# Predictors and Prevalence of Alcohol and Cannabis Co-use Among Filipino Adolescents: Evidence From a School-based Student Health Survey

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**Objectives:** This study explored the prevalence and predictors of alcohol and cannabis co-use among 9263 Filipino adolescents, using data from the 2019 Global School-based Student Health Survey (GSHS).

**Methods:** We conducted a cross-sectional secondary analysis of the GSHS, targeting adolescents aged 13-17 years and excluding cases with incomplete data on alcohol and cannabis use. Our analysis employed the bivariate chi-square test of independence and multivariable logistic regression using Stata version 18 to identify significant predictors of co-use, with a $p$-value threshold set at 0.05.

**Results:** The weighted prevalence of co-users was 4.2% (95% confidence interval [CI], 3.4 to 5.3). Significant predictors included male sex (adjusted odds ratio [aOR], 4.50; 95% CI, 3.31 to 6.10; $p < 0.001$) and being in a lower academic year, specifically grade 7 (aOR, 4.08; 95% CI, 2.39 to 6.99; $p < 0.001$) and grade 8 (aOR, 2.20; 95% CI, 1.30 to 3.72; $p = 0.003$). Poor sleep quality was also a significant predictor (aOR, 1.77; 95% CI, 1.29 to 2.44; $p < 0.001$), as was a history of attempted suicide (aOR, 5.31; 95% CI, 4.00 to 7.06; $p < 0.001$). Physical inactivity was associated with lower odds of co-use (aOR, 0.45; 95% CI, 0.33 to 0.62; $p < 0.001$). Additionally, non-attendance of physical education classes (aOR, 1.48; 95% CI, 1.06 to 2.05; $p = 0.021$), infrequent unapproved parental checks (aOR, 1.37; 95% CI, 1.04 to 1.80; $p = 0.024$), and lower parental awareness of free-time activities (aOR, 0.63; 95% CI, 0.45 to 0.87; $p = 0.005$) were associated with higher odds of co-use. Factors not significantly linked to co-use included age group, being in grade 9, always feeling lonely, having no close friends, being bullied outside school, and whether a parent or guardian understood the adolescent's worries.

**Conclusions:** The findings highlight the critical need for comprehensive interventions in the Philippines, addressing not only physical inactivity and parental monitoring but also focusing on sex, academic grade, participation in physical education classes, sleep quality, and suicide attempt history, to effectively reduce alcohol and cannabis co-use among adolescents.

**Key words:** Alcohol drinking, Cannabis, Adolescent behavior, Philippines, Cross-sectional studies

## INTRODUCTION

Drug use among adolescents is a significant global challenge [1,2], with increasing concern regarding the co-use of alcohol and cannabis [3]. The World Health Organization (WHO) identifies substance use during adolescence as a major public health issue, affecting millions worldwide [4]. This age group is particularly vulnerable to the effects of substance use,

as their brains are still developing, and early use can lead to a variety of long-term health and social consequences [2-4]. The United Nations Office on Drugs and Crime, in their 2023 World Drug Report [5], highlighted the prevalence of substance use among adolescents. According to their findings, an estimated 5.6% of young people aged 15-16 worldwide have used cannabis in the past year [5]. This figure is indicative of the reach of cannabis among adolescents on a global scale. Furthermore, alcohol use in this age group is reported to be even higher than cannabis use, pointing to a more widespread issue with alcohol among young people [5]. These findings underscore the growing prevalence of substance use in this vulnerable age group, raising alarms about the potential long-term consequences on physical, mental, and social health. Substance use during adolescence can have far-reaching effects, impacting everything from academic performance and interpersonal relationships to an increased risk of developing substance use disorders later in life [6]. Additionally, tobacco and alcohol use are pervasive global issues among adolescents, often serving as gateways to other forms of substance abuse [7].

