

Cannabis Use Behaviors and Associations with Home Cultivation and Perceived Accessibility among Secondary School Students in Songkhla, Thailand

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Abstract:

Objective: The objectives of this study are: 1) to describe the prevalence and pattern of cannabis use; 2) to describe the extent to which home cultivation of cannabis was associated with cannabis use; and 3) to describe the extent to which perceived accessibility of cannabis was associated with cannabis use among secondary school students in Thailand.

Material and Methods: We conducted a cross-sectional study at 15 schools in Songkhla Province, Thailand. We selected the schools using stratified cluster random sampling and invited all students present in the selected classroom to answer an anonymous self-administered questionnaire. We analyzed the data using descriptive statistics and logistic regression with sampling weight adjustments.

Results: A total of 3,663 students (63.6% female, mean age 16.8 years) answered our survey (response rate=100%). Among all participants, 4.4% were current cannabis users, and another 2.4% were former users. Home cultivation was significantly associated with lifetime history (current or former) vs. never used cannabis (24.4% vs. 5.3%, Adjusted Odds ratio (OR)=5.64; 95% confidence interval (CI)=4.21, 7.56). Perceived accessibility was also associated with lifetime history vs. never used (16.9% vs. 4.5%, Adjusted OR=3.89; 95% CI=1.90, 8.00). There were no significant associations between home cultivation or perceived accessibility with current vs. former use of cannabis.

Conclusion: We found associations between perceived and real (cultivated) accessibility to cannabis and cannabis use among adolescents. However, limitations regarding the study design and lack of generalizability should be considered caveats in the interpretation of the study's findings.

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Keywords: cannabis, home cultivation, perceived accessibility, students

Introduction

Cannabis is the most widely used drug globally: approximately 4.4% adults worldwide used cannabis in 2022. Among adolescents, the prevalence is slightly higher at 5.5%¹. In the past decade, various countries worldwide have considered and implemented cannabis decriminalization or legalization to varying degrees²⁻⁴.

Thailand, a middle-income country in Southeast Asia with relatively harsh punishments for drug use from the 1960s to the 2000s, became the first country in Southeast Asia to fully decriminalize cannabis use in 2022. The decriminalization process allowed for home cultivation of cannabis, as well as the retail sale of cannabis products⁵. Initially, there were few limitations (e.g., THC content not exceeding 0.2%, no sales to pregnant women or minors under 20 years of age), but it became gradually more restrictive, including requirements for a prescription as of June 2025⁶. Although decriminalization was intended to ease access to cannabis for medical purposes, most users mentioned recreational or other non-medical purposes as their main goals⁷. This context has strong implications for adolescents. Cannabis impairs cognitive functions, such as memory, thinking, and learning, particularly among youths under 21 years of age, whose brains are still undergoing maturation⁸. An earlier age of onset and frequent use of cannabis increase the risk of poor brain development and mental health problems (e.g., anxiety, depressive disorder, and schizophrenia)⁹⁻¹³. It is also a gateway drug, which can lead to the use of other narcotics¹⁴. Despite these implications for the adolescent population, the prevalence and characterization of cannabis use among Thai adolescents in this context have not been described. Furthermore, the availability of cannabis is a potential determinant of cannabis use¹⁵. Home cultivation of cannabis

enables immediate access to cannabis plants. Studies from other countries¹⁶⁻¹⁸ showed that cannabis home cultivation increased cannabis use. Thus, we hypothesize that adolescents in homes that cultivate cannabis are more likely to be cannabis users compared to those from homes with no cannabis cultivation. One additional measure of cannabis availability is the perception that cannabis is easy to obtain. Therefore, we also hypothesize that adolescents who perceive that cannabis is “easy” to obtain are more likely to be cannabis users than adolescents who do not have such a perception. Data on such issues can potentially contribute useful basic information to relevant stakeholders regarding cannabis use among secondary school students and adolescents, and their potential determinants, which can help design appropriate measures for the health protection of this vulnerable group. The objectives of this study are: 1) to describe the prevalence and pattern of cannabis use among secondary school students in Thailand; 2) to describe the extent to which home cultivation of cannabis was associated with cannabis use; and 3) to describe the extent to which perceived accessibility of cannabis was associated with cannabis use.

