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ORIGINAL RESEARCH

Multi-sector Development of Measures and Interventions to Prevent New Smokers Among Youths Living in Underprivileged Housing Projects in Thailand

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Abstract

The purpose of this research is to develop preventive measures against smoking among youths living in *Baan Eua Athon*, underprivileged housing projects in Thailand. Utilizing a mixed-methods approach, this research encompassed quantitative and qualitative data collection in nine provinces of Thailand. Stratified multi-stage sampling was conducted, and data was gathered using questionnaires, in-depth interviews, and focus group discussions. Adapting Green and Kreuter's Precede–Proceed Planning Model, the researchers identified key factors influencing youth smoking initiation through extensive fieldwork from January to December 2021. The results show that the primary drivers for new smokers, in order of significance, are limited knowledge about the effects of smoking, values, perception of associated disease risk, stress and anxiety, influence by family and friends, smoking control policies and activities of educational institutions influencing risk behaviors for new smokers. Research respondents from multiple sectors formulated seven measures to prevent new smokers, namely (1) building the capacity of stakeholders to increase knowledge among the target group; (2) creating a body of knowledge and control with retail shop operators; (3) building a smoke-free network team in the area; (4) creating smoke-free families; (5) creating an application to assess risk behaviors and offer an online consulting system; (6) developing a search process; and (7) analyzing interests to promote the needs of youth. Recommendations from this study can be used to monitor risk behaviors for new smokers and guide policy decisions for substance abuse prevention practitioners in the area.

Keywords Healthcare · Smoking · Social work · Underprivileged housing · Youth welfare

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Introduction

Despite considerable progress in reducing tobacco consumption in Thailand, effective control measures are still needed. In comparison to reported increases in the previous decade (Lee et al., 2015; Sangthong et al., 2012; Vatisathakakit, 2007), more recent investigations consistently indicate a declining trend in adolescent smoking habits (Intarut et al., 2019; Tinn et al., 2022). Whilst control measures are proving effective, studies nevertheless indicate that Thailand is predicted to fall short of the UN General Assembly target to reduce smoking by 30% before 2025 (Aungkulanon et al., 2019; Prasad & Kaur, 2021). According to current projections, the Thai smoking rate will be 17.5% by 2025, rather than the promised goal of 15%; the smoking rate is currently being reduced by 0.23% annually, rather than the necessary 0.44% (TRC, 2019).

A joint report by the WHO and the United Nations Development Programme (UNDP) identified the structure of Thailand's tobacco control system as its main weakness, and it has been suggested that multi-sector planning should be coordinated through a single channel and focused on specific target groups (WHO & UNDP, 2021). This is consistent with analysis of the Thai Non-Smokers' Health Protection Law (Saengcharoensap & Ratchadapunnathikul, 2019). There must be greater consideration of specific social contexts in order to determine the most effective local measures for reducing youth access to tobacco (Stead & Lancaster, 2005). At present, local stakeholders are not empowered to plan their own solutions to tobacco use in local communities (Charoenca et al., 2021, Sansanoh & Chakriasakul, 2013; Thammakul et al., 2013; Waipoka, 2013). Moreover, family and community involvement is more focused on reducing youth smoking and helping young smokers to quit than on preventing smoking initiation (Phetchaphum & Yamklebe, 2018; Samatnaresuan et al., 2013). This is an unsustainable approach that is underscored by the presence of new smokers in Thai society, despite a series of laws to protect the health of non-smokers since 1992. The problem is particularly prevalent in the underprivileged communities of the *Baan Eua Athon*.

Baan Eua Athon are urban housing projects for low-income groups that are notorious for a variety of social problems, including crime, drug abuse and gambling (Plangcharoensri, 2020). Interrelated are the low quality of life, low income, and low education levels of people living in the projects (Keyen, 2011; Poonsawat et al., 2022). Initial reports have suggested that high cigarette and drug use among youths in these projects is due to ease-of-access, lack of supervision and poor education (TRC, 2018). The residents of *Baan Eua Athon* projects should therefore be considered at a high risk of smoking and exposure to secondhand smoke, and thus a key area to target if Thailand wants to reduce tobacco consumption among young people. Given these challenges, this study aims to investigate the specific factors contributing to high cigarette and drug use among youths in the *Baan Eua Athon* projects. It seeks to answer the research question: What are the most effective strategies for reducing tobacco consumption among young people in these underprivileged housing projects? Consequently, the investigation

is designed to examine the situation in nine *Baan Eua Athon* projects across Thailand, identifying key risk factors and proposing targeted, evidence-based preventive solutions to curb youth smoking.

Theoretical Foundations and Models in Youth Smoking Onset

Tyas and Pederson (1998) identified four fundamental academic theories used to explain the onset of smoking among youths: reasoned action (Ajzen & Fishbein, 1970), social learning (Bandura, 1977), escalation of problem behaviors (Jessor and Jessor, 1977) and product of low self-esteem (Rosenberg, 1979). For Tyas and Pederson, subsequent studies on smoking among youths can be broadly categorized into one of these four areas: sociodemographic, environmental, behavioral or personal. In recent literature, the factors associated with smoking among youths has been refined into three main groups: (1) personal factors, such as knowledge, stress, perception of associated disease risk and self-esteem (Junnual et al., 2019; Khani Jeihooni et al., 2022; Shaluhiyah et al., 2020); (2) interpersonal factors, such as having close friends who smoke, being persuaded by friends and having parents who smoke (Joung & Chung, 2019; Patanavanich et al., 2021); and (3) environmental factors, such as ease of access to cigarettes and school rules related to smoking (Ninkron et al., 2022; Phetchaphum & Yamklebe, 2018). There are now far fewer examples of socio-demographic causes being considered primary factors, with these often providing a thread through the other three categories.

