Adolescent alcohol drinking and cannabis use: Longitudinal and cohort analysis of high school students in Australia

Lily Davidson[1,2,3], Janni Leung[1,2], Catherine Quinn[1,2], Rhiannon Ellem[1,2], Calvert Tisdale[1,2,4], Jisu Choi[2], Molly Carlyle[1,2], Melanie White[5], David J. Kavanagh[2,5] and Leanne Hides[1,2]

[1] School of Psychology, Lives Lived Well Group (LLW), The University of Queensland, Australia.
[2] National Centre for Youth Substance Use Research (NCYSUR), The University of Queensland, Australia.
[3] The Matilda Centre for Research in Mental Health and Substance Use, University of Sydney, Australia
[4] National Drug and Alcohol Research Centre (NDARC), University of New South Wales, Australia
[5] School of Psychology and Counselling, Queensland University of Technology, Australia.

Abstract

Aims: The final year of high school is a challenging phase, during which substance use is common. We conducted longitudinal and cohort comparisons on the levels of alcohol and cannabis use among final year (Year 12) high school students compared to the previous year.

Design: Longitudinal and cohort analyses of self-reported survey data.

Setting: Ten independent schools across South-East Queensland, Australia.

Participants: Year 12 students in 2020 ($n = 1024$) were compared (a) longitudinally with themselves in Year 11; and (b) to the 2019 Year 12 cohort ($n = 632$).

Measures: Self-reported alcohol and cannabis use. Analyses adjusted for socio-demographic, parental, and schooling variables.

Findings: Longitudinally, Year 12 students of 2020 had higher odds of having six or more drinks per occasion, monthly or more often, and reporting lifetime cannabis use, compared to themselves in 2019. However, they were not more likely to drink alcohol weekly or more often in 2020 versus 2019. Compared to the 2019 cohort, the 2020 cohort had higher odds of drinking weekly or more often, having six or more drinks per occasion monthly, and reporting lifetime cannabis use.

Conclusions: The 2020 cohort of Year 12 adolescents were more likely to engage in heavy drinking and cannabis use, compared to themselves the previous year, and compared to the previous cohort. Greater alcohol consumption and likelihood of cannabis use among the 2020 cohort might be explained by increased age and impacts of the COVID-19 pandemic. Future research to monitor if this is a continuing trend is warranted.

Introduction

It is crucial to monitor and prevent substance use during adolescence because of potential long-term impacts on developmental health (Ingoglia, 2021). Consequently, many nations, including Australia, have made youth substance use a public health priority. Studies of prevalence and trends over time on substance use provide information that

increases understanding of young people's health and of interventions to best support them.

In Australia, the legal drinking age is 18 years and alcohol use among youth has been declining. A longitudinal study using National Drug Strategy Household Survey (NDSHS) data from 2001 to 2019 found that more recent cohorts of youth aged 14 to 24 years were less likely than less recent cohorts to drink at risky levels, and to drink at all (Livingston

et al., 2022). Similarly, data from the Communities That Care (CTC) Youth Survey (1999–2015) showed decreases in lifetime and past-month alcohol use among Year 5–11 students in Australia (Toumbourou et al., 2018). There were similar decreases observed in the Australian Secondary Students' Alcohol and Drug (ASSAD) surveys (2002–2017) for past-week alcohol use (34% to 15%) and recent harmful use (10% to 5%; Vashishtha et al., 2021).

Trends in cannabis use have been more mixed. Despite cannabis being largely illegal in Australia (Australian Institute of Health and Welfare [AIHW], 2024b), the ASSAD surveys found slight increases in lifetime cannabis use among secondary school students from 2008 to 2017 (13.6% to 17%), and past-week cannabis use (3.5% to 5%), although these increases were not statistically significant (Vashishtha et al., 2021). In contrast, the Australian CTC Youth Survey found the prevalence of lifetime cannabis use reduced from 15% in 1999 to 4% in 2015, with a trend of 10% decline each year (Toumbourou et al., 2018). More recent research comparing substance use trends over time and potential changes in trends is warranted.