Material and Methods

Study design and setting

We conducted a cross-sectional study at public and private high schools in urban and rural areas of Songkhla Province, Thailand. We collected the study data from December 2023 to February 2024, approximately 1.5 years following the initial decriminalization.

Study participants and sample size calculation

The study population comprised students in grades 10–12 in Songkhla Province, Thailand. Participants were

recruited from randomly selected classes within 15 schools. Inclusion criteria were: (1) current enrollment in grades 10–12 at a participating school; (2) ability to read, write, and understand Thai.

We calculated the sample size for comparing two independent proportions. With cannabis home cultivation as the main exposure variable of interest, the proportion (p_1) of cannabis use among students without home cultivation is set to be similar to the prevalence of cannabis use among general high school students (1.4%)¹⁹. Assuming a doubling of this proportion among students with home cultivation ($p_2=2.8\%$), an alpha of 0.05, and 80% power ($\beta=0.20$), the estimated sample size was 1,786 participants per group, totaling 3,572.

Study instrument

Our study instrument was an anonymous self-administered paper–pencil questionnaire that included seven sections, namely: A) Socio–demographic characteristics; B) Cannabis and other substance use; C) Cannabis–related harms from owned and other’s use; D) Cannabis home cultivation; E) Perceptions of availability of cannabis and other substances; F) Perceptions of risk of harm and social norms toward cannabis and other substance use; and G) Perceptions of parental cannabis use and parenting behavior. Data from Sections A, B, D, and E were used for the analyses. We developed the study instrument by conducting a review of the literature and questionnaires related to our study^{15,20,21}. After that, we adapted them to construct our study instrument, in accordance with the research objectives, in two languages: English and Thai. We translated the English language segments into Thai and made a full draft of the questionnaire. We then conducted a pilot study using the Thai version of the questionnaire among students at a school in Hat Yai District. The students were expected to have similar demographics as our participants. We requested that the students provide their feedback on questions that needed revisions. We then used the

feedback to further revise and finalize the instrument for data collection.

Measurement of cannabis use

Cannabis use was assessed using two questions adapted from a validated Thai questionnaire^{15,21} nationally representative data are scarce with regard to cannabis use behaviors and its association with cannabis outlet density. The objectives of this study are: (1: 1) “Have you ever used cannabis in your lifetime?”, and 2) “When was the most recent time you used cannabis?”. Only current users (who had used cannabis in the past 12 months) were then asked to provide information regarding their use patterns, frequency of use (daily, weekly, monthly, less than monthly), form of cannabis used (e.g., flowers, edibles, concentrates, oils), method of administration (e.g., smoking, vaping, eating, drinking), primary purpose of use (e.g., recreational, medicinal), and co-use with other substances (e.g., tobacco, alcohol, other drugs).

Measurement of cannabis home cultivation and perceived accessibility to cannabis

We measured cannabis home cultivation with the question “Is cannabis cultivated at your house?” with the answer choices: “0. No (skip to Section E)” and “1) Yes”. We considered participants who answered “yes” to self-report home cultivation of cannabis.

We measured perceived accessibility (ease of accessibility) to cannabis with the question “How difficult or easy would it be for you to get some cannabis if you wanted some?” with the answer choices: “1. Very difficult”, “2. Difficult”, “3. Easy”, “4. Very easy”, “5. Don’t know”, and “9. Refuse to answer”. We considered students who answered “Easy” or “Very easy” as those who perceived that access to cannabis was easy, and we considered students who answered “Difficult” or “Very difficult” as those who perceived that access to cannabis was difficult.