Generally-speaking, the modest body of domestic Thai literature on smoking among adolescents also falls into these categories. However, there is seemingly a stronger inclination for Thai scholars to emphasize environmental and personal factors (Sangthong et al., 2012). Phetchaphum et al., (2014) concluded that smoking rates among youths could decline further if 68.9% of retailers in rural Thai communities did not sell tobacco products to youths. This is a wider problem in Southeast Asia, as shopkeepers value economic sustainability over compliance with tobacco regulations (Kyaing et al., 2011; Phetphum & Noosorn, 2020). By contrast, Silpanon and Laprattanathong (2013) claim that the primary causes of smoking among students in Thailand are psychological. In recent years, this has been the trend of scholarship on smoking among youths in general (Li et al., 2010; Patanavanich et al., 2021; Phetchaphum & Noosorn, 2020).

The trichotomy of causal factors is consistent with Green and Kreuter's (1999) Precede–Proceed Model, which stated that health behaviors are influenced by predisposing, reinforcing, and enabling causes, or in this case personal (leading), interpersonal (facilitating) and environmental (auxiliary) factors. In the context of healthcare, Green and Kreuter argued that educational diagnosis must be identified before a suitable intervention strategy can be determined (Aldiabat & Le Navenec, 2013; Green et al., 1980; Gielen et al., 2008). This is applicable to cigarette consumption, where research has concluded that identification of pre-existing beliefs and environmental factors (Precede) is an important step in successful prevention campaigns (Sangalang et al., 2019). Indeed, Suen et al., (2020, 2022) have successfully used the Precede–Proceed approach to provide timely, critical information to developing

system-level approaches to support smoking cessation efforts. The second part of Green and Kreuter's model (Proceed) provides a structure to support planning and implementation of health promotion programs and can be used for smoking prevention plans, focusing on environmental factors and long-term community participation (Green & Kreuter, 2005; Hogan et al., 2021).

There has been "wide adoption and considerable success" of the precede–proceed model in healthcare and intervention, yet there are some limitations (Gielen et al., 2008: p.417). The heavy data focus requires exhaustive preliminary analysis that is not always practicable in communities with limited financial and human resources (Bertera, 1990). This also delays the impact of the intervention. Gielen et al. (2008) suggested that a solution to these issues is to shorten or combine the assessment phases, which seems particularly appealing in the *Baan Eua Athon* context if solutions are to be reached by 2025. A further weakness of the precede–proceed model is a lack of emphasis on specific and explicit intervention methods, which slows down the turnaround from planning to implementation. Gielen et al. (2008) suggest a solution to this could be the adoption of intervention mapping based on theories outlined by Bartholomew et al. (2006) or the incorporation of computer-tailored health communication. With these strengths, limitations and suggestions in mind, the researcher applied an adapted precede–proceed model as a conceptual framework for this research.

Methodology

This mixed-methods investigation combined both quantitative and qualitative research. Stratified multi-stage sampling was conducted in each of the four regions of Thailand (North, Northeast, South, Central) to identify two provinces from each region. These were added to Bangkok to create a research area of nine provinces. Data was collected in the field from January to December 2021 following an adapted Precede–Proceed Planning Model (Fig. 1).

During the 'precede' stage, the researcher collected quantitative data using questionnaires with 1307 youths who had lived in the *Baan Eua Athon* project for at least 1 year (Table 1). Participants were selected using a stratified random sampling method, creating a list of youths aged 18–25 years, which was randomly arranged by name. To ensure an even distribution of participants, the researcher divided the youths into groups based on the ratio of the sample size and area population. The objective of this stage was to gather preliminary data to identify pre-existing beliefs and environmental factors associated with smoking among adolescents in the *Baan Eua Athon*. The researcher created a multi-section questionnaire for individuals in the *Baan Eua Athon* projects, following the 'precede' phases 1–3 (Table 2; Online Appendix I). While standardized measures are valuable, the decision to employ a self-constructed questionnaire was driven by the need for a contextually specific tool that could capture the unique environmental, cultural, and socio-economic factors influencing stress and anxiety among youths in the Baan Eua Athon projects. This approach allowed for a more nuanced understanding of the specific drivers of smoking behavior in this particular community setting. Questionnaire responses were

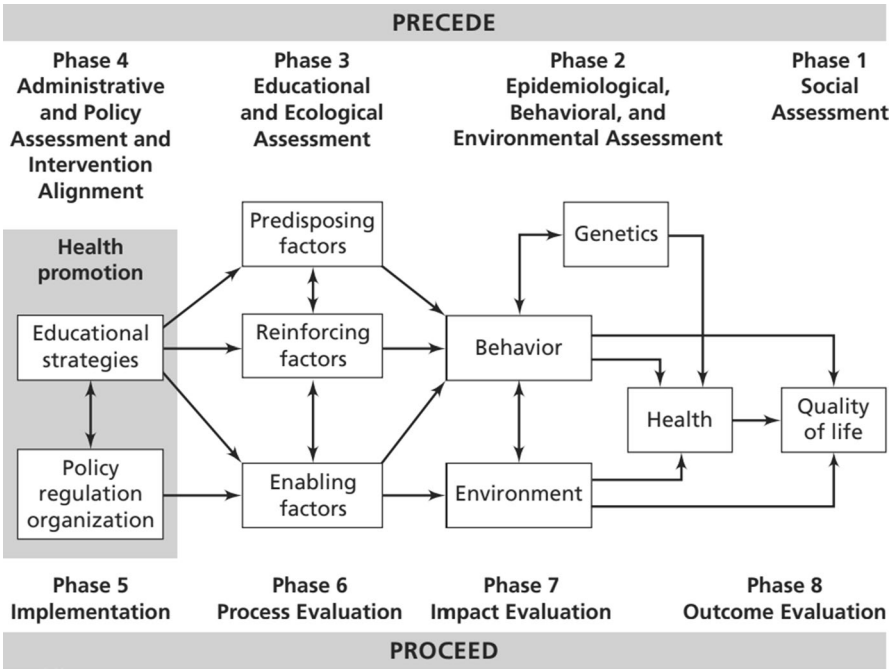

Fig. 1 Green and Kreuter's (2005) Precede–proceed planning model. Source: Gielen et al., 2008: p.410

