Substance use among high-school students in southern Thailand: Trends over 3 years (2002–2004)

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Abstract

Purpose: To examine the trends of substance use and correlated variables in high-school students in Southern Thailand.

Methods: Surveys of high-school years 7, 9 and 11 and vocational school year 2 students in four provinces in Southern Thailand were conducted in 2002–2004 to examine lifetime substance use, use within 1 year and 30 days before the interview, using a self-completed questionnaire.

Results: The prevalence of lifetime use of any illicit substance was 5–7% overall (about 7%, 9% and 13% in boys and 2%, 1% and 3% in girls in 2002, 2003 and 2004, respectively). Krathom, a local addictive plant, and cannabis were the most commonly used illicit substances on a lifetime basis with prevalences of 2.3%, 2.8%, 4.9% (p < 0.01) and 2.6%, 2.3%, 3.4% (p > 0.05) in the surveyed years. The rates of alcohol consumption in the past 30 days were 19.3%, 17.3% and 15.2% (p > 0.05) while smoking rates were 14.6%, 8.8% and 10.8% (p < 0.05). The significant correlates of current illicit substance use were surveyed year, male, vocational school, school level, and school performance.

Conclusion: The problem of substance abuse is increasing among Thai adolescents. School-based interventions seem desirable, especially in boys, vocational and public school students.

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Keywords: Trends; Substance use; High-school students; Southern Thailand

1. Introduction

As in many other countries, concern has been expressed in Thailand about an apparent increase in substance abuse problems in school children. This concern has emanated from several sources, especially parents, schoolteachers and the police, and has been given wide publicity in the public media. Surveys of students in 2001 and 2002 revealed that the percentages of teenagers involved with experimenting with illicit substance use seemed to be increasing. The numbers of students from year 6 to university who had a lifetime use of any kind of substances (excluding alcohol and cigarettes) were estimated to be 374,653 (6.2% of all students) in 2001 and 413,725 (7.0%) in 2002 (ABAC-KSC Internet Poll, 2002). Cannabis was the most common drug used by these students, followed by methamphetamine (known as Yaba in Thailand), volatile substances and ecstasy.

In a review of studies on risk and protective factors in Thailand, the common reasons given for using substances were persuasion by friends, behaving like others in a group, seeking novelty, living in an environment where controlled substances are readily accessible, and relationship problems in the family (Assanangkornchai, 2004). The study of substance use in Southeast Asia, including Thailand in the Global Initiative Project on Primary Prevention of Substance Abuse in 1997 found that social pressure towards substance use was strengthened by the attitudes of young people towards such use, notably perceptions of social approval of substance use, the belief that substance use does not entail risks and that its usage is gratifying, limited social censure, and ready availability of substances (World Health Organization, 2003).

To date, most research on the extent of the substance abuse problem in Thai young people has been cross-sectional and has only provided information on selected groups at specific times (Piyasil and Meemarayatr, 1998; Ruangkanchanasetr et al., 2005). These studies used different definitions of substance use/abuse, thus making comparisons difficult. No long-term study in this population group has been carried out and no trends concerning changes in the problem have been reported. The current project, conducted by the Drug and Alcohol Research Group at Prince of Songkhla University in Southern Thailand, aimed...
to provide information on a regional level on the magnitude of health risk behaviors, patterns of and attitudes regarding substance use, and trends over a period of years in school children. Annual surveys of regionally representative students in public and private secondary schools in Southern Thailand have been carried out since 2002. In this paper, we report the trends in illicit substance, alcohol and tobacco use, and attitudes towards such use, from the years 2002 to 2004.

2. Subjects and methods

2.1. Subjects

Four provinces of Southern Thailand, Songkhla, Pattani, Phuket and Suratthani, were selected as representative of the demographic and geographic characteristics. The selection of schools was based on a yearly updated list of schools obtained from the Provincial Education Offices. In each province, 8–10 different schools were randomly selected each year. Key issues influencing school selection were whether the school was in a rural or urban area, whether it was a private or public school, and whether it was an ordinary or vocational school. In 2002, 34 schools were surveyed, with 38 in 2003 and 2004. The sample sizes were 8708, 12,148 and 9155 students from years 7, 9 and 11 and vocational school year 2 in 2002, 2003 and 2004, respectively (Table 1). (Note. There are two certificate levels in vocational schools in Thailand. The first level is for students who finish year 9 of a normal school then continue in vocational education for 3 years to obtain a basic vocational certificate. Thus, the students who are in year 2 of this level are about the same age as those in year 11 of the ordinary school. Those who finish year 3 of the primary level can continue their study for two more years to obtain a higher vocational education certificate.)