Sampling methods

We used a stratified cluster random sampling method to select the study participants. Firstly, all schools for senior high school students in Songkhla were stratified into those located in Mueang and Hat Yai districts (representing urban areas) and those in other districts (representing rural areas). Secondly, high schools in each area were further stratified into public and private schools, resulting in a total of four strata. The research team then intended to use simple random sampling to randomly select schools from each stratum with probability proportional to size. However, due to the high level of refusal from rural private school administrators, citing the sensitive nature of our study topic, we performed simple random sampling of available schools from other groups to compensate. Thus, we received permission to collect data from a total of 15 schools (3 urban public schools, 6 urban private schools, 4 rural public schools, 2 rural private schools). Thirdly, the team randomly selected three classrooms per grade at schools with five or more classrooms per grade. At schools with four or fewer classrooms per grade, we selected all classrooms in a given grade level. Lastly, all students in the selected classrooms were invited to participate in the study.

Data collection

Following ethical approval from the Human Research Ethics Unit, Faculty of Medicine, Prince of Songkla University, we contacted school administrators to obtain permission for data collection. We also asked the schools to inform students and their parents about the study before data collection began.

We collected data from 7 December 2023 to 16 February 2024. On the day of data collection, we visited the sampled school and introduced ourselves to students in the sampled classrooms. We provided the students with information about the study's purpose and procedures, including assurances of anonymity, confidentiality, and

voluntary participation. During the explanation, consent, and data collection processes, we asked the teacher to leave the classroom. Students gave verbal informed consent prior to participation. Participants completed a self-administered questionnaire in the classroom during normal school hours. We asked students who sat in close proximity to one another to sit further apart prior to answering the questionnaire in order to reduce the potential to see one another's responses.

After completing the questionnaire, the participants would place their questionnaire in a collection box positioned at a designated location, away from the sight of teachers and other authority figures. Students who did not wish to complete the questionnaire would place the empty questionnaire in the same collection box.

Data management

We opened the collection box of questionnaires in a private location and entered the data from the paper questionnaires into the KoboToolbox platform, which uploaded the data to a password-protected server. The principal investigator (PI) then checked the data for accuracy and consistency and made the final corrections before using it for analyses.

Data analyses

We used descriptive statistics to describe the characteristics of the study participants. We used multivariable logistic regression to assess the extent to which cannabis home cultivation was associated with cannabis use, and the extent to which perceived accessibility to cannabis was associated with cannabis use. We adjusted our logistic regression analyses for sex, religion, and year of study (as a proxy for age), as these characteristics are found to be independent determinants of cannabis use according to the literature^{22–28}, while missing values were excluded from the analyses. We adjusted our analyses for

sampling weights to account for the unequal probabilities of selection by types of schools (private vs. public) and setting (urban vs. rural). All assessments of associations were conducted at a 95% level of confidence.

Ethical considerations

This study received ethical approval from the Human Research Ethics Unit, Faculty of Medicine, Prince of Songkla University (REC.66-345-18-6). Investigators also received approval for a waiver of written informed consent, which included a waiver of the requirement to record the participant's name due to the sensitive and legal issues of cannabis use and trade in Thailand.

Results

A total of 3,663 students from grades 10 to 12 responded to the survey questions. None of the students who met the study criteria and were invited refused to participate (response rate=100%). The students' mean age ($\pm$ standard error) was 16.8 ± 0.03 years. Most of the study participants were female (63.6%). Slightly above two-thirds of the students (68.8%) were Buddhists, followed by Muslims (30.5%). Among all participants, the prevalence of former cannabis users was 2.4%, while the prevalence of current users was higher (4.4%). Around 12.5% of the students reported cannabis home cultivation. Most students reported that accessing cannabis would be difficult or very difficult (37.5%) (Table 1).

