Predictors of smoking initiation among Thai adolescents from low-income backgrounds: A case study of Nakhon Pathom low-cost housing estates

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ABSTRACT

INTRODUCTION Globally, an estimated 1.3 billion people in the world smoke tobacco products, of which more than 8 million die annually. A disproportionate number of these deaths occur in low- and middle-income countries like Thailand. Over 19% (10.7 million) of the Thai population aged ≥15 years were estimated to be smokers; of these, 7.8% were aged 15–18 years. Nearly 1 in 10 Thai students is a current tobacco user; about 20% of these smokers had initiated smoking before their 10th birthday. This shows that early smoking initiation among Thai youths is indeed a public health problem. This study was conducted to examine the factors associated with smoking initiation among adolescents from low-income backgrounds.

METHODS A cross-sectional study was conducted among youth aged 15–18 years living in low-cost housing estates in Nakhon Pathom province between 1 December 2019 and 30 July 2020. A total of 290 participants were recruited by stratified random sampling. A proprietary questionnaire was used to collect the data, which were analyzed by binary logistic regression.

RESULTS Risk factors for smoking initiation were having one or both parents deceased (OR=2.28; 95% CI: 1.218–3.471, p=0.001), having divorced parents (OR=1.67; 95% CI: 1.158–2.509, p=0.013), and poor academic performance (OR=2.50; 95% CI: 0.133–3.551, p=0.032). Protective factors were having knowledge of cigarettes (OR=0.65; 95% CI: 0.179–0.895, p=0.004) and correct perception of legal public smoking places (OR=0.45; 95% CI: 0.140–0.850, p=0.025).

CONCLUSIONS To curb the risks of early smoking initiation among youths of low-income backgrounds, both education and health authorities need to collaboratively design interventions tailored to raise awareness of the negative health impacts of tobacco, improve the performance of underperforming students, and meet the social needs of students whose parents are either deceased or separated to improve their social ties.

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INTRODUCTION

Globally, the spread of tobacco smoking has continued to be a huge threat to the health of the world population, posing a proportionate burden on global public health[1]. An estimated 1.3 billion people in the world smoke tobacco products, which are the leading cause of preventable deaths[1,2]. The World Health Organization (WHO) reports that the estimated annual global tobacco deaths surpass 8 million; of these, over 7 million are attributable directly to tobacco use[3]. A disproportionate number of these deaths occur in low- and middle-income countries (LMIC) in which more than four-fifths of the global tobacco products users reside[4].

As in other LMICs, smoking in Thailand is currently alarmingly high, making it a public health and social problem. Over 45% and 3% of Thai adult males and females, respectively, were smokers[5]. A national survey on tobacco consumption in 2017 estimated that over 19% (10.7 million) of the population aged ≥15 years were smokers; of these, 7.8% were aged 15–18 years[6]. Among Thai students, nearly 1 in 10 are current tobacco users, with males four times more than females; about 20% of these smokers had initiated smoking before their 10th birthday[7].

While smoking causes no fewer than 8 million deaths globally[3], it accounts for over 50000 deaths annually in Thailand[6]. It is the second-highest cause of disability-adjusted life years among Thais, resulting in a huge economic loss. In 2009 alone, diseases attributed to smoking caused an economic loss of 74.9 billion baht or 0.78% of GDP, of which 11.5 billion baht were spent on direct medical expenses and 61.2 billion baht on premature death[8]. Most smokers begin smoking during adolescence, and the majority develop nicotine addiction afterwards[9,10]. Thus, preventing adolescent smoking in the early stage is an important public health strategy. While the average age of initiating regular smoking was 18 years for the general Thai population, it was 16 years for the 15–18 years age group[6].

