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# Association between Exposure to Alcohol Marketing and Alcohol Consumption among Adolescents in Thailand: A National High School Survey, 2018

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## Abstract:

**Objective:** Direct alcohol marketing is illegal in Thailand. However, surrogate marketing, a marketing strategy that uses brand extension, brand association, alcohol-branded merchandise, sponsorships, and corporate social responsibility (CSR) activities, is widely seen. This study examined the extent of exposure to alcohol marketing and its association with alcohol consumption and binge drinking among Thai adolescents.

**Material and Methods:** A multi-stage stratified survey was conducted among high school students in years 7, 9, 11, and vocational college level 2 (V2) from 114 schools in 22 of the 77 Thai provinces, using an anonymous, self-administered questionnaire.

**Results:** Among the 21,847 students surveyed, 53.4% were girls and the mean age was 15 years. The prevalence of current and binge drinking was 19.0% and 12.8%, respectively. Most (65.2%) students were exposed to at least one alcohol advertising media; 32.4% recognized a brand after exposure, and 12.1% expressed a desire to drink the promoted beverage. The association between the desire to drink and current drinking was most pronounced among girls in years 11 and V2 (AOR=4.06, 95% CI: 3.18, 5.18), while its association with binge drinking was strongest among girls in years 7 and 9 (AOR=3.50, 95% CI: 2.42, 5.06).

**Conclusion:** Exposure to surrogate alcohol marketing is not only prevalent among adolescents but also plays a crucial role in shaping cognitive responses, namely, brand recognition and the desire to consume alcohol, which are significantly associated with both current and binge drinking. These associations were particularly strong among girls, with notable differences by age group.

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## Introduction

Harmful use of alcohol stands as one of the principal behavioural risk factors contributing to major non-communicable diseases, presenting a modifiable and preventable challenge[1]. Alcohol use contributes to the burden of diseases caused by communicable diseases such as HIV and tuberculosis. It can also lead to a variety of social problems, including harm to other people who come into contact with drinkers, such as accidents, injuries, child abuse, and interpersonal violence. Furthermore, it imposes a heavy economic cost on society[2].

Despite wide recognition of the harms attributed to alcohol consumption, alcoholic beverages are expansively promoted worldwide, more recently using new and powerful marketing techniques and diverse platforms. Branded merchandise, brand stretching, sponsorships of sports teams and events, sales promotions, and social media, which go beyond conventional print and electronic media advertisements, are now common marketing practices used by alcoholic beverage companies and permeate our daily lives. The widespread use of digital platforms has amplified the reach of cross-border alcohol marketing attempts. Alcohol marketing, as defined by the World Health Organization, covers any activity that involves "commercial communication or other action, including advertising, promotion, and sponsorship, that is designed to increase – or have the effect or likely effect of increasing – the recognition, appeal and/or consumption of alcoholic beverages and of particular new or existing alcohol brands or products. This includes the design of alcohol products, brand stretching (using an established brand for a new product in another product category), co-branding (collaboration between different brands with the same advertising goals), depiction of alcohol products and brands in entertainment media, corporate social responsibility (CSR) activities undertaken by the alcohol industry, and the sale or supply of alcoholic beverages in educational and health settings. Trademarks and trade dress (label design, product configuration, and product packaging), which can serve multiple functions, are included when their goals align with those already mentioned previously[3].

Thailand's current regulatory framework exhibits limitations across several dimensions. These include the use of product brand imagery in advertising, ambiguities in legal language that necessitate interpretation during enforcement, both regarding prohibited content and permitted exceptions, and significant challenges in monitoring and enforcement, particularly in the vast and fast-evolving digital landscape. Identifying violators in commissioned advertising and assembling admissible evidence further complicate enforcement efforts. Moreover, the increasingly sophisticated and indirect marketing strategies adopted by the alcohol industry, which continuously adapt to advancements in communication technologies, further undermine regulatory effectiveness. Consequently, the existing measures may fall short of curbing the pervasive presence of indirect and online alcohol marketing in Thailand[4].

Substantial evidence suggests a direct relationship between alcohol marketing and the drinking patterns of young individuals. Studies indicate that greater exposure to alcohol marketing is associated with earlier initiation of drinking and increased alcohol consumption among young and current drinkers who have consumed alcohol in the past[5-7]. Furthermore, systematic reviews have consistently identified certain marketing strategies, such as alcohol-sponsored events, offering free samples, and selling alcohol-related merchandise, as particularly influential in promoting increased alcohol consumption. The positive

associations between alcohol marketing and drinking behaviour have been seen in many countries, and in studies with both small and large sample sizes[8].

In Thailand, direct promotion of alcoholic beverages through methods such as visual depictions or audiovisual presentations of alcohol consumption or encouragement to consume alcohol has been proscribed by the Alcoholic Beverage Control Act, B.E. 2551 (2008) since its enactment in 2008. Nonetheless, informational advertisements or public relations activities conducted by alcohol manufacturers are permitted, provided they serve educational or social purposes, and the ban does not extend to advertisements originating from outside the country[9].

To circumvent these regulations, the alcohol industry in Thailand employs various strategies, including brand extension, product placement, sponsorship, CSR initiatives, influencer- and user-generated content, integration of cultural and communicative elements, and data-driven targeting of consumers. Studies have illustrated loopholes in Thailand's alcohol control policy, such as the utilisation of alcohol-branded merchandise as a subtle marketing tool and the practice of brand extension to promote alcohol products through unrelated items[10,11]. These methods are forms of "surrogate marketing", which are indirect marketing approaches used to bypass legal restrictions. Moreover, analysis of national population survey data demonstrates a significant association between self-reported exposure to alcohol advertising and both past-year drinking and past-year heavy drinking among individuals aged 15 years and above in Thailand. However, this study encompasses a broad spectrum of age groups. It does not provide details of the advertisement types or exposure intensities, nor account for other potentially confounding variables that may influence the relationship between alcohol marketing exposure and drinking behaviour[12].