Table 1 Sample sizes for the quantitative phase of the investigation

Province	Number of *Baan Eua Athon* projects	Proportion of research population	Number of individuals
Northern region			
Chiang Mai	7	7/50 = 0.14	183
Phitsanulok	4	4/50 = 0.08	105
Northeastern region			
Chaiyaphum	2	2/50 = 0.04	52
Khon Kaen	4	4/50 = 0.08	105
Central region			
Samut Songkhram	4	4/50 = 0.08	105
Ratchaburi	1	1/50 = 0.02	26
Southern region			
Nakhon Sri Thammarat	2	2/50 = 0.04	52
Surat Thani	1	1/50 = 0.02	26
Bangkok			
Bangkok Municipality	25	25/50 = 0.50	653
Total	50		1307

Table 2 Details of questionnaire content from research Phase 1 (Precede)

Questionnaire section	Question content	Response format
Part 1: general information	Sex, age, education level, average daily parental income, youth occupation, current family characteristics, and main occupation of parents	Checklist
Part 2: history and accessibility of cigarettes	Smoking history, accessibility to cigarettes	Open-ended questions
Part 3: knowledge about the effects of smoking	8 questions about the effects of smoking	Yes–no
Part 4: awareness of the Non-Smokers Health Protection Act, B.E. 2535 (1992)	16 questions about the Non-Smokers Health Protection Act, B.E. 2535 (1992)	Yes–no
Part 5: values conducive to smoking	10 questions about values conducive to smoking	Rating scale (3-level scale)
Part 6: perceived risk of disease caused by smoking	7 questions about perceived risk of disease caused by smoking	Rating scale (5-point scale)
Part 7: perception of violence caused by smoking	7 questions about perception of violence caused by smoking	Rating scale (5-point scale)
Part 8: intention to not smoke	7 questions about intention to not smoke	Rating scale (5-level scale)
Part 9: stress and anxiety of youth	8 questions about stress and anxiety of youth	Rating scale (5-point scale)
Part 10: family and peer influence	2 questionnaires about family and peer influence	Rating scale (3-level scale)
Part 11: smoking control policies and activities of educational institutions	3-Level estimation scale about smoking control policies and activities of educational institutions	Rating scale (3-level scale)
Part 12: youth smoking prevention in the Baan Eua Arthorn Project	3-Level rating scale about youth smoking prevention	Rating scale (3-level scale)
Part 13: risk behaviors for being a new smoker	3-Level estimation scale about risk behaviors for being a new smoker	Rating scale (3-level scale)

processed through a statistical analysis program (SPSS) to analyze number, percentage and mean. For the factors influencing risk behaviors for new smokers, data was analyzed using logistic regression analysis with a Forward LR model (statistical significance = 0.05). In addition to this quantitative analysis, responses to open-ended questions in the questionnaire were qualitatively analyzed using thematic analysis. This involved coding the responses to identify emerging themes and patterns, which provided deeper insights into the personal experiences and perspectives of the individuals from the *Baan Eua Athon* projects regarding smoking behavior. The findings from this phase highlighted specific factors which then informed subsequent qualitative study dedicated to exploring the causes and origins of these identified factors. The insights gained from the qualitative exploration were then utilized to develop the next phase of the study, aimed at developing measures to prevent new smokers, thus demonstrating an iterative and complementary relationship between the quantitative and qualitative aspects of the research.

In this phase, the study focused on collecting further qualitative data through semi-structured, in-depth interviews with key informants, purposively selected for their direct experience and perspectives relevant to youth smoking. The sample comprised 8–12 individuals from each of four distinct groups: youths at risk of becoming new smokers, their parents, project caretakers, and public health officials. The selection criteria included factors such as age, exposure to smoking risks, and involvement in community health. The researcher, skilled in substance abuse prevention and youth mentorship, conducted the interviews, ensuring data credibility through prolonged engagement and persistent observation. Detailed notes were taken during each interview. To enhance reliability, member checks were performed, allowing informants to review and validate their interview transcripts. Following data collection, methodological triangulation was employed to verify the data's validity. The collected data was then meticulously analyzed using an inductive thematic analysis approach, with results classified into relevant typologies for comprehensive understanding. The qualitative sub-study in this phase aimed to explore the causes and origins of factors influencing the behavior of potential new smokers among youths residing in the *Baan Eua Athon* projects of Thailand. The research questions focused on understanding what are perceived as the main causes of youth smoking, areas where youths lack resilience against smoking, the disadvantages of smoking, and effective strategies for preventing smoking among youths.