In the Philippines, a 2022 government survey highlighted a concerning trend in adolescent substance use, particularly regarding the age at which individuals first use drugs [8]. The study showed that 41.3% of first-time drug users were between the ages of 15 and 19. Usage patterns varied, with about 38.7% of respondents reporting drug use two to five times a week, 24.7% monthly, and 20.6% weekly [8]. Further insights into adolescent alcohol consumption are provided by the 2018 Expanded National Nutrition Survey, which documented fluctuations in the rates of current drinkers among adolescents [9]. The survey documented a decrease from 21.7% in 2008 to 18.6% in 2013, followed by an increase from 14.9% in 2015 to 16.8% in 2018. Among adolescents aged 10 to 19, 16.8% were identified as current drinkers, with 4.0% engaging in binge drinking. Additionally, a cross-sectional survey conducted as part of the Global School-based Student Health Survey, which involved 33 184 adolescents from Indonesia, Laos, the Philippines, Thailand, and Timor-Leste, revealed that 3.1% of school-aged adolescents reported using cannabis in the past month [10]. The prevalence ranged from 0.4% in Laos to 5.6% in the Philippines, highlighting regional variations in substance use trends among adolescents. Since 1972, cannabis has been illegal in the Philippines, with the laws becoming even more stringent in 2002 when the Comprehensive Dan-

gerous Drugs Act designated cannabis as a "dangerous drug" [11]. The severity of the Philippines' cannabis laws, which impose some of the harshest penalties worldwide for possession, use, and distribution, casts adolescent cannabis use in a particularly complex light.

Despite the alarming statistics presented, the literature reveals significant gaps in our understanding of substance use among Filipino adolescents, particularly regarding the co-use of alcohol and cannabis [9,10]. Current research often overlooks the specific patterns of alcohol and cannabis co-use, the socioeconomic and cultural dynamics involved, and the particular factors contributing to these behaviors within the Filipino context. Most existing studies focus on single substance use, provide outdated data, or are geographically limited [8-10], leaving a critical gap in comprehensive, recent, and culturally sensitive research. This gap in the literature underscores the urgent need for updated and localized research that can inform targeted interventions and policies.

The primary aim of this study is to bridge the above-discussed knowledge gaps by investigating the predictors and prevalence of alcohol and cannabis co-use among 9263 adolescents in the Philippines, utilizing data from a school-based student health survey. This research strives to offer a detailed empirical analysis of the extent and nature of co-use, and to identify the key factors associated with these behaviors.

## METHODS

### Study Design, Data Source, and Participants

This cross-sectional secondary analysis used data from the 2019 Global School-based Student Health Survey (GSHS) conducted in the Philippines [12]. The GSHS is a collaborative initiative between the WHO and the U.S. Centers for Disease Control and Prevention (CDC). Its primary goal is to collect comprehensive data on adolescent health behaviors and protective factors worldwide [13]. Notably, the 2019 survey marks the fifth iteration in the Philippines, adding to an invaluable longitudinal dataset. The data processing steps, including scanning, cleaning, editing, and weighting, were meticulously carried out by the WHO and the U.S. CDC, ensuring the accuracy and reliability of the findings.

The survey included a variety of modules, including alcohol and drug use, dietary and hygiene practices, mental and physical health, and risks of violence or injury. It was structured as a self-administered questionnaire to ensure honest and confi-

dential reporting of sensitive health behaviors. The questionnaires, which were computer-scannable, were distributed and supervised by trained personnel during regular school hours, facilitating both efficient administration and accurate data collection. While the survey covered major Filipino regions such as Luzon, Mindanao, and Visayas, this study focused exclusively on the national dataset [12].

The initial survey included 10 175 adolescents aged 13-17, who were enrolled in grades 7 to 10 across various schools. This age group is typical for secondary education in the Philippines. The sample size was reduced to 9263 participants after excluding those with incomplete responses on cannabis use (n=637) and alcohol use (n=275). A two-stage cluster sampling method was used to ensure representative selection: schools were first selected based on the probabilities related to their enrollment sizes, followed by a random selection of classes within these schools. All students in the selected classes were eligible and encouraged to participate, resulting in an exceptional response rate of 100% from schools and 85% from students, which combined for an overall rate of 85% [12]. In preparing this report, adherence to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines was maintained to ensure a high standard of reporting in observational research [14].