Substance use can be impacted by environmental factors, like major societal events. One event that may have impacted recent adolescent cohorts was the COVID-19 pandemic. The World Health Organization declared the virus an outbreak of international concern on 30 January 2020 and declared a pandemic on 11 March 2020. For adolescents, school closures were implemented to limit human contact and prevent spread of the virus. Most spent many weeks under social restrictions at home, which may have impacted their substance use (e.g., due to stress or compensating for lost social opportunities). Senior high school students may have been especially disadvantaged by pandemic-related stress during their final year of schooling (including final exams). There is a need for research on potential behavioural impacts that adolescents may have experienced due to pandemic-related disruptions during this critical period.

There is some existing research on trends of substance use among school-aged adolescents throughout the pandemic (e.g., Dumas et al., 2020; Thorisdottir et al., 2021). A study of Canadian adolescents (mean age 16.68 years) found that the prevalence of substance use decreased during COVID-19 restrictions, but adolescents who continued using substances reported more frequent alcohol and cannabis use after restrictions lifted (Dumas et al., 2020). Thorisdottir et al. (2021) found that alcohol intoxication declined among Icelandic 15-to-18-year-olds during the pandemic (October 2020) compared to before the pandemic (i.e., 2016 and 2018 surveys). However, there is still limited research comparing the time course of substance use among adolescents who experienced the pandemic during their final high-school year, to previous cohorts who did not.

The aim of this study was to examine use of alcohol and cannabis among adolescents who experienced the pandemic in 2020, (a) longitudinally compared with themselves in 2019 (pre-pandemic), and (b) cross-sectionally compared with the immediately previous cohort who did not experience the pandemic during Year 12. These comparisons may provide useful information on substance use by adolescents during stressful societal events such as a pandemic. Results could inform health care service planning

in future, including increased support services or preventive interventions.

Methods

Setting

The Adolescent Aware project is a six-year longitudinal study, in which self-report survey data was collected from the same cohort of students from 10 independent high schools (i.e., schools owned and funded by private entities, not government), in South-East Queensland, Australia. The annual surveys commenced in 2015 when students were in Years 7 and 8 (aged 12 and 13 years) and concluded when these students reached Year 12 (2019 and 2020).

This study draws upon data from Year 12 students of 2019 and 2020. Only the latter group had longitudinal data gathered in Year 11 (2019). Data were initially collected from 10 high schools between 13 May to 20 August 2019. In 2020, schooling was disrupted by the pandemic and students experienced a period of studying at home from 30 March to 25 May 2020. The 2020 survey was collected after students returned to school. Due to the pandemic restrictions in 2020, nine of the ten involved high schools participated between 12 June and 12 October 2020.

Informed Consent

Procedures were in accordance with the ethical standards of Human Research Ethics Committees (approval obtained from Queensland University of Technology [1500000151] and The University of Queensland [2018000860]) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants in the study. Opt-out parental consent and active student self-consent was sought before each survey. The student consent form was completed on paper, and the surveys were completed either online or via paper and pen administration, as determined by each school.

Measures

Alcohol and Cannabis Use

Alcohol items were drawn from the Alcohol Use Disorder Indication Test, Section C (Bush et al., 1998), which assesses use over the previous 12 months. The two alcohol use variables we analysed were: (a) frequency of consumption, measured as weekly or more drinking (two to three times a month, two to three times a week, four or more times a week) versus monthly or less drinking (never, monthly or less); and (b) frequency of excessive drinking, measured as having had six or more drinks on one occasion monthly or more often (monthly, weekly, daily or almost daily), versus less than monthly (less than monthly, never). Cannabis use was based on self-reported lifetime use of cannabis/marijuana, as numbers for regular or high levels of cannabis use were too small for analyses.

Socio-Demographic Covariates

Socio-demographic covariates included age, gender, indigenous status, primary language spoken at home, parental country of birth, parental relationship status, past-year history of truancy, and academic grade. School and time

of survey (days to end of year) were also included as covariates.