The prevalence of cannabis use (both former and current) was higher among male students (5.4% and 10.9%) than among female students and students identified as other sexes (0.8% and 0.9%), and higher among grade 12 students (2.8% and 5.2%) compared to those in grades 10 (2.4% and 4.3%) and 11 (2.0% and 3.9%) (Table 2). Current users (those who used cannabis in the past 12 months) outnumber former users in all groups. Males had

Table 1 Characteristics of the study participants (n=3,663 senior high school students)

Characteristics	Weighted percent $\pm$ SE (unless otherwise indicated) (%)
Sex (n=3,638)	
Male (n=1,316)	35.4 $\pm$ 1.9
Female (n=2,277)	63.6 $\pm$ 2.0
Other sexes (n=45)	1.0 $\pm$ 0.1
Age in years (mean $\pm$ SE)	16.8 $\pm$ 0.03
Year of study (n=3,663)	
Grade 10 (Matthayom 4) (n=1,437)	35.5 $\pm$ 1.6
Grade 11 (Matthayom 5) (n=1,208)	32.9 $\pm$ 1.7
Grade 12 (Matthayom 6) (n=1,018)	31.7 $\pm$ 1.7
Religion (n=3,610)	
Buddhism (n=2,777)	68.8 $\pm$ 5.2
Islam (n=796)	30.5 $\pm$ 5.2
Christianity (n=28)	0.6 $\pm$ 0.2
Others (n=9)	0.1 $\pm$ 0.1
Cultivation of cannabis at home (n=3,663)	
No cultivation (n=2,983)	81.0 $\pm$ 1.3
Home cultivation reported (n=461)	12.5 $\pm$ 0.9
No answer/refused to answer (n=219)	6.5 $\pm$ 0.7
Perceived availability of cannabis (n=3,663)	
"Very difficult" or "Difficult" to access cannabis (n=1,371)	37.5 $\pm$ 1.8
"Very easy" or "Easy" to access cannabis (n=1,101)	25.6 $\pm$ 1.4
Don't know (n=842)	25.4 $\pm$ 1.7
No answer/refused to answer (n=349)	11.6 $\pm$ 1.4
Cannabis use status (n=3,663)	
Never users (n=3,183)	87.5 $\pm$ 1.0
Former users (did not use in the past 12 months) (n=101)	2.4 $\pm$ 0.4
Current users (used in the past 12 months) (n=182)	4.4 $\pm$ 0.6
No answer/refused to answer (n=197)	5.7 $\pm$ 0.6
Among current users (n=182)	
Forms of use (multiple answers allowed)	
Fresh/dried flowers/leaves (n=144)	82.1 $\pm$ 2.4
Concentrates (oil, soft gel, powder) (n=31)	17.9 $\pm$ 3.7
Topicals (cream/balm, soap, lipstick, spray) (n=10)	6.5 $\pm$ 3.3
Edibles or hot/cold beverages (cookie, chocolate, snacks, tea, coffee, cannabis water, mixed juice with cannabis) (n=47)	22.5 $\pm$ 4.5
Others (n=13)	8.2 $\pm$ 2.7

Table 1 (continued)

Characteristics	Weighted percent±SE (unless otherwise indicated) (%)
Methods of use (multiple answers allowed)	
Smoke (n=143)	85.3±4.5
Vape (n=6)	1.9±0.9
Ingestion (eaten or drank) (n=58)	27.8±5.1
Others (infusion drop, suppository, capsules, spraying, daubing, bathing, or others) (n=16)	6.8±2.3
Frequency of use	
One to eleven days per year (n=77)	50.8±5.6
One to three days per month (n=13)	10.3±3.0
One to six days per week (n=29)	21.5± 5.5
Every day (n=32)	17.4±4.6
Main purpose of use at present	
Recreational purpose (for enjoyment/relaxation/socialization) (n=57)	33.0±6.8
Medical purpose (pain relief, cancer, seizures) (n=5)	3.3±1.9
Other non-medical purposes (appetite, sleep, curiosity, or others) (n=81)	63.7±7.3
Simultaneous use, i.e., use at the same time with other substances (multiple answers allowed)	
Alcohol (n=17)	7.5±2.9
Cigarette (n=57)	28.7±3.7
Medicine (cough syrup/ cetirizine dihydrochloride) (n=5)	1.4±0.7
Kratom (Kratom leaf/ Kratom leaf tea mixed with other substances) (n=27)	12.9±3.4
Illegal substance (amphetamine/ methamphetamine/opium/heroin/ ecstasy/cocaine) (n=7)	2.8±1.4