## Study Variables

The primary outcome variable in this study was the co-use of cannabis and alcohol among adolescents. This variable was based on responses to two key questions from the GSHS. The first question asked about the frequency of marijuana use in the past 30 days, and the second question inquired about the number of days alcohol was consumed during the same period. Adolescents who reported using both cannabis and alcohol within this timeframe were identified as co-users. Conversely, those who did not report using these substances concurrently were labeled as not co-users. This binary classification formed the basis for examining the prevalence and predictors of substance co-use among adolescents in the Philippines.

Accompanying the primary outcome variable were several covariates selected for their potential influence on substance use behaviors. These include demographic details such as age, divided into two groups: 'Less than 15 years' and '15 years and greater'; sex, categorized as male or female; and educational grade, spanning from grade 7 to grade 10. Mental health and social dynamics were also represented through variables including "felt lonely always," "poor sleep quality," "attempted suicide," "no close friend," "bullied at school," and "bullied outside school." Physical activity was gauged through responses to "not physically active" and "did not attend physical education class." Additionally, family environment factors were included, such as whether the "parent/guardian understood their worries," the frequency of "infrequent unapproved parental checks," and parental awareness of the adolescents' "free time activities." These covariates provided a comprehensive backdrop against which the patterns and determinants of alcohol and cannabis co-use were analyzed, offering insights into the nature of adolescent behavior and health in the Philippines.

## Statistical Analysis

Descriptive statistics were initially applied to summarize the categorical variables, with the results presented as percentages (Table 1). The primary metric of interest—namely, the prevalence of alcohol and cannabis co-use among adolescents—was calculated by dividing the number of co-users by the total surveyed population and expressing this figure as a percentage. To increase the representativeness and generalizability of these findings, prevalence estimates were weighted to account for potential non-response bias and the complexity of the design. The next phase involved bivariate analysis using the chi-square test of independence, which was crucial for identifying significant associations between various categorical covariates and the status of substance co-use. This step was instrumental in isolating factors significantly associated with co-use behavior. Building on these findings, a multivariable logistic regression was conducted on variables that showed significance in the bivariate analysis. The objective was to identify the determinants of alcohol and cannabis co-use among adolescents. The results of this regression analysis were presented through adjusted odds ratios (aORs), confidence intervals (CIs), and *p*-values, all of which were also weighted to further adjust for non-response bias. The reported odds ratios were adjusted for each other in the multivariable logistic regression model. This adjustment means that the effect of each variable on the alcohol and cannabis co-use status is estimated while controlling for the influence of all other variables listed in Table 2. This approach provides a more accurate assessment of the unique contribution of each factor to the outcome. To ensure the reliability of the regression model,