Survey Completion

In total, 709 Year 12 students in 2019 provided consent to participate. Of these, 10 did not provide valid data and 67 were excluded because their school was unable to participate in 2020. In the longitudinal cohort of 2020 Year 12 students, 1098 provided consent across both 2019 and 2020. Of these, five did not provide useable data in 2019, and 69 were excluded because their school was unable to participate in 2020. The final sample included in the analysis was 632 Year 12 students in the 2019 cohort, and 1024 Year 12 students in the 2020 cohort.

Missing data for the substance use variables were minimal (1–3%). For the longitudinal analysis of Year 12 students in 2020, 70% ($n = 715$) had data for both 2019 and 2020. Females were more likely to have data at both timepoints (74.6%) than males (68.3%; Table S1) but not significantly. Students were significantly more likely to have complete data across both years if they had English as the primary language at home, parents born in Australia, not skipped school, higher academic grades, and lower substance use.

We applied multiple imputation for incomplete data to minimise bias from missing responses. Compared with the original data (Table S2), the imputed data had a higher proportion of students who spoke another language at home, had parents not living together, had truanted in the past year, had lower academic grades, and drank at least weekly.

Statistical Analysis

Two comparisons were made. For the longitudinal comparisons, multi-level modelling was used to compare alcohol and cannabis use in Year 12 students from 2020 with their use in Year 11 (2019). Time was the within-subject exposure variable. Each outcome variable was modelled in separate regressions. Hence, three longitudinal models were conducted, with two alcohol use outcomes and one cannabis use outcome analysed using logistic models. Correspondingly, between-subject cohort comparisons of the Year 12 students of 2020 and the Year 12 students of 2019 used three cohort analysis models. All analyses were adjusted for school and days to the end of the year, and included socio-demographic variables (age, gender, Aboriginal or Torres Strait Islander status, primary language at home, parental country of birth, parental relationship status, truancy in the past year, academic grade). Analyses were conducted in SPSS 28.

Results

The 2020 cohort was slightly older than the 2019 cohort (mean age 17.18 vs 17.05 years; Table 1). Students had similar socio-demographic and academic grade profiles across cohorts; over half were males, and most did not identify as Aboriginal or Torres Strait Islander and spoke English at home. Compared to the 2019 cohort, more students in the 2020 cohort had both parents born in Australia, and fewer reported their parents were living together. Fewer students in the 2020 cohort had a history of truancy. Univariate descriptive statistics showed that the 2020 cohort had higher levels of alcohol and cannabis use.

Table 1

Participant Characteristics

		Year 12, 2019 ($n = 632$)		Year 12, 2020 ($n = 1024$)	
		%	[95%CI]	%	[95%CI]
Demographics	Age (mean [SD])	17.05	[16.92-17.18]	17.18	[17.15-17.21]
	Gender Male	63.0%	[58.2%-67.7%]	60.4%	[56.5%-64.2%]
	Female	37.0%	[30.8%-43.2%]	39.6%	[34.9%-44.4%]
	Identification as Aboriginal or Torres Strait Islander	3.2%	[0.0%-10.8%]	3.5%	[0.0%-7.1%]
	Primary language spoken at home				
	English	88.3%	[85.6%-91.0%]	85.5%	[83.2%-87.9%]
	English + another language	2.2%	[0.0%-9.9%]	5.6%	[0.0%-11.5%]
	Another language	9.5%	[2.1%-16.9%]	8.9%	[3.0%-14.7%]
	Parental country of birth				
	Both parents born in Australia	55.9%	[50.7%-61.0%]	58.4%	[54.4%-62.3%]
	One parent born in Australia	20.7%	[13.8%-27.7%]	19.9%	[14.4%-25.4%]
	Both parents born overseas	23.4%	[16.6%-30.2%]	21.7%	[16.3%-27.1%]
	Parental Relationship Status				
	Living together	72.2%	[68.0%-76.3%]	64.5%	[60.8%-68.1%]
	Not living together	27.8%	[21.2%-34.5%]	35.5%	[30.6%-40.5%]
	Truancy in the past year	12.2%	[4.9%-19.5%]	25.1%	[19.8%-30.4%]
	Academic Grade				
	A	19.8%	[12.8%-26.8%]	19.8%	[14.3%-25.3%]
	B	46.8%	[41.2%-52.5%]	43.8%	[39.2%-48.3%]
	C or lower	33.4%	[27.0%-39.7%]	36.4%	[31.5%-41.3%]
Substance Use	Alcohol use in past 12 months				
	Drank ~weekly or more often	18.8%	[13.2%-24.3%]	49.1%	[44.8%-53.5%]
	Had ≥ 6 drinks on 1 occasion monthly or more often	10.9%	[5.2%-16.7%]	36.1%	[31.2%-41.0%]
	Cannabis use				
	Ever tried cannabis	14.5%	[8.8%-20.1%]	34.6%	[29.6%-39.5%]