The same key informants from the qualitative data collection were used for the next stage of the investigation (Proceed Phase). The objective of this phase was to work with community members to identify smoking prevention measures for the youths in *Baan Eua Athon*. The researcher drew up draft measures to prevent new smokers, which were presented to informants during semi-structured focus group discussions. The questions for group discussions were designed to develop preventive measures for new smokers through the cooperation of relevant sectors in the Baan Eua Athon youth community. These included inquiries about opinions on new smoker prevention policies, existing approaches to reduce youth engagement with smoking, challenges faced in preventing new smokers, expectations for prevention strategies, obstacles in utilizing smoke-free networks, approaches for creating such networks, and strategies to overcome challenges in implementing

new smoker prevention initiatives. For the purposes of delineating the participatory and non-participatory elements of the investigation more clearly, Phase 4 of Green and Kreuter's original 'precede' model has been incorporated into the 'proceed stage' of this methodology. After conducting initial research, the researcher proceeded to carry out a pilot study to evaluate the effectiveness of new smoker prevention measures. In this final stage of the investigation, the researcher purposively selected a specific group of 30 informants aged 18–25 residing in the *Baan Eua Athon* project of Ratchaburi Province who met four criteria, including having leadership potential, possessing a strong awareness of social capital, being community leaders interested in youth smoking surveillance, and being willing to join as a model area to try out measures to prevent new smokers together. These individuals did not take part in the initial survey during Phase 1 of the research. The model area where these new smoker prevention measures were implemented was the *Baan Eua Athon* Project in Ratchaburi Province. Prior to selection as the pilot area and implementation of the newly developed prevention measures, a spatial survey was conducted to determine area suitability. Evaluation of the newly developed measures was then conducted as a participatory assessment with the local community after an implementation period in the Ratchaburi project. From initial conversations in the community, the researcher selected members for an evaluation team and established assessment guidelines. Evaluation of the initial success of the preventive measures was based on a six-topic evaluative survey which asked the same questions as the original survey, but only in the following six categories:

1. Knowledge about the effects of smoking
2. Values that are conducive to smoking
3. Perception of the risk of diseases caused by smoking
4. Stress and anxiety of youth
5. Influence of family and friends
6. Policy and activities to control smoking in schools

The survey was conducted before and after the implementation of the new smoker prevention measures and analyzed using a paired sample t-test. The outcome measures for the statistical analysis in assessing the success of the trial implementation of new smoker prevention measures in the *Baan Eua Athon* youth projects included changes in internal factors of the youths, such as knowledge about the effects of smoking, values conducive to smoking, perception of disease risk from smoking, stress and anxiety levels, and influence from family and friends, as well as school policies and activities related to smoking control. The analysis focused on comparing the differences in these aspects before and after the implementation of the activities. The success of the intervention was thus measured by evaluating changes in these key areas, thereby providing a comprehensive overview of the impact of the preventive measures on youth smoking behavior in the *Baan Eua Athon* projects.

All research instruments used in this study were verified thoroughly. Firstly, content validity was ensured by having qualified experts review and revise the

questionnaire to align it closely with the research variables. Secondly, the instruments' reliability was tested by conducting a trial with a group of 30 individuals who shared characteristics with the main sample. This trial phase was critical for assessing the consistency of the responses. The results of this trial were then analyzed to determine the reliability of the questionnaire, with an acceptable reliability coefficient determined to be 0.86 or higher. These measures ensured that the research tools were both valid and reliable, providing a robust foundation for the subsequent statistical analysis of the study's findings. The study received ethical approval from the Institutional Review Board (IRB) of Nakhon Pathom Rajabhat University, with the approval number 002/2564 dated 28 January 2021. In terms of informed consent, the principle researcher introduced themselves to the participants and clearly explained the objectives of the research. It was emphasized that participation was entirely voluntary and that the participants could withdraw from the study at any time without any negative consequences. Youths and their parents or guardians were requested to sign consent forms, with their agreement documented in writing and witnessed by a third party to ensure ethical compliance. This research was financially supported by the National Research Council of Thailand (NRCT) for the year 2020 and ethical approval was obtained from the Institutional Review Board (IRB) of Nakhon Pathom Rajabhat University, Approval Number 002/2564—28th January 2021.

Results

1307 individuals completed the initial questionnaire in phase 1 of the investigation, 38.0% female and 62.0% male. The majority of the respondents (66.2%) were aged between 15–20 years, while 38.8% were between 18 and 25 years. Regarding the marital status of their parents, 57.0% of the parents were living together, 24.2% were separated, 10.6% were divorced, 1.5% had both parents deceased, and 6.7% had one parent deceased. The predominant level of education among respondents was vocational high school (80.1%), followed by those not attending school (8.2%), primary education (6.2%), and tertiary education or higher (5.5%). The average daily income of the parents was predominantly between 30 and 50 Thai Baht (43.6%), less than 30 Baht (37.3%), 51–80 Baht (12.1%), 80–100 Baht (4.7%), and more than 100 Baht (7.0%). The primary occupation of fathers was mainly in agriculture (40.0%), followed by labor work (33.4%), unemployed (20.0%), government/public enterprise (3.3%), and trading/business (3.3%). The majority of mothers were not employed (45.3%), followed by labor work (27.5%), agriculture (12.7%), government/public enterprise (10.5%), and trading/business (4.0%).