**Table 1.** Demographic characteristics by alcohol and cannabis co-use status

| Characteristics | Co-user (n=360) | Non-co-user (n=8903) | p-value |
|---|---|---|---|
| Prevalence, % (95% CI) | 4.2 (3.4, 5.3) | 95.8 (94.7, 96.6) | - |
| Age (y) | | | 0.006 |
| <15 | 259 (71.9) | 5772 (64.8) | |
| ≥15 | 101 (28.1) | 3131 (35.2) | |
| Sex | | | <0.001 |
| Male | 271 (76.8) | 3845 (43.4) | |
| Female | 82 (23.2) | 5014 (56.6) | |
| Academic year | | | <0.001 |
| Grade 7 | 138 (40.0) | 2174 (24.9) | |
| Grade 8 | 109 (31.6) | 2516 (24.9) | |
| Grade 9 | 59 (17.1) | 2169 (24.9) | |
| Grade 10 | 39 (11.3) | 1839 (21.1) | |
| Felt lonely always | | | 0.045 |
| Yes | 99 (28.7) | 2132 (24.0) | |
| No | 246 (71.3) | 6755 (76.0) | |
| Poor sleep quality | | | <0.001 |
| Yes | 104 (30.2) | 1374 (15.5) | |
| No | 240 (69.8) | 7501 (84.5) | |
| Attempted suicide | | | <0.001 |
| Yes | 206 (59.7) | 1868 (21.2) | |
| No | 139 (40.3) | 6948 (78.8) | |
| No close friend | | | <0.001 |
| Yes | 47 (13.6) | 466 (5.3) | |
| No | 298 (86.4) | 8377 (94.7) | |
| Not physically active | | | <0.001 |
| Yes | 71 (20.2) | 3192 (41.3) | |
| No | 281 (79.8) | 5192 (58.7) | |
| Bullied at school | | | 0.164 |
| Yes | 143 (48.9) | 3861 (43.9) | |
| No | 155 (52.1) | 4930 (56.1) | |
| Bullied outside school | | | <0.001 |
| Yes | 141 (45.9) | 2726 (31.1) | |
| No | 166 (54.1) | 6042 (68.9) | |
| Did not attend physical education class | | | 0.008 |
| Yes | 70 (20.0) | 1309 (14.8) | |
| No | 280 (80.0) | 7527 (85.2) | |
| Parent/guardian understood their worries | | | 0.009 |
| Yes | 87 (24.9) | 2783 (31.5) | |
| No | 263 (75.1) | 6067 (68.5) | |
| Infrequent unapproved parental checks | | | <0.001 |
| Yes | 187 (54.5) | 5939 (67.1) | |
| No | 156 (45.5) | 2911 (32.9) | |
| Parents aware of free time activities | | | 0.003 |
| Yes | 91 (25.9) | 2964 (33.6) | |
| No | 261 (74.1) | 5866 (66.4) | |

Values are presented as number (%).
CI, confidence interval.

**Table 2.** Predictors of alcohol and cannabis co-use status using multivariable logistic regression[1]

| Variables | aOR (95% CI) | p-value |
|---|---|---|
| Age (y) | | |
| <15 | 1.00 (reference) | |
| ≥15 | 1.42 (0.97, 2.10) | 0.069 |
| Sex | | |
| Male | 4.50 (3.31, 6.10) | <0.001 |
| Female | 1.00 (reference) | |
| Academic year | | |
| Grade 7 | 4.08 (2.39, 6.99) | <0.001 |
| Grade 8 | 2.20 (1.30, 3.72) | 0.003 |
| Grade 9 | 1.35 (0.82, 2.26) | 0.236 |
| Grade 10 | 1.00 (reference) | |
| Felt lonely always | | |
| Yes | 0.82 (0.59, 1.14) | 0.237 |
| No | 1.00 (reference) | |
| Poor sleep quality | | |
| Yes | 1.77 (1.29, 2.44) | <0.001 |
| No | 1.00 (reference) | |
| Attempted suicide | | |
| Yes | 5.31 (4.00, 7.06) | <0.001 |
| No | 1.00 (reference) | |
| No close friends | | |
| Yes | 1.33 (0.85, 2.07) | 0.212 |
| No | 1.00 (reference) | |
| Not physically active | | |
| Yes | 0.45 (0.33, 0.62) | <0.001 |
| No | 1.00 (reference) | |
| Bullied outside school | | |
| Yes | 1.18 (0.90, 1.54) | 0.238 |
| No | 1.00 (reference) | |
| Did not attend physical education class | | |
| Yes | 1.48 (1.06, 2.05) | 0.021 |
| No | 1.00 (reference) | |
| Parent/guardian understood their worries | | |
| Yes | 0.99 (0.72, 1.37) | 0.975 |
| No | 1.00 (reference) | |
| Infrequent unapproved parental checks | | |
| Yes | 1.00 (reference) | |
| No | 1.37 (1.04, 1.80) | 0.024 |
| Parents aware of free time activities | | |
| Yes | 0.63 (0.45, 0.87) | 0.005 |
| No | 1.00 (reference) | |

aOR, adjusted odds ratio; CI, confidence interval.
[1]Variables are mutually adjusted in the multivariable model.