Indeed, early smoking initiation among Thai youths is becoming a serious public health issue. This is happening despite the country's numerous tobacco control laws, which have been argued to be flawed with a lot of implementation weaknesses in the following areas: the boundary authorities of the law enforcement officials and their roles in implementing the law are either unknown or ambiguous; law enforcement exercises often exclude tobacco selling outlets outside the city or far away from communities; and arrests or fines due to violations in non-smoking areas are largely ignored[11,12]. Given that evidence has shown that quality of life in terms of health, environment and family ethics of poor people living in urban areas deteriorates[9], the study area, low-cost housing estate, is a modest estate that was built under the Thai government's housing project to cater for residential needs of the poor. In the face of the ever-increasing cost of living in urban areas, these houses were given mostly to low-income citizens to improve their quality of life. This area was suitable for the study because social crimes such as drugs, gambling and theft have been reported as prevalent among poor and low-income people[10,13]. Further evidence suggests that social crime perpetrators in urban areas are often those from low-income backgrounds, low educational level, having unstable careers, and live mainly in urban slums[11,12,14].

A spatial survey of the study site suggested that it is a place where adolescents can easily use cigarettes and other drugs due to a variety of reasons such as easy access to tobacco products in the neighborhood, poor presence or complete absence of tobacco regulatory agencies, and poor or unavailable tobacco education[15]. This is because both the study area and the targeted age group are hard to reach due to the nature of the setting. The 2017 tobacco consumption behavior survey in all the provinces in the country, found that Nakhon Pathom province has the highest tobacco consumption rates (19–21%) among Thais aged ≥15 years[6]. This implies that tobacco consumption in minors is a huge problem in the area, with the potential to spread to the neighboring provinces if left uncontained. Therefore, given the reasons outlined above, the research team hypothesized that youths living in the study area are at high risk of initiating smoking. Against this background, the objective of the study was to examine factors associated with smoking initiation among adolescents from low-income backgrounds.

METHODS

Study design

An analytical cross-sectional study was conducted among adolescents aged 15–18 years who were living in Thai government low-cost housing estates in Nakhon Pathom province from 1 December 2019 to 30 July 2020. First, a total of four low-cost housing estates were identified in the province; these were PhraPathon, BorPlub, Thahanbok, and Thatamnak. Individuals rather than housing units were considered as the sampling units. The total population of adolescents aged 15–18 years in the four housing estates, as obtained from the provincial Public Health office, was 848. Applying the formulae for calculating a sample size from a finite population proportion as shown below, a sample of 264 participants was determined. To account for no response, withdrawal or missing data, 10% of the determined sample size

was added, bringing the total to 290 participants[16]. The samples were drawn by stratified random sampling proportionate to the adolescents' population density in the four areas under study. Accordingly, 61 participants were drawn from both Phraprathon and Borphlab and 84 from both Thatamnak and Thahanbok. The required sample size n was determined by the formula:

$$n= \frac{NZ^2_{a/2}\,p(1\text{-}p)}{[e^2\,(N\text{-}1)]+[Z^2_{a/2}p(1\text{-}p)]}$$

where $Z_{a/2}$ is the table value of chi-squared for 1 degree of freedom at the desired confidence level (3.841), N the population size, p the population proportion (assumed to be 0.50 since this would provide the maximum sample size) and d the degree of accuracy expressed as a proportion (0.05), and e is...

As inclusion criteria, only adolescents and their parents both living in one of the four low-cost housing estates, and who had no hearing or speech impairment to provide information and communicate adequately were considered. Adolescents and their parents were both adequately informed about the purpose of the research and gave their consent to the disclosure of the research data.

Dependent variable and independent variables

Smoking initiation, which was measured by the current smoking status of the participants, was the dependent variable. This was measured on a dichotomous scale, and it was operationally defined as the smoking of any tobacco products. Independent variables were academic performance, stress, knowledge about smoking hazards, perception of non-smoking places, attitude, access to cigarettes, source of information about smoking, and smoking intention behaviors.

Research tool

A proprietary questionnaire, which was developed in English and then back-translated into the local language (Thai), was self-administered by the participants in hardcopies. The questionnaire consisted of nine distinct parts: 1) general information, 2) knowledge about smoking hazards, 3) perception of non-smoking places, 4) attitude, 5) access to cigarettes, 6) life stress, 7) source of information about smoking, 8) smoking intention behaviors, and 9) history of smoking. In all variables, except general information, knowledge about smoking hazards, and smoking history, there were negative questions or statements. This type of question is framed negatively (for example cigarette is good for my health). In this case, the highest score of a positive question becomes the lowest for the negative question and vice versa. Therefore, throughout the affected variables, responses for negative questions were scored in a reversed order (strongly agree = 1 and strongly disagree = 5; always = 1 while never = 3).