higher use of concentrates and topicals (19.0% and 7.3%) than females and others (11.3% and 1.5%). The use of concentrates appeared to be more common among older students, whereas edible consumption was highest among Grade 10 students. Students of all sexes and grades mostly used cannabis by smoking. Regarding cannabis use frequency in the past 12 months, most students reported using cannabis 1 to 11 days per year. The main purpose of cannabis use, across all sexes and years of study, was for other non-medical purposes, followed by recreation.

The majority of participants reported using cannabis with cigarettes, followed by Kratom among males, while alcohol was the second most common substance among females and others.

Cannabis home cultivation was significantly associated with lifetime history (current or former) vs. never used cannabis (24.4% vs. 5.3%, Adjusted OR=5.37; 95% CI=4.05, 7.48) (Table 3.), but there was no significant association between cannabis home cultivation and current vs. former use of cannabis (63.3% vs. 67.5%, Adjusted OR=0.84; 95% CI=0.56, 1.27). Perceived accessibility of cannabis was also significantly associated with lifetime history vs. never used cannabis (16.9% vs. 4.5%, Adjusted OR = 3.75; 95% CI=1.87, 7.50) (Table 4.), but there was no association between perceived accessibility and current vs. former use of cannabis (64.2% vs. 64.4%, Adjusted OR=0.98; 95% CI=0.53, 1.84).

Discussion

In this school-based cross-sectional study, we described the use of cannabis among secondary school students in Thailand. We also found significant associations between lifetime cannabis use and home cultivation of the plant, as well as lifetime cannabis use and perceived accessibility of cannabis. Our study findings have implications for stakeholders in substance use and adolescent health. Our study findings also merit discussions on several issues.

Our findings provide basic data on the prevalence and pattern of cannabis use among school-going adolescents, which stakeholders can use as basic information for future program designs. We found that the prevalence of current use was higher than that of former use among all participants, and this pattern remained consistent when examined by sex and grade. The prevalence of current use found in our study was higher than the prevalence found in other studies conducted before the de facto legalization^{19,29}.

Table 2 Cannabis use status among the study participants (n=3,663), and patterns of use among current users stratified by sex and class (n=182); weighted percentage±standard errors, unless otherwise indicated; column percent