multicollinearity among predictors was assessed, with variance inflation factor (VIF) values indicating no significant multicollinearity issues (minimum VIF = 1.05, maximum VIF = 1.84, and mean VIF = 1.53). A standard *p*-value threshold of 0.05 was set for statistical significance. All analyses were carried out using Stata version 18 (StataCorp., College Station, TX, USA), ensuring a rigorous and reliable statistical examination of the data.

## Ethics Statement

This study is a secondary analysis of data from the 2019 GSHS. As such, no separate ethical approval was required for this analysis. The original survey was conducted with full compliance to ethical standards, including obtaining permissions from relevant authorities, informed consent from school heads, parental consent, and child assent for all participating minors. The ethical review and approval for this secondary study were waived because it involved the analysis of pre-existing, anonymized data.

## RESULTS

In this study, which included 9263 participants, 360 participants (weighted prevalence, 4.2%; 95% CI, 3.4 to 5.3) were identified as co-users of both alcohol and cannabis. Additionally, 1726 participants (weighted prevalence, 19.2%; 95% CI, 17.8 to 20.7) reported exclusively using alcohol, without concurrent cannabis use. Conversely, 290 participants (weighted prevalence, 3.2%; 95% CI, 2.7 to 3.7) reported exclusive use of cannabis, without alcohol consumption. Furthermore, a significant proportion of our study cohort, comprising 6887 participants (weighted prevalence, 73.4%; 95% CI, 71.4 to 75.4), did not use either alcohol or cannabis.

Table 1 presents the demographic characteristics of the study participants. Significant age-related differences were observed between the two groups. The co-user group included a higher proportion of individuals aged less than 15 years (71.9 vs. 64.8% in non-co-users), and a smaller proportion aged 15 years and older (28.1 vs. 35.2%), with a statistically significant *p*-value of 0.006. Sex disparities were also notable. Among co-users, a majority were male (76.8%), significantly higher than in the non-co-user group (43.4%). In contrast, females constituted 23.2% of the co-user group and 56.6% of the non-co-users; this difference was statistically significant (*p* < 0.001). The distribution of academic years also varied

markedly between groups, with a higher percentage of co-users in grade 7 (40.0 vs. 24.9%) and grade 8 (31.6 vs. 24.9%), and lower percentages in higher academic years. This trend was statistically significant (*p* < 0.001).

A higher proportion of co-users reported always feeling lonely (28.7 vs. 24.0% among non-co-users) and experiencing poor sleep quality (30.2 vs. 15.5%), with both differences being statistically significant (*p*-values of 0.045 and < 0.001, respectively). The incidence of attempted suicide was alarmingly higher among co-users (59.7%) compared to non-co-users (21.2%) (*p* < 0.001). Similarly, a smaller proportion of co-users reported having no close friends (13.6 vs. 5.3% among non-co-users), a difference that was also statistically significant (*p* < 0.001). Physical activity patterns differed significantly; a smaller percentage of co-users were not physically active (20.2 vs. 41.3% among non-co-users) (*p* < 0.001). Bullying experiences also varied; co-users experienced more bullying outside of school (45.9 vs. 31.1%), although no significant difference was observed in school bullying. Additionally, a smaller percentage of co-users reported not attending physical education classes (20.0 vs. 14.8% among non-co-users, *p* = 0.008) and a lower percentage reported that their parents or guardians understood their worries (24.9 vs. 31.5%, *p* = 0.009).

Parental supervision showed significant differences; co-users experienced less frequent unapproved parental checks (54.5 vs. 67.1%) and a smaller percentage reported that their parents were aware of their free time activities (25.9 vs. 33.6%). Both of these differences were statistically significant (*p*-values < 0.001 and 0.003, respectively).