In each school, all classes in each educational level were recruited if there were three or less classes in that level. If there were more than three classes, three with students of mixed academic performance were randomly selected by the teachers. (In some large schools in Thailand, there are 15–20 classes in a level, with up to 50–60 students per class, with up to three top classes reserved for teachers. (In some large schools in Thailand, there are 15–20 classes in a level, with up to 50–60 students per class, with up to three top classes reserved for teachers.) The study was undertaken between June and August of each year, the first semester of the school year (Thai summer holidays are early March to the middle of May). A self-completed questionnaire was distributed to all students during a regular class by a research assistant. Students were informed about the objectives of the study and their right to refuse to participate without any effect on their student status. Participation was voluntary and anonymous. The questionnaire took about 40–50 min to complete. The students were asked to answer all questions of the questionnaire completely; there was never more than one student per class who did not wish to do so and these questionnaires were excluded from the analysis. The project was approved by the Ethics Committee for Research in Human Subjects of the Faculty of Medicine, Prince of Songklanagarindra University.

2.2. Questionnaire

The questionnaire used in our study, with about 100 questions overall, was derived from questions contained in the U.S. Monitoring the Future Project (Johnston et al., 2005), the U.S. Youth Risk Behavior Surveillance System (National Center for Chronic Disease Prevention and Health Promotion, 2001), and the National Household Survey of Substance Use in Thailand in 2001 (Academic Committee on Substance Abuse Network, 2003). The wording and format of the questionnaire were modified to ensure that it could be easily understood by high-school children. The questionnaire was piloted in 30 school children of various grades prior to the commencement of the study. The questionnaires used in 2003 and 2004 were the same, although the format was slightly modified, as the 2001 one with no change in content.

The questionnaire sought information on lifetime substance use, use within a year of the interview and use during the preceding 30 days. Questions were asked about 15 substances of abusive and addictive liability (analgesics, codeine-containing cough syrup, sedatives, hypnotics, methamphetamine, ecstasy, ketamine, cocaine, LSD, cannabis, Mitragyna speciosa, a local addictive plant, opium, heroin, inhalants and steroids). For each of these most commonly used illicit substances in Thailand, the age of first use was asked, and the students were also asked whether they had ever actually seen any of the substances or only heard of them.

Information was sought on alcohol drinking, including lifetime drinking, the frequency of drinking, binge drinking (defined as drinking more than five glasses of beer/wine/whiskey within a couple of hours) and drinking until intoxication during the preceding 30 days. Just a sip for tasting was not included. The students were also asked about the age when they first drank, whether their classmates drank alcohol and if so their estimation of the number of the classmates who drank. Similar questions were asked about smoking, except that lifetime smoking was not measured in frequency and that quantity of smoking in the previous 30 days was also asked.

Questions concerning the perceived risk of taking a substance one to two times were asked. Their perception of the availability of these substances was also asked, together with their perception as to whether they would be socially rejected if they used the substance one to two times, or would reject others who did so.

2.3. Statistical analysis

Each questionnaire was checked for completeness before data entry. If there were clues that the questions were not carefully answered, for example the same choice was given to all questions or there were more than 30% missing answers, that questionnaire was excluded from the analysis. Altogether, less than 10 questionnaires were excluded each year.

Weighted prevalence for a stratified sampling survey was calculated for each substance use. The primary sampling unit was school. The number of the selected schools in each category (private/public, ordinary/vocational, urban/rural) divided by total number of schools of that category in the selected provinces was used as the sampling probability. For example, in 2002, there were six public, six ordinary schools in the rural area in Songkhla Province, and two schools were randomly selected to participate in the study, therefore the sampling probability was 1/3. The sampling probability was taken into account in the calculation of all percentages and comparisons using the “svy” set of commands, and the generalized estimating equations (gee) method for logistic regression, grouping on educational level in each school, used to identify predictors of substance use within the previous 30 days using the “xtgee” command in stata Version 7 (StataCorp, 2001). Grouping on classroom in the gee model.
was not possible as the information was not recoded. Statistical significance was defined as \( p < 0.05 \).

Multivariate logistic regression weighted by the sampling probability was performed to assess factors related to the current use of an illicit substance. The dependent variable was the use of any 1 of the 10 illicit substances (methamphetamine, cannabis, kratom, inhalants, ecstasy, cocaine, hallucinogens, ketamine, opium and heroin) within the previous 30 days. Year of data collection, sex, school level, school type and students’ academic performance were included in the model as independent variables. Weighted odds ratio with 95% confidence interval, adjusted for other variables in the model, was obtained for each predicting variable.