Societal norms regarding alcohol use exhibit considerable variability across genders and age groups. Among adolescents, a range of psychosocial factors such as familial discord, positive attitudes toward alcohol consumption, direct observation of familial or peer drinking behaviours, and affiliations with delinquent peers, have been identified as associated factors for alcohol consumption[13,14]. However, these factors alone cannot capture the wider structural and environmental influences that may shape drinking behaviours, particularly the role of alcohol marketing. Research also suggests that susceptibility to marketing may differ by sex and age, as these factors shape adolescents' social environments, media engagement, and normative beliefs regarding alcohol. However, few studies have systematically examined these subgroup differences in relation to alcohol marketing exposure. One previous study in Thailand found an association between perceived advertising exposure and drinking behavior; however, that study had many limitations including a broad age range, lack of details on alcohol consumption type/ and intensity, and no adjustment for confounders. Against this background, our study aimed to assess the prevalence of alcohol marketing exposure among adolescents in Thailand, specifically focusing on high school and vocational students, examining more specific marketing types/forms while controlling for relevant confounding variables and their associations with alcohol consumption and binge drinking. We also assessed the extent to which sex and age group modify the association between alcohol marketing exposure and alcohol consumption. We used data from the 2018 national school survey of high school students in years 7, 9, 11, and vocational college level 2 (V2) across Thailand. Given the current climate of legislative scrutiny and the potential weakening of advertising regulations in Thailand, empirical evidence regarding the impact of alcohol advertising on youth drinking behaviour assumes heightened importance, providing crucial support for the preservation of robust advertising control measures.

## Material and Methods

### Data

This study involved analysis of secondary data using the dataset of the National School Survey for Alcohol Consumption and Health-risk Behaviours of 2018[15]. This survey is one of a series of tri-annual surveys, aiming to monitor drinking and other health-risk behaviours among high school and vocational students in Thailand.

### Subjects and methods

The subjects were students in middle schools and high schools (grades 7, 9, and 11) and level 2 of vocational schools. The number of students who completed the survey was 21,847. The students were selected from 114 schools in 22 of the 77 Thai provinces. The sample included 66 normal stream education schools and 48 vocational schools, comprising 80 public and 34 private institutions. Of these, 67 schools were located in urban areas and 47 in rural areas. Data collection was carried out between November 2018 and February 2019 in the second semester of the Thai school year. A two-stage stratified sampling technique was used, where provinces, the primary sampling unit (PSU), were randomly selected from each educational administrative zone (a total of five provinces were selected to ensure regional representation, including Bangkok and one province from the surrounding periphery). In each province, 4-5 schools, the secondary sampling unit (SSU), were selected, including two public high schools (one urban and one rural), one private school, one commerce-based vocational school, and one technical-based vocational school. In each school, 3-5 classes of each level were selected, and all students in the selected classes were asked to complete a self-administered, voluntary and anonymous questionnaire during the regular class period.

### Data collection

The process commenced with the project supervisor reaching out to selected schools across provinces, seeking authorization and scheduling data collection sessions. Participation by individual students was entirely voluntary, and schools retained the right to decline involvement. Before data collection, project coordinators briefed students on the study's objectives and protocols, emphasizing voluntary participation and confidentiality. Students provided verbal assent to participate. Subsequently, questionnaires were distributed to students, who were instructed to complete them honestly. Completed questionnaires were placed in individual envelopes and collected in front of the classroom. Study personnel then collected and scrutinized the questionnaires for authenticity and completeness. Any questionnaire with 30% or more unanswered questions, or appearing invalid, was excluded from the analysis, as were those lacking pertinent information, such as pattern of alcohol use and health-risk behaviour, for the investigation.

The Institutional Review Board of the Faculty of Medicine, Prince of Songkla University, approved a waiver for minors on the requirement for a consent document. Since research protocols ensured anonymity and involved no more than minimal risk to the subjects, giving assent by deed rather than by written informed consent had no impact on the subjects' rights or welfare.

The participation rate in this survey was 99%. Less than 5% of questionnaires were found to be invalid or incomplete and were therefore not included in the analysis.

### Variables and measurements

The questionnaire was composed of sections on demographic characteristics of the students, patterns of alcohol drinking, illegal substance use, health-risk behaviours, attitude and perceptions towards alcohol and substance use, exposure to alcohol advertising and

presence of alcohol and/–or substance–related problems in the family, peers and community, school environment concerning the magnitude of behavioural problems among students, and school rules toward alcohol and substance use.

### Drinking status

Drinking status was derived from a question asking when the students' most recent drinking session occurred, with answers including never having drank at all in their lifetime, within the previous 12 months, within the past 30 days, or within the past week. Drinking status was assessed using two dichotomous variables: current drinking and binge drinking. Current drinking was defined as having consumed at least one alcoholic drink (equivalent to 10 g of pure ethanol) in the past 30 days, while binge drinking was defined as drinking more than five drinks at a time for males and four drinks or more for females in the past 30 days (Supplementary Table 1).

### Exposure to alcohol advertisements and marketing

The students were asked if they had seen or heard of a list of alcohol marketing items or activities in the past 30 days. Those indicating awareness of each item were subsequently asked whether it prompted recognition of the corresponding alcoholic beverage brand and also if it elicited a desire to consume said beverage. Ten marketing stimuli were evaluated, encompassing displays in retail outlets, branded merchandise, promotional offers, sponsorships, online advertisements, television and radio spots, and outdoor displays. From this questionnaire segment, three key variables were derived: 1) Exposure to alcohol marketing, 2) Recognising beverages of that brand, and 3) A desire to drink beverages of that brand. Respondents affirming at least one marketing item were categorised as demonstrating positive exposure, recognition, or desire. To create the overall dichotomous variables used in the logistic regression analysis, the item–specific responses were aggregated. Specifically, a respondent was categorized as positive for "Exposure" if they reported seeing at least one of the ten marketing items. They were then categorized as positive for "Recognition" or "Desire" if they reported recognizing the brand or having a desire to drink in response to *at least one* of the specific items they had been exposed to. The ten categories of marketing stimuli evaluated in the study were composed of displays of alcoholic beverages in stores, soda with an alcoholic beverage logo, water with an alcoholic beverage logo, free gifts or discounts on other items when purchasing alcohol, clothes or other merchandise with an alcohol brand, sponsorship or CSR from the alcohol industry, beer promotion girls, alcohol advertisements on the internet or social media, alcohol advertisements on television or radio, and alcohol advertisements on billboards or cut–outs (Supplementary Table 2).

