Adj. OR = 1.59; 95% CI = 1.06–2.38, $p = .025$), with the other two becoming nonsignificant trends. By contrast, in Malaysia only being taught about the danger of smoking in class and noticing antismoking media messages were positively related to knowledge of the health effects of smoking, and these two effects remained significant even after controlling for other covariates (Adj. OR = 2.06; 95% CI = 1.43–2.97, $p < .001$ and Adj. OR = 1.66; 95% CI = 1.13–2.44, $p = .010$, respectively). Advice from doctors or nurses was not related to knowledge.

Table 3 shows the relationship between the perceived health risk of smoking and antismoking messages and education. Given that no country or gender interaction effect was

found, the results are presented combined across country and gender. Antismoking education from health professionals was not related to the perceived health risk of smoking, but both school antismoking education and the reported exposure to antismoking media messages were significantly and positively related to the perceived health risk of smoking. The significant effect of antismoking school education and media messages remained in the multivariate model (Adj. OR = 1.58; 95% CI = 1.21–2.07, $p = .001$ and Adj. OR = 1.49; 95% CI = 1.13–1.80, $p = .003$, respectively), although the effect of the latter became nonsignificant after adding in knowledge of health risk of smoking into the multivariate model. Knowledge of the health effects of smoking was significantly associated with the perceived health risk of smoking in both the bivariate and multivariate models (OR = 1.65; 95% CI = 1.42–1.92, $p < .001$ and Adj. OR = 1.71; 95% CI = 1.43–2.03, $p < .001$, respectively).

The predictive role of antismoking messages and education on susceptibility to smoking was explored for those who

Table 3. Results Showing the Association of Antismoking Messages and Education With Perceived Health Risk of Smoking Among Adolescents in Malaysia and Thailand

Predictors	Perceived health risk of smoking	
	Univariate	Multivariate
	OR (95% CI) (N = 1,857)	Adj. OR (95% CI) (N = 1,824)
Sociodemographics and smoking behavior		
Age group		
13–15 years	1	1
16–17 years	1.17 (0.91, 1.50)	0.98 (0.76, 1.27)
Gender		
Male	1	1
Female	1.34 (1.00, 1.79)*	1.19 (0.89, 1.58)
Urban or rural		
Urban	1	1
Rural	0.70 (0.48, 0.99)*	0.96 (0.71, 1.29)
Country		
Malaysia	1	1
Thailand	0.40 (0.30, 0.55)***	0.33 (0.22, 0.48)***
Smoking status		
Never smokers	1	1
Experimenters	1.64 (1.08, 2.48)	0.69 (0.46, 1.04)
Current smokers	1.61 (0.74, 3.50)	1.63 (0.84, 3.15)
Others	0.89 (0.33, 2.37)	0.49 (0.17, 1.42)
Antismoking messages or education		
Nurse or doctor talked about danger of smoking		
No	1	1
Yes	1.01 (0.77, 1.33)	1.02 (0.74, 1.41)
Last year, taught about danger of smoking in your class		
No	1	1
Yes	1.63 (1.22, 2.18)**	1.35 (1.01, 1.82)*
Noticed antismoking media messages	1.55 (1.26, 1.91)***	1.24 (0.99, 1.56)
Knowledge		
Knowledge of health risk of smoking	1.65 (1.42, 1.92)***	1.71 (1.43, 2.03)***

Note. All the data are weighted. CI = confidence interval; OR = odds ratio; Adj. OR = adjusted odds ratio; * $p < .05$, ** $p < .01$, *** $p < .001$.

reported never smoking before at baseline, while controlling for knowledge of health effects, and perceived health risk of smoking along with sociodemographic variables. Not only a country interaction effect was found but also a gender interaction but only in Malaysia. For ease of interpretation, the results are presented separately by country and gender (see Table 4). In both Malaysia and Thailand, susceptibility to smoking was not significantly associated with measures of antismoking education or with media messages, with one exception. Female Malaysian adolescents who reported receiving education about the danger of smoking in class were significantly less likely to be susceptible to future smoking, and the effect remained even after controlling for other covariates (Adj. OR = 0.26; 95% CI = 0.12–0.54, $p = .001$). Knowledge of the health risk of smoking was not related to smoking susceptibility in Malaysia for both male and female adolescents, but in Thailand it was protective from susceptibility to smoking among female adolescents (Adj. OR = 0.52; 95% CI = 0.29–0.93, $p = .030$) (for males the effect was a nonsignificant trend). By contrast, the perceived health risk of smoking was not related

to smoking susceptibility in Thailand for both gender groups but was protective among Malaysian male adolescents (Adj. OR = 0.63; 95% CI = 0.47–0.84, $p = .004$).