The results of quantitative study found a total of 20 factors influencing risk behaviors of new smokers. Applying a statistical significance criteria at 0.05 found 6 variables affecting risk behaviors for new smokers: (1) knowledge about the effects of smoking, (2) values conducive to smoking, (3) perception of risk of smoking-related diseases, (4) stress and anxiety, (5) influence of family and friends, and (6) smoking control policies and activities at schools. It was found that all six factors can predict the likelihood of new smokers among youth living in the *Baan Eua Athon* projects

Table 3 Results of the analysis of factors influencing the risk behavior of becoming a new smoker among youths living in Baan Eua Athon Project in Thailand

Variable (n = 1307 people)	Adjusted OR	95% CI	*p*-value
Knowledge about the effects of smoking			
High	1.0		
Low	1.23	1.1–2.9	< 0.001*
Values conducive to smoking			
No	1.0		
Yes	1.37	1.6–5.7	< 0.001*
Perception of risk of smoking-related diseases			
Recognise	1.0	1.4–4.9	0.002*
Do not recognise	1.98		
Stress and anxiety			
None	1.0	1.2–3.8	0.025*
Stress and anxiety	1.90		
Influence of family and friends			
None	1.0	1.2–6.1	0.011*
Influence	1.13		
Smoking control policies and activities at schools			
Policies and activities in place	1.0		
None	1.50	1.1–2.3	0.004*

*p-value < 0.05

with a success-rate of 57.1% and statistical significance of 0.05. Table 3 is a summary of statistical analysis from the Phase 1 questionnaire.

In this study, the risk behavior of new smokers among youths in the Baan Eua Athon project was analyzed using a logistic regression model. The model's prediction equation, $Z = \beta0 + \beta1X1 + \beta2X2 + \ldots + \beta pXp$, quantitatively assessed the influence of various factors on youth smoking behavior. Here, Z represents the risk behavior of new smokers, β0 is the constant in the equation, β1, β2,…,βp are the regression coefficients corresponding to the independent variables which include Knowledge About the Effects of Smoking, Values Conducive to Smoking, Perception of Risk of Smoking-Related Diseases, Stress and Anxiety, Influence of Family and Friends, and Smoking Control Policies and Activities at Schools. The regression equation, formulated as Risk behavior of new smokers in adolescents living in the Baan Eua Athon project in Thailand = 0.994 + 1.23 (Knowledge About the Effects of Smoking) + 1.37 (Values Conducive to Smoking) + 1.98 (Perception of Risk of Smoking-Related Diseases) + 1.90 (Stress and Anxiety) + 1.13 (Influence of Family and Friends) + 1.50 (Smoking Control Policies and Activities at Schools), illustrates how each factor contributes to the likelihood of youth starting to smoke. This predictive model indicates that lower knowledge about smoking effects, values that favor smoking, lesser recognition of smoking-related disease risks, increased stress and anxiety, influence from family and friends, and lack of school policies on smoking control significantly raise the risk of youths becoming smokers. The effect sizes

represented by the regression coefficients show the magnitude of influence each factor has on smoking initiation among youths, with all variables demonstrating statistical significance, as indicated by their *p*-values being less than 0.05. To supplement the quantitative analysis, the study also incorporated qualitative data. After analyzing the questionnaires, researchers conducted interviews with key informants to gain deeper insights. Selected quotes from these interviews, which are included below, are organized according to each risk factor. This combination of quantitative and qualitative analysis offers a comprehensive understanding of the factors influencing smoking behavior among youths in the Baan Eua Athon project, highlighting both the statistical significance and the real-world implications of these factors.

Interview Responses

Knowledge About the Effects of Smoking

The majority of youths were indifferent and lacked awareness of the dangers of smoking. This was due to the lack of perceived short-term effects, lack of data on long-term effects and shortage of people or agencies in the community educating about the dangers of smoking.

> "At the project, the residents lack knowledge on the harmful effects of cigarettes. As I see it, there is no agency to take care of knowledge at all. No one cares at all" (youth representative, Bangkok, interview).
> "I know a bit about the dangers of cigarettes. What I do know is that cigarettes cause cancer, but I don't know what the symptoms of cancer are and how bad it is" (youth representative, Northern Thailand, interview).

Values Conducive to Smoking

In the projects, smoking was viewed as normal and it was seen to bring happiness and laughter. People also believed that a single cigarette will not be addictive.

> "Teachers tell you it's not good but I still think it's cool" (youth representative Northeastern Thailand, interview).
> "Children smoke because they see their fathers smoke. They follow their friends. They imitate celebrities. They see the behavior of others and want to follow" (community leader, Northeastern Thailand, interview).

Perception of Risk of Smoking-Related Diseases

Youths who smoked cigarettes lacked awareness of their own vulnerabilities from smoking. There was found to be a lack of channels providing advice from knowledgeable people.

"I think most of the villages have children who smoke because the grocery stores in the villages sell cigarettes. If you go to buy cigarettes at 7–11, they won't sell them" (youth representative, Central Thailand, interview).
"My friend told me that you want to quit smoking but don't know where to go. There are 'quit smoking clinics', but I've never heard of them in this community" (youth representative, Southern Thailand, interview).

Stress and Anxiety

Youths are currently experiencing heightened levels of stress and anxiety from online learning. The disruption of the Covid-19 pandemic has led to a decline in education standards, in turn causing concern and stress. Young people have more free time, increasing the exposure to smoking in social scenarios. Youngsters associate smoking with relief, thinking that it can ease suffering.

"Most of my friends who smoke have family stress. Their parents are divorced or separated" (youth representative, Southern Thailand, interview).
"We don't have anyone to consult with, we feel stressed at home, we're in debt and we are failing at school. Smoking really helps, I think" (youth representative, Northeastern Thailand, interview).

Influence by Family and Friends

The youths in the projects smoked due to conflicts in the family or parental separation. There is a lack of people in the home environment to give good advice. Moreover, the majority of young people who smoked were found in families where their parents smoked.