Table 2 shows the results of multivariable logistic regression analysis aimed at identifying the predictors of alcohol and cannabis co-use among adolescents. The analysis was adjusted for several variables, including demographic factors, educational background, psychological aspects, and behavioral tendencies. Age group did not emerge as a significant determinant in this analysis (*p* = 0.069), with participants aged 15 years and greater having an aOR of 1.42 (95% CI, 0.97 to 2.10) compared to those less than 15 years. However, sex was a significant predictor (*p* < 0.001), with males exhibiting significantly higher odds of co-use (aOR, 4.50; 95% CI, 3.31 to 6.10) than females. In terms of academic year, grade 7 students had significantly higher odds of co-use compared to grade 10 (aOR, 4.08; 95% CI, 2.39 to 6.99; *p* < 0.001). Similarly, grade 8 students showed higher odds of co-use (aOR, 2.20; 95% CI, 1.30 to 3.72; *p* = 0.003), while grade 9 students did not show a statistically

significant difference from grade 10 students in this regard.

Psychological and behavioral factors also played a role. Always feeling lonely did not show a significant association with co-use ($p=0.237$). Poor sleep quality was a significant predictor (aOR, 1.77; 95% CI, 1.29 to 2.44; $p<0.001$), as was a history of attempted suicide (aOR, 5.31; 95% CI, 4.00 to 7.06; $p<0.001$). Having no close friends, however, was not a significant factor. Physical inactivity was associated with lower odds of co-use (aOR, 0.45; 95% CI, 0.33 to 0.62; $p<0.001$). Participants who did not attend physical education classes had higher odds of co-use (aOR, 1.48; 95% CI, 1.06 to 2.05; $p=0.021$). Other factors, such as being bullied outside school and whether a parent/guardian understood their worries, were not significant predictors. Parental monitoring was found to have a significant relationship, with infrequent unapproved parental checks associated with higher odds of co-use (aOR, 1.37; 95% CI, 1.04 to 1.80; $p=0.024$). Conversely, participants whose parents were less aware of their free-time activities had lower odds of co-use (aOR, 0.63; 95% CI, 0.45 to 0.87; $p=0.005$).

## DISCUSSION

To the best of our knowledge, our study is the first to examine the prevalence and predictors of alcohol and cannabis co-use among Filipino adolescents. We found that the weighted prevalence of alcohol and cannabis co-use in this group is 4.2%. This result is consistent with studies from outside the Philippines [15-17], which have reported that substance co-use among adolescents is relatively common, indicating a global trend of substance experimentation during adolescence. Our findings also reveal demographic disparities, particularly a higher prevalence of substance co-use among males and younger age groups, aligning with prior research [18,19]. Similar patterns have been observed in studies from European and Asian countries, where males are more likely to engage in substance use [20-23]. This trend may be related to sex differences in risk-taking behaviors and social norms. Additionally, the higher prevalence of substance use among younger age groups is concerning, as it suggests potential long-term negative impacts on adolescent development and health due to early exposure to substances.

The significant association between poor sleep quality and substance co-use among Filipino adolescents underscores a critical aspect of adolescent health that demands focused attention. Poor sleep quality can intensify stress and emotional

instability, increasing the likelihood that adolescents will turn to substance use. This observation is consistent with international studies that describe a cyclical relationship between sleep disturbances and substance use, where each condition may exacerbate or trigger the other [24]. In the Philippines, this indicates a need for interventions that address not only substance use but also underlying factors such as sleep hygiene. Schools and community health programs would benefit from including sleep education workshops that inform adolescents about the importance of sleep, its effects on overall health, and effective strategies for improving sleep habits. Additionally, healthcare providers should be encouraged to screen for sleep issues during routine assessments of adolescents.