Discussion

This is the first comparative study conducted in two Southeast Asian countries to examine whether antismoking education provided in schools and by health professionals, as well as exposure to antismoking media messages, is related to knowledge of the health risk of smoking and perceived health risk of smoking and whether these interventions can help reduce smoking susceptibility among adolescents.

The study reveals that class education was the most important educational medium for adolescents from both countries as it was the only one with an independent effect on knowledge and the perceived health risk of smoking for both Malaysian and Thai adolescents. Reported awareness of antismoking

Table 4. Susceptibility to Smoking Among Never-Smoked Adolescents in Malaysia and Thailand

Predictors	Malaysia				Thailand			
	Male		Female		Male		Female	
	univariate	Multivariate	univariate	Multivariate	univariate	Multivariate	univariate	Multivariate
	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)
	(N = 685)	(N = 780)	(N = 885)	(N = 780)	(N = 685)	(N = 748)	(N = 885)	(N = 748)
Sociodemographics								
Age group	1	1	1	1	1	1	1	1
13–15 years	1.90 (0.68, 5.30)	2.12 (0.73, 6.18)	1.43 (0.51, 4.02)	1.87 (0.73, 4.76)	0.85 (0.40, 1.80)	0.85 (0.38, 1.88)	1.29 (0.52, 3.18)	1.09 (0.44, 2.71)
16–17 years								
Urban or rural	1	1	1	1	1	1	1	1
Urban	1.37 (0.68, 2.76)	1.35 (0.68, 2.68)	1.40 (0.65, 3.01)	1.28 (0.57, 2.86)	1.14 (0.72, 1.81)	1.10 (0.68, 1.78)	0.46 (0.19, 1.13)	0.47 (0.20, 1.15)
Rural								
Antismoking messages or education								
Nurse or doctor talked about danger of smoking	1	1	1	1	1	1	1	1
No	0.89 (0.35, 2.24)	0.92 (0.38, 2.26)	0.88 (0.35, 2.16)	1.55 (0.59, 4.06)	0.89 (0.53, 1.52)	1.05 (0.60, 1.82)	0.69 (0.22, 2.12)	1.27 (0.44, 3.71)
Yes								
Last year, taught about danger of smoking in your class	1	1	1	1	1	1	1	1
No	0.98 (0.42, 2.29)	1.24 (0.56, 2.72)	0.32 (0.13, 0.83)*	0.26 (0.12, 0.54)**	1.18 (0.81, 1.72)	1.15 (0.75, 1.75)	1.34 (0.48, 3.75)	1.41 (0.56, 3.57)
Yes	0.86 (0.38, 1.92)	0.99 (0.46, 2.14)	1.10 (0.52, 2.34)	1.34 (0.50, 3.55)	1.37 (0.91, 2.07)	1.41 (0.88, 2.26)	2.44 (0.77, 7.74)	2.83 (0.94, 8.53)
Knowledge								
Noticed antismoking media messages	1	1	1	1	1	1	1	1
Knowledge of health effects of smoking ^a	0.99 (0.64, 1.51)	1.13 (0.71, 1.82)	1.02 (0.65, 1.60)	1.06 (0.65, 1.74)	0.99 (0.65, 1.32)	0.95 (0.60, 1.51)	0.65 (0.38, 1.11)	0.52 (0.29, 0.93)*
Perceived harm								
Perceived health risk of smoking ^a	0.72 (0.52, 0.98)*	0.63 (0.47, 0.84)**	0.84 (0.54, 1.31)	0.94 (0.60, 1.45)	0.82 (0.62, 1.07)	0.80 (0.59, 1.09)	1.02 (0.65, 1.60)	1.15 (0.73, 1.79)

Note. All the data are weighted. CI = confidence interval; OR = odds ratio; Adj. OR = adjusted odds ratio; * $p < .05$, ** $p < .01$, *** $p < .001$.

^aHigher score means more of the attribute.

messages was independently associated with higher knowledge in Malaysia but not in Thailand. However, information from health professionals had no association at all. These findings suggest that both Malaysia and Thailand have reasonably effective antismoking education provided through their schools where it is provided. Its greater effectiveness as a risk communication tool may lie with the credibility and the personal relationship that teachers have with their students (Brian, 2000). Despite its importance, our estimate suggests that less than a third of the adolescents from both countries received antismoking education in schools, thus underscoring the need to increase such efforts.