### Other explanatory variables

We incorporated additional variables potentially associated with students' alcohol consumption or exposure to marketing into our analysis. These encompassed demographic and background characteristics such as religious affiliation, geographic region, living arrangements (with family, alone, with friends or non–family members, or in a school dormitory), grade point average, and school classification (public or private, urban or rural, and ordinary or vocational). Furthermore, we assessed household, school, and community environments by inquiring whether parents, stepparents, other family members, friends, school personnel, or individuals in their neighbourhood exhibited issues related to alcohol consumption, smoking, drug use, gambling, gaming addiction, or violence.

Moreover, we examined group norms regarding alcohol, tobacco, and drug use, as well as risk behaviours (e.g., gambling, weapon possession, gang involvement, and sexual assault). Students rated the perceived percentages

of peers and schoolmates engaging in these behaviours on visual analogue scales, with responses categorised as ≥60% to indicate the perception that a majority of their social circle or school population exhibited these behaviours.

Finally, participants were queried about school policies aimed at prohibiting alcohol consumption or drug use among students and staff (Supplementary Table 3).

The study controlled for various confounding factors, including socio-demographics, school characteristics, and socio-environmental factors. Socio-environmental variables included alcohol/drug use or risk behavior problems and were assessed by asking students whether individuals in their close environment, such as parents, friends, school personnel, or people in their neighborhood, had problems related to alcohol consumption, smoking, drug use, gambling, gaming addiction, or violence. These questions were designed to identify the presence of problems (dichotomous yes/no for presence of problems) to indicate whether students perceived the existence of these behaviors in those individuals. Perceived social norms were assessed by asking students the perceived percentage of peers and schoolmates who engaged in alcohol/drug use and various risk behaviors using visual analogue scales. These responses were categorized, and students were classified as having a 'positive perceived norm' if they reported a perceived percentage of ≥60%, indicating their perception that a majority of their social circle or school population exhibited those behaviors.

### Data analysis

The outcome variable was drinking status as previously defined, which had two outcome variables (current and binge drinking). Exposure variables comprised four domains: 1) exposure to alcohol marketing, 2) socio-demographic characteristics of students (gender, school level, region, living arrangements), 3) school characteristics (public/private, high school/vocational, rural/urban), and 4) social environment factors (perceptions of alcohol/drug use and risk behaviour among family, friends, school staff, and community members; social norms regarding alcohol, tobacco, and drug use; risk behaviours; depression and suicidality; and school policies).

Students were categorised into two age groups: middle school (years 7 and 9) and high school (year 11 and vocational college level 2), representing early adolescence (age 11–15 years) and late adolescence (age 16–18 years), respectively. Sampling weights were computed to adjust for variations in subject selection probabilities across provinces and educational levels. These weights were calculated as the inverse of the probability of selection from the student population in each province and zone. The first-stage weight accounted for differences in the number of provinces in the educational administrative zone, while the second-stage weight adjusted for the total number of school students in each province.

Data analysis utilised the epicalc and survey packages in R[16,17]. Descriptive statistics were presented using means with standard deviation (S.D.) or medians with interquartile range (IQR) for continuous variables as appropriate and frequencies with percentage for categorical variables. Logistic regression, accounting for the survey design, examined associations between alcohol marketing exposure, recognition, desire to drink, and drinking behaviour, controlling for other variables. Initially, the univariate analysis tested each exposure variable from the four domains against each outcome variable, with inclusion in the initial multivariate model if the p-value was <0.2. Backward elimination removed variables with p-values>0.05. Effect modification by sex and age group (proxied by school year) was assessed using interaction terms in multivariate models. Associations between marketing exposure and drinking status were further analysed, stratified by sex and age group.

### Ethics

The 2018 national school survey and ethical clearance for secondary data analysis were approved by and obtained from the Ethical Review Board for Research in Human Subjects (REC.61–298–18–9 and REC.62–054–18–1) of the Faculty of Medicine, Prince of Songkla University.

## Results

### Sample characteristics

Overall, 21,847 students participated in the survey, with 53.4% identifying as female. The number of students in years 7, 9, and 11 was 6,825, 6,017, and 5,154, respectively, while 3,851 students were studying in V2. The mean age was 15.0 years (S.D.=1.84, range=10–25), with 57.4% from urban schools. The majority (85.7%) were residing with their parents or other family members.

Approximately 31.6% of students had consumed alcohol in their lifetime. The prevalence of current and binge drinking was 19.0% and 12.8%, respectively. The distribution of alcohol, tobacco, and drug use by sex and school year is shown in Supplementary Table 1. Vocational school students exhibited the highest prevalence of lifetime, current, and binge drinking, with male students consistently showing higher rates compared to females across all school levels.

### Exposure to alcohol marketing

Among all students, 65.2% reported exposure to at least one form of alcohol promotional item or activity within the past month, with a median of 3 exposed items (IQR=0, 6). Displays of alcoholic beverages in stores (52.6%) were the most prevalent form of exposure (Supplementary Table 2), while CSR or sponsorship from the alcohol industry (19.7%) was the least encountered. The prevalence of exposure to most promotional items or activities was higher among girls than boys. Additionally, exposure to each marketing item was more pronounced among students reporting current and binge drinking in the past 30 days, compared to non–drinking students (Supplementary Table 2).

After exposure to a marketing item or activity promoting a specific brand of alcoholic beverage, 40–49% of students reported recognising the beverage, while 2.3–6.8% expressed a desire to consume it. Displays of alcoholic beverages in stores elicited the highest percentages of recognition and desire to drink (Supplementary Table 2). Except for advertising containing alcohol promotion girls, girls were more likely than boys to recognise the alcoholic beverage of the marketed brand when they saw or heard the advertising. Across the ten specific marketing items surveyed, the percentage of students exposed who then recognized the beverage ranged from 40% to 49%, and the percentage expressing a desire to drink the promoted beverage ranged from 2.3% to 6.8%. Supplementary Table 2 provides item specific data on exposure, recognition, and desire, stratified by sex, age group, and drinking status. Displays in stores were most prevalent and CSR/sponsorship least prevalent. Exposure was higher among drinkers, girls had higher exposure to most items than boys, displays elicited highest recognition and desire, girls were more likely to recognize the beverage brand than boys (except for advertising containing beer promotion girls), and recognition/desire were higher among drinkers. Across all marketing items, current and binge drinkers exhibited higher rates of recognition and desire compared to non–drinkers (Table 1).