Characteristics	By sex		By class		
	Male (%) (n)	Female & other sexes (%) (n)	Grade 10 (%) (n)	Grade 11 (%) (n)	Grade 12 (%) (n)
Among all study participants					
Cannabis use status	(n=1,316)	(n=2,322)	(n=1,437)	(n=1,208)	(n=1,018)
Never users	78.2±1.4 (n=1,019)	92.5±0.9 (n=2,145)	88.0±1.3 (n=1,259)	87.9±1.3 (n=1,048)	86.5±2.0 (n=876)
Former users (did not use in the past 12 months)	5.4±1.2 (n=76)	0.8±0.2 (n=25)	2.4±0.4 (n=43)	2.0±0.5 (n=30)	2.8±0.7 (n=28)
Current users (used in the past 12 months)	10.9±1.3 (n=155)	0.9±0.3 (n=24)	4.3±0.9 (n=67)	3.9±1.0 (n=62)	5.2±1.2 (n=53)
No answer/refused to answer	5.4±1.1 (n=66)	5.9±1.0 (n=128)	5.3±0.9 (n=68)	6.3±1.3 (n=68)	5.5±1.1 (n=61)
Among current users					
Forms of use (multiple responses allowed)					
Fresh/dried flowers/leaves	81.0±2.5 (n=124)	88.9±6.1 (n=18)	90.9±3.0 (n=53)	81.6±5.0 (n=51)	74.4±4.8 (n=40)
Concentrates (oil, soft gel, powder)	19.0±4.3 (n=26)	11.3±5.5 (n=5)	6.5±2.7 (n=8)	7.3±3.0 (n=9)	36.6±7.0 (n=14)
Topicals (cream/balm, soap, lipstick, spray)	7.3±3.8 (n=9)	1.5±1.4 (n=1)	0.7±0.7 (n=1)	4.8±1.9 (n=6)	13.2±8.8 (n=3)
Edibles or hot/cold beverages (cookie, chocolate, snacks, tea, coffee, cannabis water, mixed juice with cannabis)	20.0±4.8 (n=38)	40.3±13.3 (n=9)	26.6±11.2 (n=18)	15.7±3.7 (n=15)	24.1±7.7 (n=14)
Others	7.7±2.6 (n=10)	10.0±8.5 (n=2)	5.9±3.5 (n=4)	14.2±5.3 (n=7)	5.7±3.1 (n=2)
Methods of use (multiple responses allowed)					
Smoking	86.2±4.1 (n=127)	77.9±12.9 (n=14)	81.2±9.7 (n=51)	87.3±3.6 (n=51)	87.8±8.1 (n=41)
Vaping	1.2±0.7 (n=4)	7.4±6.0 (n=2)	1.8±1.2 (n=2)	3.8±2.4 (n=3)	0.6±0.6 (n=1)
Ingestion (eaten or drank)	24.5±5.4 (n=46)	55.1±10.8 (n=12)	29.6±11.3 (n=21)	22.6±5.5 (n=19)	30.2±8.6 (n=18)
Others (infusion drop, suppository, capsules, spraying, daubing, bathing, or others)	6.5±2.4 (n=12)	10.1±4.2 (n=4)	6.1±3.5 (n=4)	5.2±2.0 (n=7)	8.8±5.4 (n=2)
Frequency of use					
One to eleven days per year	50.0±5.8 (n=68)	59.9±21.4 (n=8)	45.1±10.4 (n=31)	63.1±7.2 (n=27)	45.3±8.1 (n=19)
One to three days per month	10.5±3.3 (n=12)	9.1±9.5 (n=1)	2.6±1.2 (n=3)	10.1±4.7 (n=5)	17.2±5.8 (n=5)
One to six days per week	21.6±5.8 (n=27)	21.9±17.2 (n=2)	43.9±11.0 (n=15)	18.1±3.4 (n=11)	4.6±3.2 (n=3)
Every day	18.0±5.0 (n=29)	9.1±7.4 (n=2)	8.4±3.1 (n=8)	8.7±4.1 (n=9)	32.8±9.0 (n=15)
Main purpose of use					
Recreation (for enjoyment/relaxation/socialization)	32.6±8.2 (n=51)	37.6±19.0 (n=6)	35.8±14.4 (n=20)	29.3±6.5 (n=20)	33.2±10.1 (n=17)
Medical purpose (pain relief, cancer, seizures)	2.8±2.1 (n=2)	6.3±4.4 (n=3)	1.2±1.2 (n=1)	1.9±1.2 (n=2)	6.4±4.7 (n=2)
Other non-medical purposes (appetite, sleep, curiosity, or others)	64.6±8.5 (n=69)	56.1±20.0 (n=10)	63.0±14.6 (n=32)	68.8±6.7 (n=27)	60.4±9.1 (n=22)

Table 2 (continued)