"I smoke because of the stress of my parents separating" (youth representative, Northeastern Thailand, interview).
"Parents are so important but they go out to work and earn a living. No one looks after the children. When they return from school at 5 o'clock, the children have nowhere to go and gather with their friends in quiet places. It is here they secretly smoke and do other drugs as well" (parent, Northern Thailand, interview).

Smoking Control Policies and Activities at Schools

Some schools do not have measures or guidelines in place for the prevention and solving of concrete smoking problems.

"People who smoke randomly like to go to the bathrooms at school. This is a point where friends gather and smoke—here and quiet places beside the school" (youth representative, Northeastern Thailand, interview).
"Most of my friends at school who smoke cigarettes mingle in the bathroom. Friends invite each other like this. There are a lot of secret places at school" (youth representative, Northern Thailand, interview).

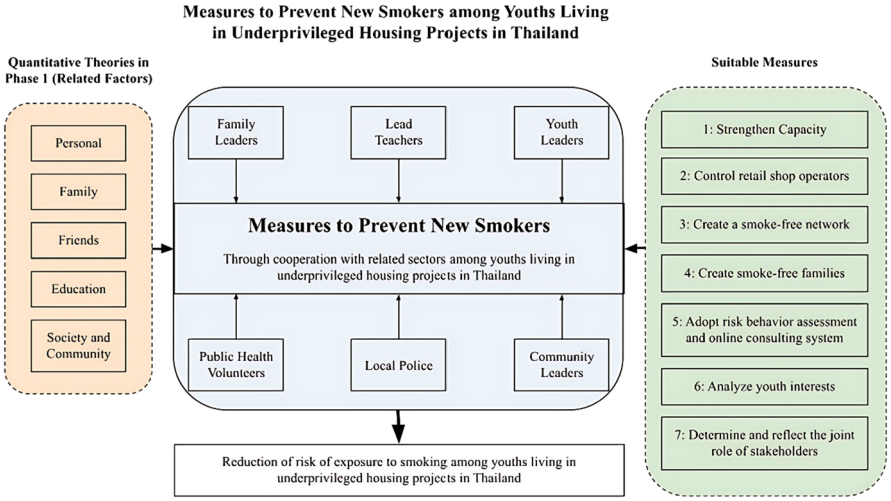

Fig. 2 Conceptual framework for the development of measures to prevent new smokers among youths living in underprivileged housing projects in Thailand

Measures to Prevent New Smokers

From the analysis of the overall data, seven measures were designed to prevent new smokers in the *Baan Eua Athon* projects. These are listed below with accompanying details and also represented in Fig. 2.

1. Strengthening the capacity of relevant personnel to enhance preventive knowledge
2. Building a body of knowledge and control among retail shop operators
3. Creating smoke-free networks in the area
4. Creating smoke-free families
5. Adopting a new smoker risk behavior assessment application and online consulting system
6. Analyzing local interests to promote the needs of youth
7. Determining the joint role of stakeholders

Measure 1: Strengthening Capacity

Six groups of leaders were identified by local people and trained in the prevention of smoking initiation: youth leaders, family leaders, lead teachers, community leaders, public health volunteers and local police (Table 4).

Measure 2: Building a Body of Knowledge and Control with Retail Shop Operators

Stakeholders organized a learning process on the impact of easy youth access to cigarettes. The course included development of the attitudes of retail operators about the spirit of the law and the necessity of law enforcement, as well as reiterating the

Table 4 Training provided to strengthen the capacity of local leaders to prevent new smokers

Group	Training received
Youth leaders	To recognise the dangers and identify visual effects
	To develop smoking refusal skills
	To build self-esteem among youths
Family leaders	To counsel youths on how to protect themselves
	To promote the use of an online ebook
	To promote positivity
	To find collaborative solutions with the smoke-free network team
Lead teachers	To build knowledge
	To observe behaviors
	To teach rejection skills
	To adjust the curriculum
	To reduce stress
	To organize activities
Community leaders	To develop a local smoke-free network
	To create a positive attitude towards prevention
	To transfer knowledge
Public health volunteers	To educate retailers in smoking legalities
	To reduce youth access to cigarettes
	To protect people in the community from exposure to secondhand smoke
	To develop behavioral observation skills
	To distribute an online e-book and knowledge kit
Local police	To promote knowledge of law enforcement measures
	To change the attitudes of retail operators
	To develop behavioral observation, surveillance and prevention skills

importance of retail operators verifying the age of their customers and refusing the sale of cigarettes to minors. The course also promoted the use of media developed by the researcher to raise awareness of the hazards of smoking.

Measure 3: Creating a Smoke-Free Network in the Area

A ‘smoke-free network’ was formed by the stakeholders in the community, consisting of academics, community leaders, family leaders and youth leaders. The network focused on prevention and knowledge enhancement, working together to make plans for community surveillance and communication.

Measure 4: Creating Smoke-Free Families

Parents educated their children about the dangers of smoking and developing media literacy skills, rejection skills, and cognitive skills to distinguish between right and wrong. Youth counseling was also promoted to encourage youths to see their

potential and self-worth. Parents conducted behavioral observations and assessments. When problems were found, they sought solutions or consultation through the local network. Within the family, rules and regulations were co-created so that young people can protect themselves from access to cigarettes.

Measure 5: Adopting a New Smoker Risk Behavior Assessment and Online Consulting System

Stakeholders used a risk behavior assessment application to monitor smoking among youths living in the *Baan Eua Athon* project. They also used a data linking system to exchange information between agencies working in the community and encourage people in the community to study more via an online ebook system.

Measure 6: Analyze Youth Interests

Activities were run by the local smoke-free network team. Using communal areas within the project and nearby meeting rooms or sports fields, activities were organized with budget support from the government to ensure continuity of the activities. Youths were made managers of the activities and helped plan events with the support of the local network.