The relationship between a history of attempted suicide and substance co-use highlights a critical intersection between mental health issues and risk behaviors in adolescents [25]. Unlike the general correlation with psychological distress, attempting suicide signifies a profound personal crisis and suggests that substance use among these adolescents may serve not only as a coping mechanism but also as a desperate escape from their psychological pain [25,26]. This distinction is crucial for tailoring prevention and intervention programs, emphasizing the need for acute mental health services that are accessible and equipped to support adolescents in crisis. It advocates for a dual approach where schools focus not only on substance abuse education but also on establishing robust support systems that include counseling services, suicide prevention programs, and crisis intervention teams. Integrating these services can provide a safety net for at-risk adolescents, potentially reducing the incidence of both substance use and suicide attempts. Establishing partnerships between educational institutions, mental health organizations, and community resources can facilitate a comprehensive network of support tailored to the needs of Filipino youth.

The lack of a significant association between loneliness and substance co-use in our study marks a notable departure from findings reported in other regions [27,28]. This difference may be attributed to cultural variations in social relationships and coping strategies among Filipino adolescents. In cultures where community and familial bonds are especially strong, the effects of loneliness on behaviors such as substance use may be lessened by these supportive networks. This observation suggests that interventions in the Philippines could be more effective if they capitalize on these existing social struc-

tures, promoting family and community involvement as protective factors against substance use. Additionally, this finding encourages a more detailed examination of the social dynamics of Filipino adolescents, urging future research to investigate how cultural contexts influence the relationship between loneliness and risk behaviors.

Our findings on the inverse relationship between physical activity and substance co-use among adolescents align with global studies that suggest active participation in physical activities serves as a protective factor against substance use [29,30]. This relationship highlights the extensive benefits of physical activity, which go beyond physical health to encompass mental health and social well-being [31]. The positive effects of physical activity on mental health, possibly through the release of stress-relieving endorphins and the creation of a supportive social environment, provide a viable strategy for preventing substance use. Additionally, the link between skipping physical education classes and an increased likelihood of substance co-use underscores the importance of school-based physical activity programs. These programs should not only focus on boosting physical activity levels among students but also incorporate substance use education and foster social interactions as preventive measures against substance use.

Finally, the significant role of parental monitoring identified in this study is consistent with international research that underscores the protective effects of parental supervision in preventing adolescent substance use [32-34]. The association between less frequent unapproved parental checks, reduced parental awareness of adolescents' free-time activities, and higher odds of co-use underscores the importance of parental involvement in adolescents' lives. This aligns with findings from various cultural contexts that support active parental engagement and communication as effective strategies to prevent adolescent substance use [35,36]. However, these findings also prompt further discussion on finding the appropriate balance between supervision and autonomy in adolescent development, particularly in the Filipino context.

In direct response to the identified gaps and our study's findings, we propose actionable recommendations for developing context-specific intervention and education programs aimed at mitigating the risks associated with the co-use of alcohol and cannabis among adolescents. Specifically, we advocate for the integration of specialized curriculum modules within schools that focus on the risks of substance co-use, emphasizing the unique challenges and health implications it

presents. These modules should employ interactive and engaging methods, such as role-playing and peer-led discussions, to foster a deeper understanding and resilience against substance use. Additionally, policy recommendations include the implementation of community-based outreach programs that involve parents and guardians in substance use education, equipping them with the tools to effectively communicate and monitor their children's activities. Furthermore, establishing mental health support services within educational institutions could provide a dual approach, addressing both the prevention of substance co-use and offering interventions for those at risk or already engaged in such behaviors. These recommendations are envisioned to function collaboratively across educational, familial, and community settings, ensuring a comprehensive approach to substance use prevention among Filipino adolescents. Implementing these strategies requires collaboration among policymakers, educators, and health professionals, on the basis of our findings, to create safer environments conducive to the well-being and healthy development of young people.