### Perception of family, school, and neighbourhood social environment

Supplementary Table 3 presents additional variables potentially linked to drinking behaviour among the students. The percentages of students reporting family or friend involvement in alcohol/drug use or behavioural problems such as gambling, gaming, and violence ranged from 48.9% to 68.9%. Of all students, 42.1% to 70.5% perceived

risk behaviours (alcohol, tobacco, or drug use, gambling, gaming, weapon possession, gang activity, sexual assault, depression, or suicidal tendencies) were common among their peers, staff, and neighbours. Most students (82.4%) believed their school had policies or regulations to deter alcohol and drug use. Perceptions of family, peer, school, and neighbourhood issues related to alcohol/drug use and risk behaviours were also prevalent and significantly more common among students who reported current or binge drinking (Supplementary Table 3).

### Association Between Exposure to Alcohol Marketing and Drinking Behaviours

Initially, univariate analysis assessed exposure to any marketing item/activity and recognition of or desire to drink the promoted beverage as independent variables, against drinking behaviours (current drinking vs. non-drinking; binge drinking vs. non-binge drinking). Subsequently, multivariate logistic regression models examined each outcome variable with the main exposure variables (marketing exposure, recognition of, and desire to drink alcohol) after adjusting for significant factors from the univariate analyses. On univariate analysis, students who were exposed to alcohol marketing were more likely to be current drinkers. In the multivariate model the association between exposure to alcohol marketing and current drinking status was not significant (AOR=0.89; 95% CI: 0.79–1.02; Table 2). However, significant statistical interactions were observed between exposure and both sex and age groups (results not shown), which led to the subsequent stratified analyses.

**Table 1** Percentages of exposure to and recognition of alcohol promotional items or activities and desire to consume alcohol by type of drinkers among school students in 2018

| | Non-drinker % (SE) | Current drinker % (SE) | Binge drinker % (SE) | All students % (SE) |
|---|---|---|---|---|
| In the past month, did you have any exposure to alcohol marketing? | 63.8 (0.49) | 68.7 (0.96) | 71.2 (1.14) | 65.2 (0.41) |
| If yes, did you: | | | | |
| Recognise the beverage of that brand? | 27.3 (0.46) | 46.2 (1.02) | 49.0 (1.25) | 32.4 (0.40) |
| Have a desire to drink alcohol? | 5.2 (0.24) | 34.4 (0.98) | 39.4 (1.21) | 12.1 (0.29) |

**Table 2** Association between exposure to alcohol marketing and current or binge drinking in the past 30 days among students in 2018

| Variable | Current drinker | | Binge drinker | |
|---|---|---|---|---|
| | Univariate OR (CI) | Multivariate* AOR (CI) | Univariate OR (CI) | Multivariate* AOR (CI) |
| Exposure to alcohol marketing | 1.21 (1.10, 1.33) | 0.89 (0.79, 1.02) | 1.37 (1.22, 1.54) | 1.05 (0.90, 1.22) |
| Recognising beverages of that brand | 2.09 (1.91, 2.29) | 1.33 (1.18, 1.50) | 2.25 (2.02, 2.50) | 1.37 (1.20, 1.58) |
| Desire to drink beverages of that brand | 7.12 (6.36, 7.97) | 3.58 (3.11, 4.13) | 7.37 (6.54, 8.31) | 3.29 (2.82, 3.85) |

*Covariates in the model included students' socio-demographic characteristics, school characteristics, perceptions of family, school and neighbourhood social environments towards alcohol, drug use and risk behaviour problems and school alcohol and drug use policies

Associations between alcohol consumption and marketing exposure exhibited variations across sex and age groups. On stratified analyses and adjusting for potential confounders, the association between exposure to alcohol marketing and current or binge drinking did not reach statistical significance across all sex–age groups, except among girls in years 7 & 9, where a negative association was observed. However, irrespective of sex–age group, there were significant associations between current and binge drinking and recognising or expressing a desire to consume the specific brand of alcoholic beverage following exposure to its marketing materials or activities. Recognition and desire were consistently and significantly associated with both current and binge drinking across most sex–age groups, while exposure itself did not show this consistent pattern in the stratified models. This distinction (exposure vs. recognition/desire) is a crucial, nuanced finding. For example, in the stratified analyses, while the association between overall exposure to marketing and drinking was not consistently significant across all groups, recognition of and desire to drink the promoted beverage were significantly associated with increased odds of current and binge drinking across nearly all sex and age strata. As shown in Table 3, the association between the desire to drink and current drinking was most pronounced among girls in years 11 & V2 (AOR=4.06, 95% CI: 3.18, 5.18), while its association with binge drinking was strongest among girls in years 7 & 9 (AOR=3.50, 95% CI: 2.42, 5.06).

**Table 3** Association between drinking status and alcohol marketing exposure, recognition of beverages and desire to drink, by sex and school year, among students in 2018