Characteristics	By sex		By class		
	Male (%) (n)	Female & other sexes (%) (n)	Grade 10 (%) (n)	Grade 11 (%) (n)	Grade 12 (%) (n)
Simultaneous use (use at the same time) with other substances (multiple responses allowed)					
Alcohol (any type)	5.5±2.3 (n=14)	20.2±10.1 (n=3)	3.3±1.4 (n=4)	17.1±6.5 (n=10)	3.3±2.8 (n=3)
Cigarette (any type)	27.2±4.6 (n=50)	37.6±17.1 (n=6)	38.3±7.7 (n=21)	25.7±8.5 (n = 21)	23.7±6.5 (n=15)
Medicine (cough syrup/cetirizine dihydrochloride)	1.6±0.8 (n=5)	0.0±0.0 (n=0)	1.6±1.4 (n=1)	3.1±1.7 (n=4)	0.0±0.0 (n=0)
Kratom (Kratom leaf/Kratom leaf tea mixed with other substances)	13.9±3.9 (n=25)	5.1±5.5 (n=1)	5.7±2.4 (n=6)	15.5±6.8 (n=13)	16.3±5.3 (n=8)
Illegal substance (amphetamine/ methamphetamine/ opium/ heroin/ ecstasy/ cocaine)	3.3±1.7 (n=7)	0.0±0.0 (n=0)	0.0±0.0 (n=0)	5.1±2.5 (n=4)	3.2±2.6 (n=3)

Table 3 Cannabis use status among participants who reported and did not report cannabis cultivation at home; row percent

Outcome	No outcome	Outcome	Crude OR (95% CI)	Adjusted OR (95% CI)*
History of use (current or former) vs. never users	Never users	History of use		
No home cultivation reported (n=2,865 students)	94.7±0.7	5.3±0.7	1 (Ref.)	1 (Ref.)
Cannabis home cultivation reported (n=440 students)	75.6±2.1	24.4±2.1	5.74 (4.60, 7.14)	5.37 (4.05, 7.48)
Current users vs. former users	Former users	Current users		
No home cultivation reported (n=149 students)	32.5±5.1	67.5±5.1	1 (Ref.)	1 (Ref.)
Cannabis home cultivation reported (n=119 students)	36.7±5.2	63.3±5.2	0.83 (0.56, 1.23)	0.84 (0.56, 1.27)

Exclude for no answer/refused to answer in analysis.

*Adjusted for sex assigned at birth, religion, year of study, setting (urban vs. rural area), and parental cannabis use, OR=odds ratio, CI=confidence interval

Furthermore, the higher prevalence of cannabis use in our study was similar to certain settings^{7,30} but differed from others^{30–32}. The main reason for the current use of cannabis among our participants was “other purposes” (non–recreational, non–medical purposes). These findings differed from a previous study conducted among the general adult population in Thailand, which found that the main purpose among young people was recreation⁷. The most common form of cannabis used was as fresh or dried

flower or leaves mixed with tobacco in a cigarette. These findings are consistent with a previous study³³, which also found a high prevalence of combustible cannabis product use among adolescents. However, it should be noted that the cannabis market in Thailand was undergoing rapid development and changes at the time of the study, and the products available in the market at the time of the survey may not reflect the products (and consumption choices) available at other periods.

Table 4 Cannabis use status among participants who reported difficulty vs. ease in access to cannabis; row percent

Outcome	No outcome	Outcome	Crude OR (95% CI)	Adjusted OR (95% CI)*
History of use (current or former) vs. never users	Never users	History of use		
“Very difficult” or “difficult” to access cannabis (n=1,306 students)	95.5±0.8	4.5±0.8	1 (Ref.)	1 (Ref.)
“Very easy” or “easy” to access cannabis (n=1,068 students)	83.1±2.4	16.9±2.4	4.35 (2.49, 7.60)	3.75 (1.87, 7.50)
Current users vs. former users	Former users	Current users		
“Very difficult” or “difficult” to access cannabis (n=60 students)	35.6±6.3	64.4±6.3	1 (Ref.)	1 (Ref.)
“Very easy” or “easy” to access cannabis (n=177 students)	35.8±5.1	64.2±5.1	0.99 (0.60, 1.65)	0.98 (0.53, 1.84)

Exclude for don't know/ no answer/ refused to answer in analysis.