General information captures participants characteristics, mainly sociodemographics such as age, gender, academic performance (measured as cumulative grade point average), parental marital status and occupation, etc. Questions on knowledge of tobacco health impacts were administered with true or false response options. There were 6 questions in total, in which a correct response was assigned a score of '1' while a wrong was assigned '0', with total score 0–6 points. Perception of legal public smoking places was measured on a 3-point Likert scale (agree = 3, not sure = 2, and disagree = 1). The possible aggregated score ranged 9–27 points (9 items). Higher score indicating a poor perception of the legal public smoking places.

Similarly, questions related to four variables were measured on a 5-point Likert scale; attitude towards smoking (strongly agree = 5, agree = 4, not sure = 3, disagree = 2 and strongly disagree = 1), while access to tobacco, life stress and source of information about cigarettes were assessed in the same manner (always = 5, usually = 4, sometimes = 3, rarely = 2 and never = 1). Therefore, the possible scores ranged 9–45 points for attitude (9 items), 6–30 points for access to cigarettes (6 items), 5–25 points for life stress (5 items) and 4–20 points for information about cigarettes (4 items). While low attitude scores illustrate a more liberal attitude toward smoking, higher access scores show greater access to cigarettes. For life stress, higher scores demonstrate less stress while for the source of tobacco information, higher scores imply that the person got information from multiple sources.

In contrast, questions regarding smoking intention behaviors were close-ended and measured on a 3-point Likert scale (always = 3, sometimes = 2, and

never = 1). Therefore, the range of possible scores was 8–24 points (8 items). The higher the score, the more the intention to smoke. Questions regarding smoking history were asked with multiple choices. The questions included smoking status, number of cigarettes smoked in 30 days preceding the survey, duration of smoking, etc. Smoking initiation was measured by asking the participant about their current smoking status.

The overall mean scores for all the variables were computed and interpreted according to Best's criteria of classification as 'low', 'moderate' or 'high'[17]. Lastly, the overall mean scores were used for the final analysis to identify factors influencing smoking initiation. Before the data collection, the questionnaire was validated by three experts; two were experts in tobacco research and control, and the other was an expert in behavioral science. Upon satisfying the content validity test, the questionnaire was pilot-tested among 30 samples of seemingly similar characteristics as the study target group. Reliability analysis produced a Cronbach alpha of 0.87[18].

Data collection

Before data collection, an introductory letter was obtained from the Research and Development Institute Nakhon Pathom Rajabhat University to the provincial health authorities and participants' parents. This was to communicate the purpose of the research and to request permission to collect some baseline data (such as the population size of the target group) from the relevant agencies in Nakhon Pathom Province. The sampled participants were equally briefed about the research benefits and how important the information they provide during the data collection process for the benefit of all. Similarly, they were assured of their safety and full protection of their rights to withdraw, and confidentiality of the information they provide. After the participants or their guardians gave informed consent, the questionnaire was distributed to them and were asked to give their most accurate responses. Participants were allowed to fill in the questionnaires at their own pace, uninterrupted. After the questionnaires were retrieved, their completeness was checked by the research assistants for analysis eligibility.

Data analysis

The data were analyzed using the statistical programme for social sciences (SPSS®, version 22.0, New York, NY, USA). Current smoking status was the outcome of measure (dependent variable). Other variables such as knowledge of cigarettes hazards, attitude towards smoking, access to cigarettes, life stress, source of information about smoking, smoking intention behaviors, perception of legal smoking places and sociodemographic characteristics were the independent variables. Categorical variables were analyzed by descriptive statistics and presented as frequencies and percentages. Knowledge, attitude and other related variables were analyzed and presented by mean ± SD, with a corresponding interpretation. To measure the magnitude of association between the independent variables and the outcome variable (current smoking status), beta coefficients were produced using a stepwise binary logistic regression.