3. Results

3.1. Illicit substance use

The prevalence of students who stated that they had used at least one illicit substance in their lifetime was 5–7% in each year. This increased significantly in boys over the study period from 7.43% in 2002 to 9.00% in 2003 and 12.79% in 2004 \( (p < 0.05) \), but remained about the same for girls (2.42%, 1.42% and 2.62%). Krathom and cannabis were the most commonly used substances, with overall rates of use in the 3 years of 2.3%, 2.8%, 4.9% \( (p < 0.01) \) and 2.6%, 2.3%, 3.4% \( (p > 0.05) \), respectively. Significant upward trends for kratom were seen in both boys and girls, with that for boys increasing from 3.98% in 2002 to 5.61% in 2003 and 9.43% in 2004 \( (p < 0.001) \) and for girls 0.69%, 0.66% and 1.42% \( (p < 0.05) \). The proportions of boys and girls who had ever used inhalants tended to rise, while rates of methamphetamine declined by 2003–2004 (Table 2). The use of other illicit substances was less than 1.5% in both boys and girls in each year. The rates of lifetime use of common substances tended to increase in parallel with educational levels, however the highest prevalence was in vocational students (Table 2).

The majority of the students who reported the use of the most common substances (krathom, cannabis, inhalants and methamphetamine) at some stage of their lives also reported use during the preceding 12 months and about half in the preceding 30 days (Figs. 1 and 2).

## Table 2

Weighted percentages of lifetime use of common substances by school level and year

<table>
<thead>
<tr>
<th>Level</th>
<th>Amphetamine</th>
<th>Cannabis</th>
<th>Krathom</th>
<th>Inhalants</th>
<th>Ecstasy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y7</td>
<td>0.09</td>
<td>1.13</td>
<td>0.36</td>
<td>0.47</td>
<td>1.90</td>
</tr>
<tr>
<td>Y9</td>
<td>2.15</td>
<td>2.40</td>
<td>1.99</td>
<td>4.00</td>
<td>4.93</td>
</tr>
<tr>
<td>Y11</td>
<td>3.84</td>
<td>2.49</td>
<td>4.34</td>
<td>5.59</td>
<td>4.91</td>
</tr>
<tr>
<td>V2</td>
<td>6.64</td>
<td>10.16</td>
<td>7.37</td>
<td>9.81</td>
<td>16.78</td>
</tr>
<tr>
<td>Total</td>
<td>2.79</td>
<td>2.73</td>
<td>2.32</td>
<td>4.44</td>
<td>4.96</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y7</td>
<td>0.00</td>
<td>0.08</td>
<td>0.30</td>
<td>0.10</td>
<td>0.32</td>
</tr>
<tr>
<td>Y9</td>
<td>0.24</td>
<td>0.14</td>
<td>0.32</td>
<td>0.28</td>
<td>0.28</td>
</tr>
<tr>
<td>Y11</td>
<td>1.21</td>
<td>0.11</td>
<td>0.08</td>
<td>0.44</td>
<td>0.49</td>
</tr>
<tr>
<td>V2</td>
<td>3.40</td>
<td>0.54</td>
<td>1.91</td>
<td>2.71</td>
<td>0.21</td>
</tr>
<tr>
<td>Total</td>
<td>1.13</td>
<td>0.19</td>
<td>0.41</td>
<td>0.79</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Letter a: \( p < 0.001 \); letter b: \( p < 0.05 \); letter c: \( p < 0.01 \) for the comparison between years of the survey.

Kratom was the best-known substance. About half of the girls and more than half of the boys each year reported having seen real kratom leaves. Cannabis and methamphetamine were also well-known. The proportion of students who had ever seen real methamphetamine tended to decline by 2003 and 2004, while those for cannabis and kratom remained rather constant.
during the 3 years (Figs. 3 and 4). Overall, 30–40% had never seen any illicit substance.

3.2. Alcohol and tobacco use

In 2002, 38% of boys and 27% of girls admitted having drunk more than a few sips of alcohol sometime during their lifetime; the comparable figures for in 2003 were 42% and 27%, in 2004 39% and 22%. The proportions of students who admitted drinking an alcoholic beverage during the past 30 days tended to decrease in both boys and girls through 2003–2004. Among boys and girls, 8.9% and 1.8%, respectively claimed they had drunk alcohol on more than 10 of the previous 30 days. The percentages of binge drinking in boys and girls did not differ significantly each year while the percentages of drinking until intoxicated dropped from 2002 to 2003 and remained rather constant for 2004 (Table 3).