| Exposure variable | Drinking status Adjusted odds ratio (95% confidence interval)* | |
|---|---|---|
| | Current drinker [a] | Binge drinker [b] |
| Among all students | | |
| Exposure to alcohol marketing | 0.93 (0.82, 1.05) | 1.08 (0.93, 1.26) |
| Recognising beverages of that brand | 1.43 (1.27, 1.61) | 1.47 (1.28, 1.69) |
| Desire to drink beverages of that brand | 3.72 (3.23, 4.30) | 3.45 (2.95, 4.03) |
| Among girls in Years 7 & 9 | | |
| Exposure to alcohol marketing | 0.64 (0.51, 0.81) | 0.75 (0.55, 1.02) |
| Recognising beverages of that brand | 1.31 (1.03, 1.67) | 1.10 (0.82, 1.47) |
| Desire to drink beverages of that brand | 3.76 (2.71, 5.20) | 3.50 (2.42, 5.06) |
| Among boys in Years 7 & 9 | | |
| Exposure to alcohol marketing | 0.96 (0.73, 1.26) | 1.50 (1.03, 2.19) |
| Recognising beverages of that brand | 1.27 (0.96, 1.69) | 1.83 (1.29, 2.58) |
| Desire to drink beverages of that brand | 2.37 (1.63, 3.43) | 3.17 (2.03, 4.96) |
| Among girls in Year 11 & Vocational 2 | | |
| Exposure to alcohol marketing | 0.89 (0.71, 1.13) | 0.94 (0.71, 1.25) |
| Recognising beverages of that brand | 1.39 (1.13, 1.70) | 1.30 (1.02, 1.66) |
| Desire to drink beverages of that brand | 4.06 (3.18, 5.18) | 3.17 (2.44, 4.12) |
| Among boys in Year 11 & Vocational 2 | | |
| Exposure to alcohol marketing | 1.14 (0.90, 1.44) | 1.23 (0.95, 1.60) |
| Recognising beverages of that brand | 1.37 (1.10, 1.72) | 1.45 (1.14, 1.85) |
| Desire to drink beverages of that brand | 3.69 (2.88, 4.73) | 3.46 (2.65, 4.52) |

*Covariates in the model included students' socio–demographic characteristics, school characteristics, perceptions of family, school and neighbourhood social environments towards alcohol, drug use and risk behaviour problems and school alcohol and drug use policies
[a]The baseline level is no drinking in the past 30 days
[b]The baseline level is no binge drinking in the past 30

## Discussion

This paper illustrates the extent to which school students in Thailand were exposed to alcohol advertising or marketing materials and their association with their own drinking behaviours (>65%). With active and widespread indirect alcohol marketing activities in Thailand, it is not surprising that exposure to alcohol marketing was prevalent among high school students regardless of their drinking status. Over half of the students reported exposure to various promotional items or activities within the past month, with girls having a higher prevalence of perceiving and being induced by marketing materials than boys. Additionally, the prevalence of exposure to most promotional items or activities was higher among girls than boys. Among those exposed, recognition and desire were observed, and importantly, these factors (not exposure), were the primary drivers associated with current and binge drinking in the multivariate analyses (Tables 2 and 3). Displays of alcoholic beverages in stores constituted the most encountered form of marketing, followed by other media channels such as social media, television, and billboards. Importantly, while the prevalence of exposure was slightly higher among drinkers compared to non-drinkers in adjusted multivariate models (Table 1), overall exposure was not significantly associated with current or binge drinking overall (Table 2), and this lack of a consistent association was maintained across most sex and age strata (Table 3). Moreover, our analysis revealed that male adolescents were more inclined than females to engage in alcohol consumption and binge drinking.

More importantly, multivariate and stratified analyses revealed that recognition of and desire to consume the marketed beverage were significantly and consistently associated with both current and binge drinking across all sex and age groups (Tables 2 and 3). These associations were notably stronger than those observed for overall exposure to alcohol marketing, underscoring the greater influence of these cognitive and affective responses.

This study also reveals that a significant proportion of students recognised advertised alcoholic beverages and expressed a desire to consume them after exposure to marketing materials. This finding confirms prior research in Thailand, which demonstrated that exposure to alcohol advertising or brand logos, even on non-alcoholic products, can trigger consumers' recall of the company's primary alcoholic beverage and stimulate a desire to consume it[11,18]. This desire was particularly prominent among current and binge drinkers, indicating a reinforcement effect of marketing on existing drinking behaviours. This supports existing literature, indicating that greater exposure to alcohol marketing correlates with an increased likelihood of engaging in binge and hazardous drinking behaviours among youth[5].

Our analysis also found that the recognition of and desire to consume the promoted beverage was independently associated with current drinking or binge drinking behaviours, with variations observed across sex and age groups. It is important to note that these multivariate associations for marketing exposure, recognition, and desire are robust, as they were determined independently of various socio-environmental factors. These socio-environmental factors were also found to be significantly associated with drinking behaviors, as detailed in Supplementary Table 3, and were included as covariates in our multivariate models. This reinforces the independence and significance of the adjusted findings regarding alcohol marketing.

Specifically, stronger associations between these variables and current drinking were seen among girls, while among boys, the associations were stronger with binge drinking. While girls had a higher exposure to most specific items and overall (Supplementary Table 2), the multivariate analysis of overall exposure (as a composite variable) and drinking outcomes showed limited significant associations (Table 3), unlike recognition and desire. The gender-specific alcohol marketing strategies and the resulting disparities

in gender consumption habits have been extensively documented. To bolster overall alcohol consumption, the alcohol industry perpetuates gender-specific marketing tactics and product development aimed at influencing societal norms regarding alcohol consumption[19]. Notably, our study revealed that advertising containing attractive beer promotion girls aroused the most recognition and desire to drink in boys, whereas branded merchandise generated the highest percentage of recognition for girls, indicating that these marketing tactics are effective when targeting teenagers. The descriptive analysis of specific items showed variations in exposure, recognition, and desire patterns by sex and age (Supplementary Table 2), reiterating that the multivariate models focused on the overall impact of recognition and desire after any exposure. This finding was consistent with previous research suggesting that men and women are differentially exposed to and influenced by various forms of alcohol advertising, with men being more susceptible to broadcast advertising, particularly for beer, while young women are more influenced by billboard and print media advertising[20]. However, conflicting findings exist, as some reviews have reported no gender disparities in drinking behaviours following exposure to alcohol marketing[7,21].

Our study underscores the importance of considering both age and sex as potential modifiers of the impact of alcohol marketing on consumption patterns. Nevertheless, our analysis did not account for students' self-identified gender, thereby precluding the identification and analysis of transgender individuals as a distinct subgroup. Previous research from our team has shown that students identifying as LGBTQ+ generally exhibit higher rates of depressive symptoms, suicidality, and alcohol use compared to cisgender heterosexual participants[22]. Additionally, the literature indicates that sexual minority individuals often adhere to different norms regarding alcohol consumption[23]. Therefore, future studies should adopt a more comprehensive approach to gender classification and report findings specific to adolescents who identify as LGBTQ+. This approach would facilitate a more nuanced understanding of the association between gender identity, alcohol marketing, and alcohol consumption behaviours.