RESULTS

Out of the 290 questionnaires distributed and retrieved, only 240 were duly filled in and therefore eligible for analysis, giving a response rate of approximately 83%. From the analyzed data, as indicated in Supplementary file Table 1, it was found that the vast majority of the respondents were males (84.6%), mostly aged 18 years (57%). More than a third (37.5%) had a low CGPA (< 2.00) and more than half (52.5%) had CGPA between 2.00 and 3.00, with a large proportion having more than 100 baht (>$3) daily income. While most of the parents were on contractual employments (61%), nearly 55% were married and almost a fourth was separated. More than half (51.5%) of the participants were smokers and the overwhelming majority (63%) smoked 1–5 cigarettes a day, and 65.4% had been smoking for over 2 months preceding the survey.

Table 1 shows the mean (SD) and frequency (%) of participants' correct knowledge. The overall mean score was 4.71 (0.54) out of 6 and the per cent accuracy was approximately 79%. For the individual item mean scores, participants demonstrated the highest knowledge, mean 1.00 (0.7), in effects of direct smoking and secondhand smoking, and lowest knowledge of the illegality surrounding selling cigarettes to minors, mean 0.39 (0.49). An overwhelming number of the participants demonstrated appreciable knowledge of cigarettes as an addictive substance (97%), as a cause of lung

Table 1. Correct knowledge about harmful effects of cigarettes among adolescents of low-cost housing estate Nakhon Pathom Thailand, 2020 (N=240)

Knowledge items	Mean (SD)	Total	Males	Females	p
		n (%)	n (%)	n (%)	
Cigarettes are a type of addictive substance	0.97 (0.18)	232 (96.7)	196 (84.5)	36 (15.5)	0.643
Smoking can lead to diseases such as lung cancer and emphysema	0.99 (0.09)	238 (99.2)	201 (84.5)	37 (15.5)	0.715
Smoking, in addition to being harmful to smokers, also affects those around them	1.00 (0.7)	239 (99.6)	202 (84.5)	37 (15.5)	0.846
Cigarettes contain a large amount of caffeine, resulting in a faster heart rate in smokers	0.71 (0.46)	170 (70.8)	144 (84.7)	26 (15.3)	0.935
Regular smoking causes bad breath	0.99 (0.11)	237 (98.8)	201 (84.8)	36 (15.2)	0.396
It is not illegal to sell cigarettes to children under the age of 18	0.39 (0.49)	93 (38.8)	81 (87.1)	12 (12.9)	0.391
Overall	4.71 (0.54)	202 (84.0)	171 (71.2)	31 (12.8)	0.579
Total % of correct answers		78.6%			

Table 2. Attitude towards smoking among adolescents of low-cost housing estate Nakhon Pathom Thailand, 2020 (N=240)

Attitude items	Mean (SD)
Smoking is a great way to relieve stress	2.42 (1.06)
Smoking represents a modern cool person	3.19 (1.33)
Smoking represents maturity	3.24 (1.25)
Smoking increases acceptance among peers	3.15 (1.35)
Smoking increases self-confidence	3.03 (1.24)
Smoking disgusts the opposite sex	3.30 (1.16)
Smoking is a waste of money	3.81 (1.12)
Smoking shortens life	3.57 (1.09)
Cigarettes are a very dangerous drug, production and selling should be banned	3.32 (1.16)
Overall mean	3.23 (0.69)

Table 3. Source of information about smoking for adolescents of low-cost housing estates Nakhon Pathom Thailand, 2020 (N=240)

Items	Mean (SD)
My school organizes an activity to educate us about smoking	3.71 (0.99)
Community leaders organize a mass campaign against tobacco use	3.17 (1.19)
I receive information about cigarettes from public health workers	3.17 (1.19)
I receive news of activities related to smoking from media volunteers	2.75 (1.24)
Overall	3.20 (0.97)

cancer (99%) and tachycardia (71%), and influences bad breath (85%). Males appeared to be more knowledgeable than females across all items, but the difference was not significant.