Overall, 42%, 32% and 30% of boys, and 20%, 15% and 10% of girls in 2002–2004 reported smoking a cigarette at some time during their lives, and most of these had smoked within the past 30 days. The proportions of current smokers dropped in 2003 but slightly increased in 2004. Only 5.7%, 2.6% and 4.2% of the students in 2002–2004 had smoked on more than 10 of the previous 30 days or smoked six or more cigarettes a day. All frequencies tended to increase in parallel with increased level of schooling (Table 3).

In each of the 3 years about 60% of the students stated that they knew others who drank alcohol, while about half reported others who smoked. Only 9–17% of boys and 4–7% of girls said that more than 10 of their classmates drank alcohol or smoked cigarettes. Boys and older students estimated higher numbers of drinking or smoking among their classmates than did girls and younger students.

3.3. Perceived risk, rejection and availability of substances

Students of the three survey years had similar views on substance use. In each year, more than half of the students thought that all substances entailed risk, even if they were used rarely. A greater proportion of girls tended to see a risk. The rates of students seeing alcohol, tobacco and kratom as entailing a risk to the users were similar—about 54–56% in boys and 63–67% in girls. Methamphetamine, heroin and inhalants were the substances, which most students viewed as entailing risk (Table 4).

Disapproval rates for the use of most substances were high in each of the annual surveys. Over 70% of students in 2003 said they would reject a friend if he or she used methamphetamine, cannabis, inhalants, ecstasy or heroin, even once or twice. The percentage of expecting to be rejected if they themselves used a substance was higher than that of rejecting friends for the same substance. Rejection was more frequently associated with kratom use than with cigarette smoking, and with

Table 3

<table>
<thead>
<tr>
<th>Level</th>
<th>Alcohol drinking</th>
<th>Binge drinking</th>
<th>Drinking until intoxicated</th>
<th>Tobacco smoking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y7</td>
<td>9.82</td>
<td>14.44</td>
<td>11.17</td>
<td>3.10</td>
</tr>
<tr>
<td>Y9</td>
<td>23.98</td>
<td>27.34</td>
<td>22.81</td>
<td>11.27</td>
</tr>
<tr>
<td>Y11</td>
<td>30.85</td>
<td>24.60</td>
<td>30.72</td>
<td>20.10</td>
</tr>
<tr>
<td>V2</td>
<td>45.34</td>
<td>51.00</td>
<td>50.73</td>
<td>28.78</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y7</td>
<td>6.71</td>
<td>7.26</td>
<td>6.26</td>
<td>1.70</td>
</tr>
<tr>
<td>Y9</td>
<td>13.88</td>
<td>14.99</td>
<td>11.39</td>
<td>5.20</td>
</tr>
<tr>
<td>Y11</td>
<td>13.54</td>
<td>12.10</td>
<td>6.29 b</td>
<td>4.69</td>
</tr>
<tr>
<td>V2</td>
<td>21.19</td>
<td>15.58</td>
<td>19.24</td>
<td>9.37</td>
</tr>
<tr>
<td>Total</td>
<td>13.61</td>
<td>12.05</td>
<td>9.44</td>
<td>5.12</td>
</tr>
</tbody>
</table>

Letter a: p < 0.01; letter b: p < 0.05 for the comparison between years of the survey.
cigarette smoking more frequently than with alcohol drinking (Table 4).

About 10% and 20% of the students identified alcoholic beverages and cigarettes as difficult to obtain. Cannabis was more commonly perceived as being more difficult to obtain than kratom, and kratom more difficult than tranquilizers/hypnotics. The perceived ease of availability of all substances rose in 2004, despite having declined in 2003 (Table 4).

3.4. Correlates of current illicit substance use

Altogether 873 (2.9%) of the 30,011 responses indicated the use of an illicit substance within 30 days of the survey. A period effect with an increasing trend in later years was seen. The 2003 study group had 1.46 times the odds of using any substance within 30 days of the survey than the 2002 study group, while the 2004 study group had 2.35 times the odds. Associations with type of school, sex and school level were found. After adjusting for other variables, boys, students in vocational schools and in higher school levels were more likely to have used a substance; compared to girls, students in ordinary school and in year 7, the lowest year surveyed. Sex, school level, and school type had the strongest association, with boys and vocational school students having 6.6 and 3.3 times the odds to have used a substance within 30 days of the survey (Table 5).