The main strength of this study is that the survey was systematically conducted within large, nationally representative samples, allowing us to analyse and present data separately for boys and girls in early and late adolescence age ranges. However, several limitations warrant acknowledgement. Firstly, the study focused only on a population attending secondary education; therefore, our findings may not be extrapolated to those outside the secondary education demographic. Secondly, the cross-sectional design employed herein precludes causal inferences, and thus a cautious interpretation of the results is suggested. Current or binge-drinking adolescents may be more sensitive to alcohol marketing, and conversely, those marketing materials may be more stimulating to current or binge drinkers than non-drinkers.

Thirdly, limitations pertain to exposure and outcome measurements, as the assessment of marketing exposure and drinking behaviours relied on self-reported histories. We collapsed marketing exposure items together and dichotomised the variable. Given that exposure and outcome are contingent upon intensity, frequency, and duration, the dichotomous reporting methods utilised herein (ever vs. never) may obscure nuanced dose-response relationships. Using more precise measurements could provide a more comprehensive assessment of the association between drinking behaviours and marketing exposure. Lastly, despite assurances of questionnaire anonymity, the survey's classroom setting, with teachers in proximity, may have prevented students from answering truthfully. This could have led to an under-reporting of drinking behaviours and skewed association measures towards the null.

## Conclusion

In conclusion, this study contributes to our understanding of the relationship between alcohol marketing and adolescent drinking behaviours, which is moderated by sex and age. Efforts to mitigate the impact of alcohol marketing on youth drinking should consider gender- and age-specific interventions. Furthermore, regulatory measures targeting the marketing practices of the alcohol industry may help reduce adolescents' exposure to promotional materials and curb alcohol-related harm among this demographic. Further research is warranted to explore additional factors influencing adolescent alcohol consumption and evaluate the effectiveness of interventions aimed at reducing alcohol-related harm in this population.

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## Conflict of interest

The authors declare that there are no conflicts of interest.

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**Supplementary Table 1** Prevalence of alcohol consumption, tobacco, and drug use among students in 2018 by sex and school level, % (SE)

| | Male (%) | | | Female (%) | | | All students |
|---|---|---|---|---|---|---|---|
| | Y7+Y9* | Y11+V2** | Total | Y7+Y9 | Y11+V2 | Total | |
| Lifetime history of alcohol consumption | | | | | | | |
| No | 82.0 (0.62) | 51.3 (0.99) | 68.5 (0.59) | 77.6 (0.67) | 57.6 (0.87) | 68.4 (0.55) | 68.4 (0.40) |
| Yes | 18.0 (0.62) | 48.7 (0.99) | 31.5 (0.59) | 22.4 (0.67) | 42.4 (0.87) | 31.6 (0.55) | 31.6 (0.40) |
| Age at first drink (mean, sd) | 12.5 (8.92) | 14.7 (5.52) | 14.1 (5.38) | 12.8 (5.32) | 14.9 (4.13) | 14.1 (4.00) | 14.1 (3.27) |
| Alcohol consumption in past 30 days | | | | | | | |
| No | 89.7 (0.50) | 68.0 (0.93) | 80.2 (0.52) | 87.2 (0.55) | 75.4 (0.78) | 81.7 (0.47) | 81.0 (0.35) |
| Yes | 10.3 (0.50) | 32.0 (0.93) | 19.8 (0.52) | 12.8 (0.55) | 24.6 (0.78) | 18.3 (0.47) | 19.0 (0.35) |
| Binge drinkers | | | | | | | |
| No | 93.6 (0.40) | 77.0 (0.83) | 86.3 (0.44) | 92.1 (0.44) | 83.4 (0.68) | 88.0 (0.40) | 87.2 (0.30) |
| Yes | 6.4 (0.40) | 23.0 (0.83) | 13.7 (0.44) | 7.9 (0.44) | 16.6 (0.68) | 12.0 (0.40) | 12.8 (0.30) |
| Tobacco use in past 30 days | | | | | | | |
| No | 94.4 (0.38) | 85.7 (0.67) | 90.6 (0.36) | 97.7 (0.24) | 96.7 (0.31) | 97.2 (0.20) | 94.1 (0.20) |
| Yes | 5.6 (0.38) | 14.3 (0.67) | 9.4 (0.36) | 2.3 (0.24) | 3.3 (0.31) | 2.8 (0.20) | 5.9 (0.20) |
| Drug use in past 30 days | | | | | | | |
| No | 90.2 (0.50) | 81.8 (0.77) | 86.5 (0.44) | 93.8 (0.37) | 90.4 (0.53) | 92.2 (0.32) | 89.5 (0.27) |
| Yes | 9.8 (0.50) | 18.2 (0.77) | 13.5 (0.44) | 6.2 (0.37) | 9.6 (0.53) | 7.8 (0.32) | 10.5 (0.27) |

*Y7+Y9=levels 7 and 9 (middle school students), 11–15 years (early adolescents)
**Y11+V2=level 11 and level 2 of vocational colleges (V2) (high school students) 16–20 years (late adolescents)