The impact of the reported exposure to antismoking media messages on knowledge, which was found in Malaysia but not in Thailand, is not surprising as there was a major nation-wide mass-media antismoking campaign in Malaysia prior to our baseline survey, but no similar campaign in Thailand at the time of the study. This finding suggests that antismoking media messages can become an important source of knowledge where they are being systematically provided as would be expected. This by-country specificity also makes it more likely that the effects found in Malaysia actually relate to the antismoking campaign conducted there and are not some artifact. Consistent with other studies (Ackoff & Ernshoff, 1975; Hsieh et al., 1996; Rao & Miller, 1975; Simon & Arndt, 1980; Wakefield et al., 2003), antismoking campaigns such as the *Tak Nak* campaign in Malaysia can complement other efforts in increasing adolescents' knowledge of the health risk of smoking, which in turn can increase their perceived risk of smoking. Given their reach, such campaigns can be cost-effective vehicles in the long term because they reach so many, thus the apparently high upfront cost would actually be low based on per person influenced (Hurley & Matthews, 2008; Ratcliffe, Cairns, & Platt, 1997; Stevens, Thorogood, & Kayikki, 2002). The lack of influence of the advice of health professionals could be because the method of delivering the advice or content is not as persuasive or appropriate due to lack of experience in doing so. Few health professionals in these two countries see it as their role to provide information about the health risk of smoking and, even if they do, they are likely to do so only for the small number whom they think are susceptible to smoking or who are current smokers who need such advice. Our estimate indicates that only a fifth of Malaysian adolescents and just under a third of Thai adolescents received any advice from their doctors or nurses on the danger of smoking, so it may be premature to rule this out as a means of risk communication. There is a hint at least in Thailand that antismoking education provided by authority figures such as doctors and nurses might help to increase adolescents' knowledge of the health risk of smoking.

Of note are the gender differences found in the role class education plays in reducing smoking susceptibility among adolescents in the two countries. In Malaysia, class education had a direct effect on smoking susceptibility among the female adolescents, but not for the males. It seems for the male Malaysian adolescents, susceptibility to smoking is reduced only if an intervention can increase their perceived health risk of smoking. The gender differences in effect needs to be taken into account when designing interventions to ensure effectiveness particularly given the markedly higher rate of smoking

among male adolescents in Malaysia (Hammond et al, 2008). In Thailand, however, antismoking education in class did not have any direct impact on the smoking susceptibility of both male and female adolescents. Its effect appears to be indirect via knowledge in reducing smoking susceptibility among female adolescents. Taken together, this finding suggests that different strategies may be needed to protect male and female adolescents from smoking in these countries. It seems that in both countries antismoking messages and education exert their influence on the smoking susceptibility of adolescents primarily through increasing knowledge and the perceived health risk of smoking, with the exception of female adolescents in Malaysia where class education alone may be enough to protect them from smoking. The reasons for the difference between the two countries in the effect for female adolescents are somewhat unclear and may reflect differences in the quality of the antismoking education provided in schools, as the prevalence of such education is similar across the two countries. Alternatively, it could be because the *Tak Nak* campaign, which was specifically designed to target Malaysian adolescents, may have helped to reinforce the messages provided in Malaysian schools.

The main strengths of this study are the use of broadly representative samples, and the use of data from two middle-income countries with different cultural and tobacco control environments, thus, allowing us to determine which findings are generalisable and which are not. However, the study also has several limitations. Self-reported measures are susceptible to memory bias and the social desirability effect. Events that are salient and recent are more likely to be remembered and reported than those that are less salient and more distant. The measures for antismoking interventions did not assess the intensity of events, only whether or not they occurred, and this may have contributed to the lack of effect. The use of cross-sectional data also precludes any inferences about the directionality of effects. Thus, it is possible that adolescents who are more interested in smoking may be the ones who are more likely to report noticing antismoking messages or receiving antismoking education or advice.

Conclusions

Educating adolescents about the danger of smoking in schools is an effective means of reducing their smoking susceptibility in Malaysia and Thailand, although different prevention strategies may be necessary to ensure effectiveness for male and female adolescents. Nation-wide antismoking media campaign may be another important means of communicating the risk of smoking to adolescents.

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Declaration of Interests

None declared.

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