Longitudinal Changes in 2020 Year 12 Students from 2019

Longitudinal analyses comparing 2020 Year 12 students to themselves in 2019 revealed that compared to the previous year (Table 2), there were no significant differences in drinking alcohol weekly or more often (OR = 1.09, 95% CI [0.62, 1.94], p = 0.757), but the 2020 Year 12 students had three times higher odds of having had six or more drinks on one occasion in the past 12 months (OR = 3.09, 95% CI [1.89, 5.05], p < 0.001), compared to when they were in Year 11. Odds of lifetime cannabis use also increased (OR = 2.06, 95% CI [1.36, 3.11], p = 0.001).

Table 2

Multi-Level Models on Changes in Substance Use Longitudinally and Across Cohorts

Logistic Regressions	Longitudinal Analysis		Cohort Comparison Analysis	
	Estimates by Time[1]		Estimates by Cohort[2]	
	OR [95%CI]	*p*	OR [95%CI]	*p*
Alcohol use in past 12 months				
Drank ~weekly or more often	1.09 [0.62, 1.94]	0.757	1.87 [1.09, 3.19]	0.023
Had ≥ 6 drinks on one occasion monthly or more often	3.09 [1.89, 5.05]	<0.001	1.77 [1.19, 2.62]	0.004
Cannabis use				
Ever tried cannabis	2.06 [1.36, 3.11]	0.001	1.46 [1.05, 2.02]	0.024

Notes: Covariates adjusted for included: school, age, gender, Aboriginal or Torres Strait Islander status, primary language at home, parental country of birth, parental relationship status, truancy in past year, academic grade, and days to the end of the year at time of survey (full model results are available in Table S3).
[1] Within-subject comparison of Year 12, 2020 vs Year 11, 2019
[2] Between-subjects comparison of Year 12, 2020 vs Year 12, 2019

Cohort Comparisons between 2020 Year 12 Students vs 2019 Year 12 students

Compared to 2019 Year 12 students (Table 2), the 2020 cohort were more likely to use substances. The 2020 Year 12 students had higher odds of drinking weekly or more often (OR = 1.87, 95% CI [1.09, 3.19], p = 0.023), of having six or more drinks monthly (OR = 1.77, 95% CI [1.19, 2.62], p = 0.004), and of lifetime use of cannabis (OR = 1.46, 95% CI [1.05, 2.02], p = 0.024), compared to the 2019 Year 12 cohort (Figure 1).

Figure 1

Estimated Marginal Means of Alcohol and Cannabis Use from the Cohort Comparisons of Year 12, 2019 and 2020