In light of the findings of this study, several recommendations for public health policy and practice are proposed. First, it is crucial to implement early intervention and prevention strategies in schools, with a particular focus on younger adolescents at the beginning of secondary education. These programs should include components that address mental health, physical activity, and substance use education, tailored to meet the developmental needs of this age group. Additionally, public health policies should promote parental involvement and educate parents about the importance of monitoring and communicating with their adolescent children about the risks of substance use. In terms of practice, healthcare providers should be trained to screen for substance use and related risk factors, such as poor mental health and low levels of physical activity, during routine adolescent health visits. For future research, there is a need to explore the underlying reasons for early initiation of substance co-use and the sex disparities observed in substance use patterns. Studies investigating the effectiveness of school-based interventions and parental involvement programs in the Filipino context would provide valuable insights for evidence-based policy-making. Furthermore, longitudinal studies are warranted to understand the long-term impacts of early substance co-use on physical, mental, and social health outcomes. This comprehensive approach, encompassing policy, practice, and research, is

crucial in mitigating the risks associated with alcohol and cannabis co-use among adolescents in the Philippines and potentially in other similar contexts globally.

The study has several notable strengths, primarily due to its utilization of the GSHS. This tool, collaboratively designed by the WHO and the U.S. CDC, is both robust and globally recognized. It facilitates the collection of comprehensive and comparable data on adolescent health behaviors, thereby lending substantial credibility and reliability to the study's findings. The large sample size of 9263 participants, coupled with a high response rate of 85%, significantly enhances the representativeness and generalizability of the results to the broader adolescent population in the Philippines. Furthermore, the study's methodology, which included a thorough analysis of a wide range of variables such as demographic factors, mental health, physical activity, and familial influences, provides an understanding of the predictors of alcohol and cannabis co-use among adolescents. This comprehensive approach lays a robust foundation for the study's conclusions and recommendations, making it a valuable contribution to the field of adolescent substance use research.

However, the study is not without its limitations. As a cross-sectional analysis, it can identify associations but cannot establish causal relationships between variables, which leaves ambiguity regarding the directionality of these relationships. Additionally, the reliance on self-reported data may introduce bias, as participants might underreport or overreport their substance use due to social desirability or recall issues. The exclusion of adolescents not attending school also means that the findings may not be fully representative of all Filipino youth, particularly those who are out of school and may have different patterns of substance use. Furthermore, the study's focus on alcohol and cannabis co-use might overlook the use of other substances, such as tobacco, which could also be relevant in this context. Lastly, the cultural and social nuances specific to the Philippines might limit the applicability of the findings to other cultural contexts, necessitating caution in generalizing the results globally. Despite these limitations, the study provides crucial insights into the patterns and predictors of substance co-use among adolescents in the Philippines, offering a solid base for future research and public health interventions.

In this study, which included 9263 Filipino adolescents, we explored the patterns and determinants of alcohol and cannabis co-use, finding a prevalence rate of 4.2%. Our findings indicate that the primary predictors of such co-use include male sex, enrollment in lower academic years, poor sleep quality, a history of attempted suicide, a lack of physical activity, non-participation in physical education classes, infrequent unapproved parental checks, and low parental awareness of their children's activities during free time. Highlighting these insights, the study underscores the urgent need for tailored prevention strategies. These strategies should focus on early intervention, enhanced mental health support, and increased parental involvement, all aimed at mitigating the risks of substance use among adolescents.

## NOTES

### Author Contributions

Conceptualization: Adebisi YA. Data curation: Adebisi YA. Formal analysis: Adebisi YA. Funding acquisition: None. Methodology: Adebisi YA, Lucero-Prisno III DE. Project administration: Lucero-Prisno III DE, Magramo MM, Yap-Tan AR, Sy FAR, Kasimieh O, Niez RA, Santos FED, Cañezo Jr. VC. Visualization: Adebisi YA. Writing – original draft: Adebisi YA, Ogaya JB. Writing – review & editing: Lucero-Prisno III DE, Magramo MM, Yap-Tan AR, Sy FAR, Kasimieh O, Niez RA, Santos FED, Ogaya JB, Cañezo Jr. VC.

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