**Supplementary Table 2** Prevalence of exposure to, recognition of, and desire to drink alcoholic beverages among students in 2018 by sex and age group (%, SE)

| | Male | | | Female | | | Drinking status | | |
|---|---|---|---|---|---|---|---|---|---|
| | Y7+Y9 | Y11+V2 | Total | Y7+Y9 | Y11+V2 | Total | Non-drinker | Current | Binge |
| Displays of alcoholic beverages in stores | | | | | | | | | |
| Exposed | 45.5 (0.82) | 49.4 (0.99) | 47.2 (0.63) | 55.1 (0.77) | 60.3 (0.85) | 57.5 (0.57) | 52.0 (0.51) | 53.4 (1.03) | 55.3 (1.24) |
| Recognised | 15.6 (0.61) | 23.8 (0.84) | 19.2 (0.50) | 20.3 (0.63) | 30.9 (0.83) | 25.2 (0.52) | 18.5 (0.41) | 32.5 (0.96) | 35.6 (1.19) |
| Desired | 3.2 (0.28) | 10.5 (0.60) | 6.4 (0.31) | 4.6 (0.32) | 10.1 (0.54) | 7.2 (0.31) | 2.2 (0.15) | 21.9 (0.85) | 26.2 (1.09) |
| Soda with alcoholic beverage logo | | | | | | | | | |
| Exposed | 33.3 (0.77) | 38.3 (0.97) | 35.5 (0.61) | 33.6 (0.73) | 38.4 (0.86) | 35.8 (0.56) | 34.9 (0.49) | 37.0 (0.99) | 39.4 (1.21) |
| Recognised | 11.2 (0.51) | 17.3 (0.76) | 13.8 (0.44) | 11.5 (0.49) | 17.4 (0.67) | 14.2 (0.41) | 12.1 (0.34) | 19.2 (0.81) | 21.3 (1.01) |
| Desired | 2.4 (0.25) | 6.8 (0.47) | 4.3 (0.25) | 2.4 (0.22) | 5.2 (0.37) | 3.7 (0.21) | 1.6 (0.12) | 11.5 (0.63) | 14.8 (0.85) |
| Water with alcoholic beverage logo | | | | | | | | | |
| Exposed | 28.0 (0.73) | 32.7 (0.93) | 30.1 (0.58) | 26.5 (0.68) | 31.2 (0.82) | 28.7 (0.53) | 28.9 (0.46) | 31.4 (0.96) | 32.5 (1.17) |
| Recognised | 9.8 (0.48) | 15.5 (0.73) | 12.3 (0.42) | 10.1 (0.47) | 14.9 (0.63) | 12.3 (0.39) | 10.9 (0.32) | 16.7 (0.77) | 17.3 (0.93) |
| Desired | 2.4 (0.24) | 6.4 (0.48) | 4.2 (0.25) | 2.02 (0.22) | 4.5 (0.36) | 3.1 (0.20) | 1.9 (0.14) | 10.1 (0.60) | 12.1 (0.79) |
| Free gifts or discounts on other items when purchasing alcohol | | | | | | | | | |
| Exposed | 19.2 (0.64) | 22.6 (0.82) | 20.7 (0.51) | 18.8 (0.61) | 19.8 (0.68) | 19.3 (0.45) | 19.9 (0.40) | 21.7 (0.83) | 24.4 (1.04) |
| Recognised | 5.7 (0.37) | 9.2 (0.55) | 7.2 (0.32) | 6.0 (0.38) | 8.1 (0.45) | 7.0 (0.29) | 6.0 (0.24) | 11.4 (0.63) | 13.3 (0.82) |
| Desired | 1.4 (0.19) | 4.7 (0.40) | 2.9 (0.21) | 1.7 (0.21) | 3.4 (0.30) | 2.5 (0.18) | 1.3 (0.11) | 7.8 (0.53) | 9.9 (0.72) |

**Supplementary Table 2** Continued

| | Male | | | Female | | | Drinking status | | |
|---|---|---|---|---|---|---|---|---|---|
| | Y7+Y9 | Y11+V2 | Total | Y7+Y9 | Y11+V2 | Total | Non-drinker | Current | Binge |
| Clothes or other merchandise with alcohol brand | | | | | | | | | |
| Exposed | 27.6 (0.72) | 34.4 (0.94) | 30.6 (0.58) | 33.6 (0.73) | 42.3 (0.87) | 37.6 (0.57) | 33.3 (0.48) | 37.5 (1.00) | 38.7 (1.21) |
| Recognised | 10.0 (0.48) | 16.4 (0.73) | 12.8 (0.42) | 12.9 (0.50) | 20.7 (0.73) | 16.6 (0.44) | 12.7 (0.34) | 20.9 (0.84) | 21.9 (1.02) |
| Desired | 1.8 (0.21) | 6.1 (0.47) | 3.7 (0.24) | 2.1 (0.22) | 4.7 (0.37) | 3.3 (0.21) | 1.6 (0.12) | 10.4 (0.63) | 11.8 (0.79) |
| Sponsorship or CSR* from the alcohol industry | | | | | | | | | |
| Exposed | 18.4 (0.63) | 23.6 (0.83) | 20.7 (0.51) | 17.0 (0.58) | 20.8 (0.71) | 18.7 (0.45) | 19.6 (0.40) | 20.7 (0.82) | 22.9 (1.02) |
| Recognised | 6.3 (0.40) | 10.8 (0.61) | 8.3 (0.35) | 5.8 (0.36) | 9.9 (0.53) | 7.7 (0.31) | 7.3 (0.27) | 10.5 (0.62) | 12.0 (0.79) |
| Desired | 1.7 (0.22) | 4.5 (0.40) | 2.9 (0.21) | 1.11 (0.16) | 2.5 (0.26) | 1.7 (0.15) | 1.3 (0.11) | 6.1 (0.49) | 7.9 (0.65) |
| Beer promotion girls | | | | | | | | | |
| Exposed | 32.4 (0.76) | 42.3 (0.98) | 36.7 (0.61) | 39.8 (0.76) | 50.7 (0.88) | 44.8 (0.58) | 39.2 (0.50) | 46.5 (1.02) | 50.1 (1.25) |
| Recognised | 11.6 (0.53) | 20.1 (0.79) | 15.3 (0.46) | 12.0 (0.50) | 20.5 (0.71) | 15.9 (0.43) | 12.8 (0.35) | 24.0 (0.87) | 27.5 (1.10) |
| Desired | 3.9 (0.33) | 10.8 (0.62) | 6.9 (0.33) | 2.08 (0.22) | 5.2 (0.37) | 3.5 (0.21) | 2.3 (0.16) | 15.1 (0.74) | 18.4 (0.96) |
| Alcohol advertisements on the internet or social media | | | | | | | | | |
| Exposed | 33.9 (0.77) | 40.9 (0.97) | 37.0 (0.61) | 42.7 (0.77) | 51.8 (0.88) | 46.9 (0.58) | 41.9 (0.51) | 42.2 (1.01) | 44.0 (1.23) |
| Recognised | 11.0 (0.51) | 17.8 (0.76) | 14.0 (0.44) | 13.6 (0.52) | 23.0 (0.75) | 17.9 (0.45) | 13.6 (0.36) | 22.4 (0.85) | 23.9 (1.04) |
| Desired | 2.2 (0.25) | 7.4 (0.53) | 4.5 (0.27) | 2.6 (0.25) | 7.0 (0.45) | 4.7 (0.25) | 1.6 (0.13) | 14.4 (0.73) | 17.0 (0.94) |
| Alcohol advertisements on television or radio | | | | | | | | | |
| Exposed | 31.3 (0.76) | 36.4 (0.95) | 33.6 (0.60) | 38.8 (0.75) | 45.3 (0.88) | 41.8 (0.57) | 38.3 (0.50) | 36.5 (0.99) | 38.0 (1.20) |
| Recognised | 10.9 (0.52) | 16.8 (0.75) | 13.5 (0.44) | 12.7 (0.51) | 20.0 (0.71) | 16.1 (0.43) | 13.3 (0.36) | 18.7 (0.79) | 19.9 (0.97) |
| Desired | 2.1 (0.25) | 6.2 (0.48) | 3.9 (0.25) | 2.4 (0.24) | 5.4 (0.40) | 3.8 (0.23) | 1.6 (0.13) | 11.6 (0.67) | 13.4 (0.83) |
| Alcohol advertisements on billboards or cut-outs | | | | | | | | | |
| Exposed | 34.0 (0.77) | 40.4 (0.97) | 36.8 (0.61) | 40.8 (0.76) | 48.3 (0.88) | 44.3 (0.58) | 40.4 (0.50) | 40.9 (1.01) | 43.0 (1.23) |
| Recognised | 11.8 (0.53) | 17.8 (0.77) | 14.4 (0.45) | 13.5 (0.53) | 21.7 (0.74) | 17.3 (0.45) | 13.9 (0.36) | 21.0 (0.84) | 22.3 (1.03) |
| Desired | 2.3 (0.25) | 6.7 (0.49) | 4.2 (0.26) | 2.4 (0.24) | 5.6 (0.40) | 3.9 (0.23) | 1.5 (0.12) | 12.2 (0.68) | 15.0 (0.89) |
| Exposure/recognition/desire for ≥1 item | | | | | | | | | |
| Exposure positive | 57.2 (0.82) | 62.2 (0.96) | 59.4 (0.62) | 67.3 (0.73) | 74.1 (0.75) | 70.5 (0.53) | 63.8 (0.49) | 68.7 (0.96) | 71.2 (1.14) |
| Recognition positive | 23.8 (0.70) | 36.1 (0.96) | 29.2 (0.58) | 29.3 (0.71) | 42.1 (0.88) | 35.2 (0.56) | 27.3 (0.46) | 46.2 (1.02) | 49.0 (1.25) |
| Desire positive | 7.45 (0.43) | 18.5 (0.78) | 12.3 (0.42) | 8.28 (0.44) | 16.1 (0.65) | 11.9 (0.38) | 5.2 (0.24) | 34.4 (0.98) | 39.4 (1.21) |