Participants' perception of legal public smoking places was measured. As Supplementary file Table 2 demonstrates, the perception overall mean score was just 1.5 (0.41). Well over half (58.5%) of the participants had a correct perception of where smoking is legally acceptable. The vast majority of the participants (59%) disagreed that it is legal to smoke in public buses/trains, cinemas/theaters (52%), schools (70%), temples (57%), and government enterprises (63%). Additionally, 57% disagreed with smoking in children's parks, hospitals (71%), and shopping malls (52%). Only about 45% disagreed with smoking in hotels/resorts.

Participants' attitude towards smoking was average. As presented in Table 2, the overall mean attitude was 3.23 (0.69). The mean scores were relatively similar across the individual items. Except for the question 'Smoking is a great way to relieve stress', where the mean score was <3, the mean scores for the remaining items were >3.

Participants demonstrated easy access to cigarettes as the scores in most of the items were low (Supplementary file Table 3). The overall average score was 2.70 (0.78). Other individual items had scored as low as 1.84 (0.93), indicating higher access to cigarettes. Access to cigarettes was easier when a family member or acquaintances were involved, mean

Table 4. Smoking intention behaviors among adolescents of low-cost housing estate Nakhon Pathom Thailand, 2020 (N=240)

Intention items	Always	Sometimes	Never	Mean (SD)
	n (%)	n (%)	n (%)	
I am tempted to try when I see people smoking cigarettes on the streets	58 (24.2)	157 (65.4)	25 (10.4)	2.14 (0.57)
I feel the need to smoke when I feel stressed and depressed	101 (42.1)	129 (53.7)	10 (4.2)	2.38 (0.57)
I contemplate smoking after meals	60 (25.0)	100 (41.7)	80 (33.3)	1.92 (0.76)
When I go to a public restroom and see a smoking person, I want to try	65 (27.1)	92 (38.3)	83 (34.6)	1.92 (0.78)
I like to be with friends who smoke	120 (50.0)	100 (41.7)	20 (8.3)	2.42 (0.64)
I keep friends who like to smoke when visiting entertainment places	101 (42.1)	121 (50.4)	18 (7.5)	2.35 (0.62)
When I feel I want to smoke I simply find and pick up a filter and smoke	80 (33.3)	116 (84.4)	44 (18.3)	2.15 (0.70)
When I am at home, I think of smoking secretly in my bedroom	44 (18.3)	81 (33.8)	115 (47.9)	1.70 (0.76)
Overall	79 (32.8)	112 (46.7)	49 (20.5)	2.12 (0.23)

Table 5. Predictors of smoking initiation among adolescents of low-cost housing estate Nakhon Pathom Thailand, 2020 (N=240)

Variables	OR	95% CI	p
One or both parents are deceased	2.28	1.218–3.471	0.001*
Knowledge of cigarettes harm	0.65	0.179–0.895	0.004*
Divorced parents	1.67	1.158–2.509	0.013**
Perception about legal smoking places	0.45	0.140–0.850	0.025**
Poor academic record	2.50	1.133–3.551	0.032**

Factors with p≤0.25 such as age, gender, knowledge, perception of legal smoking places, academic performance, parental marital status, deceased parents, income, access to cigarette, stress level, source of information, and smoking intention were included in the model. *p<0.01, **p<0.05.

3.56 (1.35).

The participants' stress level was measured and presented in Supplementary file Table 4. It appears that participants were stressed from various life events such as studying [2.76 (1.04)], family [2.80 (1.07)], finances [2.89 (1.06)], neighborhood [3.05 (1.14)], and friends [3.17 (1.20)]. The overall mean score was just 2.93 (0.84), indicating a medium level of stress.

Participants' sources of cigarette information were assessed as shown in Table 3. The overall mean score was 3.20 (0.97). The mean score for participants who got information from school was 3.71 (0.99), community leader 3.17 (1.19), healthcare workers 3.17 (1.19), and media volunteers 2.75 (1.24).