4. Discussion

Although there have been some large-scale national studies in Thailand (notably the Estimation of Population Related with Substance Abuse (Academic Committee on Substance Abuse Network, 2003), and the ABAC Poll Study of Student Involvement in Substances (ABAC-KSC Internet Poll, 2002), this paper extends those findings by describing 3-year trends and attitudes toward substance use, with correlation of surveyed year, school level and sex with use, in a large 30+ school survey. We found that substance use in Thai students was low, as only 5–7% of students had used an illicit substance at least once in their lifetime and 3% of students were current users, as compared, for instance, to 51–55% in 1999–2004 for lifetime use of any illicit drug in the US students (Johnston et al., 2005). However, a comparison of these results with other Thai surveys, although difficult because of different definitions, suggests that adolescent substance use has risen during recent years, which has also been noted in the national sample of students (ABAC-KSC Internet Poll, 2002), and worldwide (Bauman and Phongsavan, 1999).

The substance most often used was alcohol, followed by tobacco, as was also found in previous reports from Thailand (Assanangkornchai, 2004; World Health Organization, 2003; Ruangkanchanaset et al., 2005), the US and elsewhere (Parry et al., 2004; Young et al., 2002; Chen et al., 2004; Kokkevi et al., 2000). Cigarette smoking declined in 2003–2004 in both sexes, while alcohol drinking changed little. This was possibly due to an intensive anti-smoking movement, which began in Thailand earlier than did a similar movement against alcohol. Students’ attitudes towards alcohol were overall more favorable than that towards tobacco, and the perceived availability of alcohol was higher than for tobacco. This may reflect a government
free trade policy for alcoholic beverages introduced at the end of 1999, which resulted in the increased production and sales of certain alcoholic beverages as a promotional product in some villages under the “One Tambon (village) One Product (OTOP)” program. It is common in Thailand for licit substances (especially alcohol and cigarettes) to be used by male youngsters following sports gatherings, during festive periods, and at social gathering with their friends (World Health Organization, 2003). The frequency of binge drinking and drinking until intoxicated increased with age for both genders, although both were much lower for females. This is in keeping with international findings that binge drinking, often beginning around age 13, tends to increase during adolescence, peak in young adulthood (ages 18–22), then gradually decrease (National Institute on Alcohol Abuse and Alcoholism, 1997). It is a cause for concern as alcohol and tobacco use are associated with several serious consequences; such as motor vehicle injuries, suicide, sexual assault and high-risk sex (National Institute on Alcohol Abuse and Alcoholism, 2003). Given the high and increasing rates of motorcycle accidents (Suriyawongpaisal and Kanchanasut, 2003), sexually transmitted diseases and unwanted pregnancies among young people in Thailand (World Health Organization, 2001), interventions emphasizing the link between binge drinking and driving and unsafe sex are needed.

Krathom was the most popular illicit substance, with increasing trends of use and seeing real krathom by both boys and girls in 2003 and 2004. Other substances highly used or known by the students were cannabis, methamphetamine and inhalants. This compares to a national household survey in 2003, in which it was found that cannabis, krathom, methamphetamine and inhalants were the four most prevalent substances ever used by the general population aged 12–65 years, with lifetime rates of 4.4%, 2.6%, 2.4% and 1.1% (Academic Committee on Substance Abuse Network, 2003). The perceived availability of krathom in each year was highest, as was the proportion of students saying they saw less risk in trying krathom than other substances, almost comparable to tobacco and alcohol. Krathom is an addictive plant commonly found in southern Thailand and traditionally used by villagers. It is generally believed that krathom can enhance work performance by increasing endurance and tolerance to sunlight and that it can be used to relieve fatigue and treat some illnesses such as diabetes mellitus, coughing, diarrhea and hypertension (Assanangkornchai et al., 2004). There have been several studies reporting the pharmacological properties of mytryamine alkaloids in krathom leaves, such as morphine-like antinociceptive effects (Thongpradichote et al., 1998); inhibitory effect on electrically stimulated contraction of ileum (Watanabe et al., 1997); and gastric acid secretion through the opioid receptor (Tsuchiya et al., 2002) in animals. As strong evidence supporting the benefit of krathom in human beings has not yet established and the long-term health consequences of using it are not known, to be on the safe side students should be warned about the potential risks and consequences of krathom use.