Had ≥ 6 drinks monthly or more often*

Drank ~weekly or more often*

Ever tried cannabis*
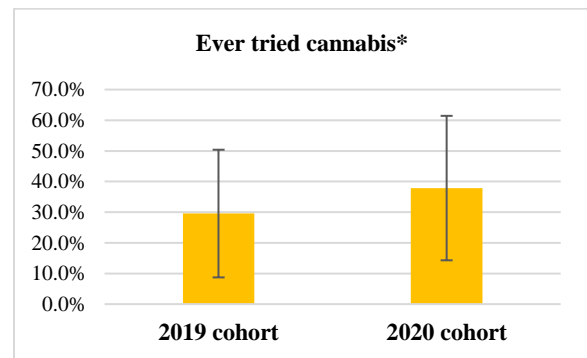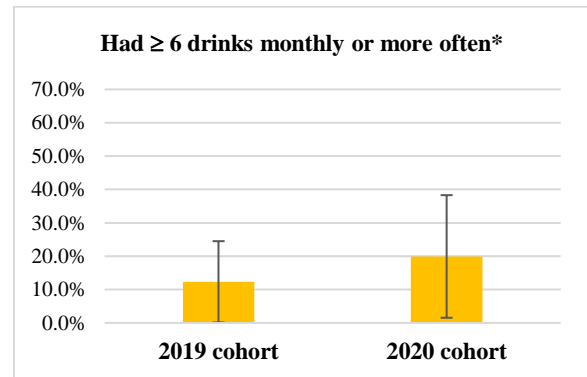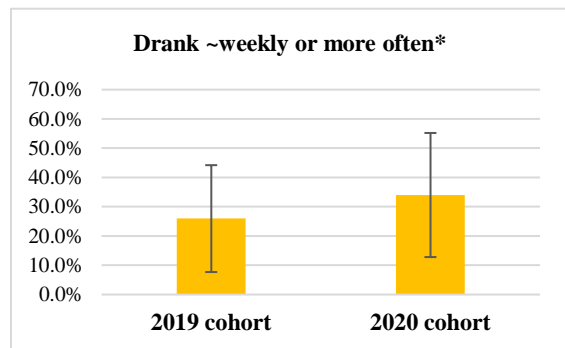
Note: See Table S4 for data

Discussion

This study contributes to knowledge about alcohol and cannabis use among adolescents, including how adolescents' substance use may change in response to a major societal challenge such as a pandemic. We examined alcohol and cannabis use among a large sample of Australian Year 12 students of 2020 longitudinally compared to themselves in Year 11 (2019), and cross-sectionally compared to a previous cohort of Year 12 students attending the same schools during 2019, the year before the pandemic. After adjusting for socio-demographic, parental, and schooling factors, we found some differences in substance use in the cohort of students who completed Year 12 during the pandemic (2020).

Longitudinally, the 2020 Year 12 students had higher odds of drinking excessively and having used cannabis in their lifetime compared to when they were in Year 11 in 2019. This is expected because substance use increases as adolescents age (AIHW, 2024a), especially as some students reach the legal drinking age in Australia of 18 years during Year 12. However, the results of our cohort comparison (2019 Year 12 students vs 2020 Year 12 students) cannot be explained as developmentally driven changes. Compared to the 2019 cohort, the 2020 cohort of Year 12 students was more likely to have had alcohol weekly or more often, and more likely to have six or more drinks on one occasion, monthly or more often. They were also more likely to have used cannabis in their lifetime than their predecessors.

A possible explanation for the higher rates of substance use among the 2020 Year 12 cohort was their experience of the pandemic and related stressors (e.g., social restrictions, studying at home). There are few studies on trends of substance use among adolescents throughout the pandemic (e.g., Dumas et al., 2020; Thorisdottir et al., 2021). Our results somewhat align with a study of Canadian adolescents, which found that although prevalence of adolescents using alcohol and cannabis decreased after pandemic restrictions, those who continued using these substances showed increased frequency of use post-restrictions (Dumas et al., 2020). In both studies, increased substance use post-restrictions may be explained as a reaction to increased stress levels during the pandemic, or students overcompensating for missing out on 'normal' adolescent experiences, including substance use. Additionally, although social restrictions may have reduced opportunities for attending events that involve substance use, the restrictions may have provided more time for young people to use substances at home.

The increase in lifetime cannabis use between the 2019 and 2020 cohorts also aligns with pre-pandemic increases in lifetime cannabis use observed among Australian secondary school students in the ASSAD study, between 2008 and 2017 (Vashishtha et al., 2021). Therefore, increases in lifetime cannabis use observed in our study could reflect the global trend towards normalising recreational cannabis use (Sznitman et al., 2015), despite cannabis remaining illegal in Australia. However, since the increase in lifetime cannabis use observed in the ASSAD study over almost ten years did not reach significance (13.6% to 17%), it seems plausible that the significant increase in lifetime cannabis use observed in our study, over a single year (2019–2020), was uniquely related to the COVID-19 pandemic.