We examined participants' behaviors relating to smoking intention as described in Table 4. The results show that the overall average of smoking intention was 2.12 (0.23). On the individual items, the mean scores vary from as low as 1.70 (0.76) (the temptation to smoke in the bedroom) to as high as 2.42 (0.64) (attracted to befriend smoking peers).

As depicted in Table 5, the binary logistic analysis shows that smoking initiation was associated with living parents, parental marital status, knowledge of cigarettes health hazards, perception of legal smoking places, and academic performance. Accordingly, the risk of smoking initiation among adolescents who lost one or both parents was 1.28 times higher than among those having both parents alive (OR=2.28; 95% CI: 1.218–3.471, p=0.001). Conversely, the risk of smoking initiation decreased by 35% among participants with high knowledge of the harmful effects of cigarettes as against those with low knowledge (OR=0.65; 95% CI: 0.179–0.895, p=0.004). Additionally, the risk of smoking initiation among adolescents from divorced parents was 67% higher than the risk among their counterparts whose parents were married (OR=1.67; 95% CI: 1.158–2.509; p=0.013). Similarly, those who had correct perceptions about legal smoking places had a 55% reduction in risk of smoking initiation (OR=0.45; 95% CI: 0.140–0.850; p=0.025) as opposed to those with wrong perceptions. Lastly, adolescents with poor academic performance had a significantly higher risk of smoking initiation than those with good performance (OR=2.50; 95% CI: 0.133–3.551, p=0.032).

DISCUSSION

Of the 240 participants aged 15–18 years, more than half (51.7%) were already smokers, with the majority having had started smoking longer than a couple of months preceding the survey. Nearly two-thirds of these smokers smoked between 1–5 cigarettes per day. This was expected, despite their demonstrated high level of knowledge of the harmful effects of smoking, because the perceived social benefit of smoking among adolescents has been reported to outweigh the perceived harm of smoking, therefore adolescents' tendency to smoke is not diminished by the undermined perceived smoking hazards[19].

However, access to cigarettes was relatively easy and a large proportion did not even know that selling cigarettes to minors is illegal under the Thai tobacco control laws. This is because a previous study reported that more than two-thirds of tobacco retailers violate tobacco control laws by selling tobacco products to minors, selling in sticks, and having point-of-sale (POS) displays[20]. This easy access might be an influencing factor for smoking initiation despite high knowledge of the health consequences of using tobacco products. Moreover, nearly a third of adolescents in our study were unsure about places where public smoking is legally allowed or not. This highlights the existing gap of knowledge that calls for educating adolescents to raise their awareness of the designated acceptable public smoking areas.

The low-cost housing estates investigated in the present study were mainly the residences of a low-income Thai population whose children are more inclined to use tobacco[21]. Their neighborhood differs significantly in many respects from the traditional Thai setting. Noteworthy, the socioeconomic status (SES) of these people is generally low – this includes low education attainment, low-income jobs, and poor social cohesion. Studies have shown that a socially cohesive environment has the potential to reduce the use of drugs among its youths[22]. In addition to this economic disadvantage, a significant number of parents were smokers, many youths were either dropouts or never went to school, and child labor was prevalent. This poor SES status is a predictor of smoking initiation. Itanyi et al.[23] reported that low SES increases the odds of smoking initiation among adolescents in urban neighborhoods. Importantly, the neighborhoods of these estates are mostly near major cities where serious criminal activities occur, underscoring the observed smoking risks among the study participants. Accordingly, evidence from previous studies has linked perceived crimes in neighborhood environments to a significant rise in youth substance abuse[22].