Rates of methamphetamine, cannabis and krathom use, binge drinking and smoking were highest among vocational school male students. These students were at the same grade and age level as year 11 students in normal schools, but the social context is somewhat different, as the vocational school functions as an adult learning setting with more tolerant attitudes toward alcohol and tobacco use. Poor school performance was also associated with current substance use. This is also reflected in a review of studies about risk and protective factors for substance use in Thailand (Assanangkornchai, 2004), which found substance use in high-school or vocational school students is associated with various social factors such as peer influence, substance-using peers, roles of school and teachers in the prevention of substance use, class attitudes toward substance use, the availability of substances, and academic achievement, factors also noted in the international literature (Oetting et al., 1997). This may suggest that vocational students who are in an environment where substance use is more accepted might benefit from some targeted educational programs, and adolescents who have poor academic performance should be carefully monitored.

Gender differences in substance use, highlighted in other epidemiological studies (Latimer et al., 2004; Young et al., 2002; Chen et al., 2004; Poulin et al., 2005) and also seen in a national sample of adults (Academic Committee on Substance Abuse Network, 2003), were also evident in our study. In Thailand, boys are raised to be more independent than are girls, and drinking and smoking are considered to be male behaviors in Thai society and not acceptable for females, which probably helps explain the higher rate of substance use in our male students. However, a number of girls each year, especially those in the vocational schools, did admit to having used a substance in their lifetime, having drunk alcohol and smoked a cigarette in the previous 30 days. There was also a tendency for the use of krathom, cannabis and volatile substances to increase in the later years, raising a concern that drinking, smoking and substance use are becoming more common in Thai women. This may reflect a major social trend, as also noted elsewhere, for example, the increasing similarity of drinking patterns of men and women in younger cohorts of the US national longitudinal survey (Grant, 1997).

About half of the students overall who had ever used some common substances had also used them within the past 30 days before the survey; however the frequency of use was low, mostly less than 5 days in the past month. Further analyses found that about 20% of the lifetime users had tried two or more different substances, suggesting that these students were not regular users, but tended to be occasional users or to experiment with these substances. Other epidemiological studies of youth both in Thailand and in other countries have also found similar patterns (Ruangkanchanasetr et al., 2005; Johnston et al., 2005; Latimer et al., 2004). This is in keeping with the observation that most adolescents try alcohol or illicit drugs, so experimentation is normative and most who try alcohol or illicit drugs do not become problem users (Spooner et al., 2001). Thus, it may suggest that substance use is a developmental phenomenon, which increases from early to late adolescence and substance abuse is less common than experimentation in adolescence.

This study has at least two limitations to note. First, our participants were students in four provinces in Southern Thailand, and not a part of a national survey, which in two ways may reduce
the generalizability of the findings: we may have over-sampled adolescents in traditional kratom-using areas, and also southern Thailand has a higher Muslim population than Thailand as a whole, and alcohol drinking is prohibited for Muslims. Despite these demographic differences, however, our results are generally in keeping with the national data. Secondly, our data were solely based on student self-reporting, with no collateral data, such as from family, school or peers, which would strengthen the validity of the results. Estimates of adolescent substance use can be subject to considerable measurement error because of misreporting through such things as substance omission in use can be subject to considerable measurement error because of misreporting through such things as substance omission in the questionnaire, jargon and conceptual confusion (Morral et al., 2003). However, trends over time are reported in this paper, which probably reflect true trends in substance use, since under-reporting may be assumed to be constant over time.

In conclusion, our study reflects the dynamic situation in Thailand where substances of relatively high availability such as kratom, cannabis and inhalants have increasing trends of use, while more highly controlled substances such as methamphetamine follow a downturn. Alcohol and tobacco use, although most prevalent, are both targets of use-prevention campaigns, and their trends of use are decreasing. However, as anti-smoking movements were actively implemented long before similar movements for alcohol, and alcohol production and sales have been promoted recently, the rate of smoking in adolescents was smaller than that of alcohol use in each year. Adolescent substance use seems to be occasional and experimental rather than regular, as most users tried multiple substances but on an infrequent basis. A gender difference was found, with a higher rate of use of every substance seen in males. Effects related to surveyed year, type of school, school level and school performance, were also noted, most of which were consistent with other studies, both national and international. Finally, the study points to the need for further investigation of the processes of substance use in youth to gain a clearer understanding for planning appropriate development-specific interventions. Interventions aimed at motivating and teaching youth not to succumb to social enticement to use substances, and insisting on reduction in youth substance use, especially early use of alcohol and tobacco, as well as increased awareness of the consequences arising from substance use, should be employed.

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