*Adjusted for sex assigned at birth, religion, year of study, setting (urban vs. rural area), and parental cannabis use, OR=odds ratio, CI=confidence interval

Our study also provides empirical evidence for stakeholders: cannabis home cultivation and perceived ease of access are significantly associated with cannabis use among school-going adolescents. We found a statistically significant association between home cultivation and lifetime history vs. never used cannabis, albeit no association between home cultivation and current vs. former use of cannabis. The study findings supported the notion in our hypothesis that home cultivation increased the physical availability of cannabis, which in turn increased cannabis use^{15,34,35}. However, the lack of association between home cultivation and current vs. former use still needs a clear explanation, which should be considered in future studies. Similarly, we found a statistically significant association between perceived accessibility of cannabis and lifetime cannabis use, but no association between perceived accessibility and current vs. former use. The findings partially supported our hypothesis regarding perceived accessibility as a potential determinant of cannabis use^{15,36}, but the lack of association with current vs. former use requires further investigation. Furthermore, we measured perceived accessibility based on each participant's subjective perceptions (i.e., we did not define “easy” or “difficult” for

our participants); the potential information bias from this ambiguity could have remained in the study findings.

One point of consideration in the interpretation of our findings is the sampling method for our study schools. Due to time, resources, and logistical constraints, we could only include 9 urban schools and 6 rural schools in our study. Of Songkhla's 1.43 million population, 0.57 million lived in Hat Yai or Mueang Songkhla Districts (designated as urban areas in our study), and the remaining 0.86 million lived in other districts (designated as rural areas in our study). Thus, urban school students were over-represented among our participants, and rural school students were under-represented. We have tried to address this issue of representation by accounting for sampling weights in our analyses. However, it should be noted that our sampling method might have yielded data that were not representative of the population and may be prone to various selection biases^{37,38}.

The strengths of our study included the relatively large sample size and the perfect response rate, which enabled us to rule out chance as the best explanation of our findings and minimize the possibility of selection bias from non-response, respectively. The use of a self-

administered paper-and-pencil questionnaire might have helped to reduce participant confidentiality and encourage honest reporting. However, a number of caveats should be considered in the interpretation of our study findings. Firstly, the cross-sectional study design implies that we could not establish the temporality of the associations, and the outcome (cannabis use) could have influenced the occurrence of the exposure (home cultivation and perceived accessibility). Secondly, we only collected data from schools in a province in Southern Thailand, a region where the drug-use culture is dominated by the use of a plant called kratom (*Mitragyna speciosa*) rather than cannabis, limiting the generalizability of our study findings. We also did not collect data from vocational school students and adolescents who were not enrolled in schools, which further limited the generalizability of our study findings. Future studies should consider using a longitudinal study design and expanding the study areas and participants to other demographic groups. Thirdly, although we took precautions to reduce potential social desirability bias (e.g., asking the teachers to leave the room, asking participants to sit adequately far apart to prevent on-lookers), the shifting nature of cannabis legality in Thailand and concerns regarding information security could have nonetheless influenced our study results, and the prevalence or detail of cannabis use may nonetheless contain errors. Lastly, in our analysis on the association between cannabis home cultivation or perceived accessibility and cannabis use, we did not adjust for a number of characteristics that might have influenced cannabis use, including sensation-seeking tendencies, peer influence, and mental health status. Confounding by these characteristics should be noted in the interpretation of our study findings.

Conclusion

We conducted a school-based cross-sectional study, described the prevalence and patterns of cannabis

use among secondary school students in Songkhla Province, Thailand, and found that current or former cannabis use (vs. never used) was associated with the home cultivation of cannabis and perceived ease of access to cannabis. The findings have implications for stakeholders in substance use and adolescent health. However, limitations regarding the study design and the generalizability of the study findings should be considered as caveats in the interpretation of the study findings.

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Conflict of interest

None

Data availability statement

All data necessary for the replication of the study's findings are available from the corresponding author upon reasonable request.

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