Measure 7: Determining and Reflecting the Joint Role of the Stakeholders

Roles were delegated to reduce the duplication of work on smoking prevention in the community. For families, the emphasis was on communication and morality. For young people, the emphasis was on peer guidance and support. For teachers, the emphasis was on provision of knowledge and development of skills. For community leaders, the emphasis was on observation and consultancy. For public health volunteers, the emphasis was on laws and knowledge dissemination. For the police, the emphasis was on surveillance and law enforcement.

Pilot Study

The measures were implemented in the pilot study community at the *Baan Eua Athon* Housing Project in Ratchaburi Province, which was deemed suitable after an initial spatial survey. The community is inhabited by people with low incomes, who are a mix of both employed and unemployed workers. Due to cost reduction measures, the residents have a poor quality of life. Additionally, community leaders are concerned about the prevalence of smoking, alcohol consumption, and drug use among the residents, and believe that urgent management is necessary. When residents of this *Baan Eua Athon* project were asked about their smoking habits, it was discovered that many of them smoked, with a steadily increasing trend, particularly among young people who do not have access to education. Residents believed that if smoking is allowed to continue, it could have a negative impact on the physical health of both the smokers and those around them who are exposed to secondhand

smoke. Locals also felt that it could also have an adverse effect on the family's financial status and potentially lead to chronic health issues in the future. Therefore, the youths of the *Baan Eua Athon* project in Ratchaburi were deemed at a high risk of smoking and exposure to secondhand smoke, and thus a suitable group for implementation of the pilot study.

As shown in Table 5, there was a statistically significant difference between the risk behaviors reflected in evaluation after the implementation of preventive measures compared to those before implementation. These statistics, combined with the responses from participants interviewed during the investigation, demonstrate that the adoption of preventive measures against new smokers through the cooperation of people living in this *Baan Eua Athon* project resulted in a reduction of risk behaviors.

Discussion

This primary aim of this investigation set out with the principle aim to identify and develop effective measures to curb the initiation of smoking among youths residing in the *Baan Eua Athon* housing projects, a demographic identified as particularly vulnerable to tobacco use initiation in Thailand. The findings of this

Table 5 Evaluation scores of factors influencing risk behaviors for new smokers among youth living in the *Baan Eua Athon* prototype project before and after the implementation of measures to prevent new smokers

Risk factors (n = 30 people)	Mean	*SD*	t-test	*p*-value
Knowledge about the effects of smoking			− 19.03	< 0.001*
Before	9.30	1.69		
After	17.30	1.53		
Values conducive to smoking			− 27.716	< 0.001*
Before	12.07	22.16		
After	67.23	18.74		
Perception of risk of smoking-related diseases			− 23.80	< 0.001*
Before	18.47	1.39		
After	8.19	1.98		
Stress and anxiety			− 23.80	< 0.001*
Before	9.17	1.86		
After	19.12	1.49		
Influence by family and friends			− 10.04	< 0.001*
Before	12.07	3.45		
After	19.23	1.36		
Prevention of smoking among youth in the Baan Eua Athon project			− 22.250	< 0.001*
Before	10.59	1.978		
After	26.49	2.820		

mixed-methods study in nine provinces underscore the multifaceted nature of smoking initiation among youths, pinpointing critical drivers such as insufficient knowledge about harmful effects, conducive values towards smoking, perceived risks of smoking-related diseases, levels of stress and anxiety, influence from family and peers, and the role of educational policies in shaping smoking behaviors. Notably, knowledge regarding the health consequences of smoking emerged as a statistically significant predictor of smoking initiation, affirming the necessity of enhancing educational efforts. The investigation also revealed the profound impact of social influences and environmental factors, such as familial dynamics and stress management, on young individuals' smoking behaviors. These insights were instrumental in the development of seven targeted measures aimed at mitigating the identified risk factors, thereby laying a foundation for informed, multilayered intervention strategies tailored to the unique needs of youths in underprivileged communities.

Knowledge about the effects of smoking on health was identified as a statistically significant factor in determining the likelihood of individuals becoming new smokers in the *Baan Eua Athon* communities. This is consistent with the notion that knowledge is an important personal factor affecting behavioral performance (Green & Kreuter, 1999). Recent studies in Thailand (Salatte, 2018; Yimcharoen, 2016) have recommended that curriculum development should be considered as a major area for preventing smoking among youths. Interestingly, Tyas and Pederson (1998) suggested that the impact of knowledge of the health effects of tobacco is uncertain. Alongside several other studies, this suggests that knowledge has no effect on the likelihood of smoking among youths (Botvin et al., 1992; Virgili et al., 1991). Further research into this area is recommended to create a larger body of evidence that can help developers determine the correlation between knowledge and smoking risks. Nonetheless, there can be no harm in raising awareness of the effects of smoking on health in the community as part of a general drive to increase understanding and encourage youths to make informed choices about their social behaviors. Research by Lantz et al. (2000) recommends the combination of school-based interventions with community based programmes that seek to encourage positive social behaviors. This investigation indicates that such interventions should also consider the family environment and sociopolitical context of the community.

This study found that many youths in the *Baan Eua Athon* projects lack self-confidence and smoke to relieve stress. Studies by Yong-En (2013) and Wimuttipanya (2014) found that emotional intelligence is an important causal factor of drug problems among students in Thailand. Therefore, managing or reinforcing positive emotions for young people can reduce the risk of smoking. This is also linked to perceptions of maturity and interpersonal factors. According to this investigation, young people feel like adults when smoking, consider the habit to 'cool' and try to emulate role-models around them. This is in line with the results of a study by Karimy et al. (2013), which found that attitude is a factor affecting smoking among adolescent males. In fact, meta-analyses of tobacco prevention programmes have found that initiatives focusing on the resistance of social influences are the most effective in reducing youth smoking (Institute of Medicine, 1994; Rooney & Murray, 1996).