*CSR=corporate social responsibility

**Supplementary Table 3** Distribution of perceptions of family, school, and neighbourhood social environment by type of drinkers among high school students in Thailand in 2018, % (SE)

| Perception variable | Non-current drinkers | Current drinkers | Non-binge drinkers | Binge drinkers |
|---|---|---|---|---|
| In the past year, were there any of these problems in your family, school or neighbourhood? | | | | |
| Alcohol or drug use problems in family members | 59.8 (0.46) | 76.8 (0.87) * | 60.9 (0.45) | 77.8 (1.04) ** |
| Risk behaviour problems in family members | 21.9 (0.39) | 31.0 (0.96) * | 22.7 (0.39) | 30.4 (1.14) ** |
| Alcohol or drug use problems in peers | 20.1 (0.38) | 61.0 (1.00) * | 22.4 (0.39) | 65.3 (1.19) ** |
| Risk behaviour problems in peers | 37.0 (0.46) | 56.8 (1.02) * | 38.3 (0.45) | 57.9 (1.24) ** |
| Alcohol or drug use problems in school personnel | 32.7 (0.44) | 45.2 (1.02) * | 33.4 (0.43) | 46.4 (1.24) ** |
| Risk behaviour problems in school personnel | 24.4 (0.41) | 30.1 (0.94) * | 24.6 (0.40) | 31.6 (1.15) ** |
| Alcohol or drug use problems in neighbourhood | 59.8 (0.46) | 73.2 (0.92) * | 60.8 (0.45) | 73.4 (1.11) ** |
| Risk behaviour problems in neighbourhood | 56.9 (0.47) | 68.8 (0.95) * | 57.8 (0.45) | 68.5 (1.16) ** |
| 60% or over of the students in my school had this problem | | | | |
| Alcohol or drug use | 11.0 (0.30) | 32.1 (0.95) * | 11.9 (0.30) | 36.3 (1.19) ** |
| Risk behaviours | 34.2 (0.46) | 47.0 (1.03) * | 34.8 (0.44) | 49.4 (1.25) ** |
| Depression or suicidality | 2.1 (0.13) | 3.3 (0.32) * | 2.1 (0.13) | 3.9 (0.43) ** |
| 60% or over of my friends had this problem | | | | |
| Alcohol or drug use | 5.8 (0.23) | 30.5 (0.95) * | 6.9 (0.25) | 35.4 (1.19) ** |
| Risk behaviours | 23.7 (0.42) | 35.8 (0.99) * | 24.3 (0.41) | 37.7 (1.21) ** |
| Depression or suicidality | 1.5 (0.12) | 2.7 (0.30) * | 1.6 (0.12) | 3.0 (0.38) ** |
| My school had policy or regulations to prevent and encourage students and staff not to drink alcohol or use drugs | 82.0 (0.37) | 84.1 (0.79) * | 82.2 (0.36) | 84.1 (0.97) |

*denotes a significant difference in percentages of that variable between non-drinkers and current drinkers
**denotes a significant difference in percentages of that variable between non-current binge drinkers and current binge drinkers