Strong bonding between parents and children has been reported to improve parent–child interactions regarding issues of a sensitive nature such as sexuality, alcohol, tobacco and drugs, thereby reducing risky behaviours[24,25]. Unfortunately, the parent–child connection within and between families in the study area was poor. This could be the reason that increased risks of early smoking initiation were observed among youths whose parents were deceased or those living within a separated family (due to divorce or other living arrangements). This was no surprise as the majority of children/youths were often left alone or with relatives because the parents usually went to work in distant places and returned home late. This lack of parental connection could deprive youths of crucial guidance through adolescence, which is a critical period in their lives requiring parental guidance to make healthy choices now and be economically productive later. Furthermore, evidence has demonstrated that single parenting reduces parent–child connections because the parent has to balance the parental responsibility with making ends meet. This could often lead to a compromised quality time spent with the children[26]. Similarly, parental/family structure is an immediate environment that influences both social and sexual behaviors of young people at different stages of their lives[25,27-31]. Not only in early smoking initiation, but even in sexual behaviors, parents play fundamental roles. For instance, sexual initiation sets on earlier in youths raised by or living with a single parent than in those living with both parents[24,32]. While this could potentially partly explain the reason why children raised by a single parent initiate smoking early, the loss of parents may further exacerbate the already weakened connection, making them vulnerable to wrong choices such as developing an interest in tobacco use in the early years of their lives.

Moreover, almost one in three adolescents in our study was unsure about legally permissible public smoking places. However, correct perception of legal public smoking places appeared to decrease the risks

of early smoking initiation among the participants. Perhaps how public smoking venues are designated, usually isolated from populated areas, may create some sort of negative impression about smoking in the minds of youth, thereby dissuading them from attempting it. However, public smoking is almost a norm in Thailand, as places provided for public smoking are not properly used and the offenders are usually ignored[11,12]. As such, a survey reported that almost 70% of Thai smoking students were first exposed to smoking in public smoking places[7]. This may pose a serious public health concern because it may indicate that smoking areas are provided close to public places where minors have access.

Expectedly, youth who were correctly knowledgeable about the health impacts of tobacco showed a decline in the likelihood of smoking initiation. Corroborating this finding is a study that reported a significantly higher cessation intention among Thai smoking university women after being properly sensitized about the health-damaging effects of tobacco[33]. The plausibility of this finding and its agreement with our findings was expected because there has been a growing body of evidence of successful smoking cessation interventions with the transtheoretical model (TTM) approach[34]. Also, youth with low educational attainment reported an increased risk of smoking initiation than those with high levels[21,35]. This is not surprising as education is a prerequisite of knowledge, which allows youth not only to make their own decision but do so while being aware of the consequences of their choices. Arguably, knowledge is a key instrument for decision making in adolescent life. Adolescents that have adequate quality information would most likely take the right protective decisions, compared with those who lack such knowledge.

As observed in the present study, smoking initiation was more likely among participants who underperformed in school compared with those who performed well. Consistent evidence of an association between poor academic performance with higher risk of early smoking initiation, more smoking frequency, and larger quantity of cigarettes smoked, has been documented[36-38]. Recent evidence, which reaffirms the relationship between poor academic performance and smoking, also explores the unexplained role and pattern of friendship ties as they relate to smoking and academic performance among school-going adolescents[39]. As good academic performance is associated with socioeconomic opportunities later in life[40], solving the problem of early smoking initiation among school-age youth becomes important in helping their adulthood years to be more productive.

Limitations

There were only 37 female adolescents in the study sample, of which only a third was smoking. This under-representativeness of females prevented us from running gender-segregated analysis models. Therefore, the results presented here are for both genders combined. Hence, care is needed when interpreting the results.

CONCLUSIONS

Early smoking initiation among the youth of Nakhon Pathom low-cost housing estates was pervasive. To curb the risks of smoking initiation early, both education and health authorities need to collaboratively design interventions tailored to raise awareness of the negative health impacts of tobacco, improve the performance of the academically lagging students, and meet the social needs of students whose parents are either deceased or separated, to improve their social ties. Similarly, schools should also constantly monitor smoking behaviors among underperforming students as they represent a high-risk group.

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The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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DATA AVAILABILITY
The data supporting this research are available from the authors on reasonable request.

AUTHORS' CONTRIBUTIONS
Conceptualization, PN and NN; methodology, PN; software, SY; validation, PN, SY and NN; formal analysis, PN; investigation, PN; resources, SY; data curation, PN; writing and original draft preparation, SY; writing, reviewing and editing, SY; visualization, PN; supervision, NN; project administration, PN. All authors have read and agreed to the final version of the manuscript.

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