This was especially true of intervention led by peers (Black et al., 1998; Dobbie et al., 2019; Tobler, 1986, 1997).

This study also found a significant risk of smoking among youths who were influenced by family and friends. Prior studies concur that male adolescents with parents or friends who smoke are at heightened risk (Bagchi et al., 2014; Das et al., 2011; Worarun, 2017). Yet, home life also has an environmental impact on increasing the smoking initiation risk. Most youth smokers in the projects were from families with divorced or separated parents. There was consequently a lack of caregivers to educate them about smoking dangers and monitor their exposure to cigarettes. When combined with a surrounding environment where economic concerns take precedence, there is a cocktail of risk factors enabling smoking initiation. There is no government agency to supervise the sale of cigarettes at retail outlets. Most shops openly sell cigarettes to youth without complying with legal measures. If youths can buy cigarettes and have an unsupervised home in which to use them, there is little surprise that rates of smoking continue to increase.

This study was intended to bridge the gap in domestic Thai scholarship on smoking among adolescents by examining the complex interplay of environmental, personal, and psychological factors contributing to smoking initiation, a theme recurrently highlighted but not fully explored within the current literature (Sangthong et al., 2012; Phetchaphum et al., 2014; Silpanon & Laprattanathong, 2013). By employing the Precede–Proceed Model (Green & Kreuter, 1999), the present study advances the understanding of these factors, moving beyond mere identification to the development of targeted measures aimed at mitigating smoking among youths in underprivileged housing projects. This methodological choice not only aligns with Green and Kreuter's assertion on the necessity of educational diagnosis before strategizing interventions, but also addresses the call for a more nuanced exploration of predisposing, reinforcing, and enabling causes influencing health behaviors (Aldiabat & Le Navenec, 2013; Sangalang et al., 2019). The findings in this study emphasize the significance of knowledge, values, disease risk perception, stress, anxiety, and the influence of family and friends, which provides actionable insights grounded in the initial stages of the Precede–Proceed Model. This investigation has not only reinforced the Precede–Proceed Model's comprehensive approach to health promotion (Green & Kreuter, 2005; Hogan et al., 2021), but has also addressed its noted limitations, including intensive data demands and the call for specificity in intervention methods (Gielen et al., 2008). By adapting the model for application to the *Baan Eua Athon*, this investigation has elucidated the multifaceted nature of youth smoking behaviors in a domestic Thai context, and has operationalized these insights into tangible benefits for the *Baan Eua Athon* communities. This progression from theory to practice through the adaptive Precede–Proceed Model has helped to ensure that the contribution of this investigation extended beyond academic discourse to effect real-world change in smoking prevention among Thailand's youth.

Limitations and Recommendations

There are limitations with the small sample size of the pilot project and the suitability of generalizing findings to a wider population. Additionally, the absence of a trial or control group in this study poses a further limitation. Without a proper comparison group, it is difficult to conclusively attribute the observed changes in smoking behaviors solely to the intervention. The inclusion of a control group would have allowed for a more rigorous comparison, thereby enhancing the study's internal validity. This would have facilitated a more precise assessment of the intervention's effectiveness, isolating its impact from other external or coincidental factors. Future studies should consider incorporating such a comparison design to more accurately gauge the efficacy of similar interventions. It is hoped that further pilot studies may also improve the accuracy of these research findings and enable researchers and policy-makers to continue refining the measures identified in this investigation. Notwithstanding, the seven measures developed in collaboration with the *Baan Eua Athon* community were shown to have a positive impact within the pilot community. Despite its limitations, the present study provides an initial framework for understanding and addressing youth smoking behaviors in underprivileged communities like *Baan Eua Athon*. The development and implementation of the seven measures, in collaboration with the community, represent a pioneering step towards tailored smoking prevention strategies. These measures, while specific to the pilot community, offer valuable insights and a foundation for broader applications. The positive impact observed within the pilot community underscores the potential of community-engaged approaches in public health initiatives. This study can not only inform current policy-making but can also set a precedent for future research to build upon, emphasizing the importance of localized and participatory methods in developing effective health interventions. From these results, the researcher wishes to make four tentative policy recommendations that can be further explored after future pilot studies have been implemented to assess their suitability and the overall accuracy of these conclusions:

1. The Ministry of Public Health, Ministry of Education and National Housing Authority should define the structure for management and surveillance within the projects.
2. School administrators and community leaders should formulate policies, plans and decisions for preventing new smokers based on the seven measures outlined here. These should consider both personal and interpersonal factors, as well as the surrounding environment. Importantly, policies must focus on adjusting community attitudes so that they co-own the problem.
3. The community sector should plan and support the building of knowledge, understanding and attitudes. This must be suitable for operators in the area and support the organization of exchange forums, emphasizing the participation of all sectors to develop activities that meet the diverse needs of youths.

4. The government sector must become more closely involved in the regulation of cigarette access for the youth of Thailand and consider the provision of incentives for local retailers who comply with tobacco regulations.

If youths are engaged in interesting and stimulating activities that reduce their exposure to smoking, they are less likely to become smokers. The focus of community initiatives must be to develop and increase the provision for youth activities in the projects. It is recommended that future studies should compare preventive measures for new smokers in urban and rural contexts to determine the different approaches required in different environments.

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Declarations

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