Potential increases in adolescent alcohol use observed in this study are of public health concern, because alcohol use has been decreasing among youth (Livingston et al., 2022). Therefore, an increase in current cohorts could translate to a set-back in improving population-level health. Since heavier drinking during late adolescence is associated with alcohol use disorder in adulthood (McCambridge et al., 2011), recognising rising alcohol use among adolescents is important. Future research to monitor longer-term trends of alcohol and cannabis use post-COVID-19 is warranted. Notably, most students were under the legal drinking age of 18 years, meaning their use of alcohol, as well as cannabis, was illegal. Finding increased use of both substances post-pandemic raises questions about the effectiveness of current alcohol and cannabis use policies in Australia. Further research on trends of cannabis use among youth is also warranted, due to health concerns and changing policies and attitudes towards normalising recreational cannabis use, globally.

Strengths

A strength of this research is its observation of changes in substance use among the same students over time (pre and post pandemic) and compared to a similar cohort (same educational or life stage) from the year before, who completed Year 12 before the pandemic. This allowed us to demonstrate within and between cohort changes in substance use among adolescents, potentially in response to the pandemic. Notably, COVID-19 did not affect people in our sampling location as profoundly as many places around the world, including bigger cities in Australia (i.e., number of people infected, lengthiness of restrictions implemented; e.g., Vogler et al., 2023). Consequently, potential impacts of the pandemic on adolescent health may be reduced in our sample. Future research could compare the substance use trajectories of adolescents from different cities and countries, who had different experiences of the pandemic.

Limitations

While this study makes important contributions to evidence about potential impacts of the pandemic on adolescents, the authors acknowledge limitations. The data is observational and cannot be used to infer causality. Truancy and grades were used as covariates, but they may also result from substance use. Regardless of the direction of the relationship, students presenting with negative outcomes may benefit from interventions addressing substance use and psychosocial needs.

A longitudinal sample from Year 11 to Year 12 would be expected to show increasing substance use, because of increasing age. While we did not have data to test whether this longitudinal increase was greater than increases observed for previous cohorts, the cohort analysis at Year 12 provided an age-controlled comparison. The two cohorts

may also differ because the 2020 cohort were the first Year 12 students in Queensland to experience the new Year 12 Certificate of Education System (Australian Tertiary Admission Rank instead of Overall Position). Experiencing this new system may also have contributed to disproportionate pressure on the 2020 cohort. Although the two cohorts may differ, we attempted to reduce potential differences and maximise comparability by adjusting for student characteristics.

Covariates included student and some parental factors, but other broader-level factors were not examined. Future research could include additional covariates associated with adolescent drinking, like family-level and social factors (e.g. parental drinking or supply of alcohol, attitudes toward drinking, and social factors; Ball et al., 2023; Ksinan et al., 2023). Additionally, we did not measure excessive drinking differentially for males and females. Since females have lower tolerance for large amounts of alcohol, this is a limitation that future research could address (e.g. measure four or more drinks for females, five or more drinks for males; Wechsler et al., 1995).

Finally, participating students were from independent high schools and may not be representative of the wider senior student community. Independent schools form a small part (11.4%) of the Australian school system, and typically enrol students from higher socio-economic backgrounds, compared to Catholic and government schools (Flack et al., 2020).

Conclusion

The 2020 cohort of adolescents were more likely to use alcohol frequently and excessively, and to have used cannabis, compared to the previous cohort, who did not experience COVID-19 during Year 12. Findings imply that the more recent cohort may benefit from support to prevent further risky substance use and associated health impacts. Future research that monitors substance use among youth cohorts is warranted, given the increase in use observed in this study, potentially related to the pandemic. Increasing alcohol and cannabis use observed among these adolescents also highlights the need to assess effectiveness of policies regarding use of these substances in Australia, including the illegality of using cannabis, and the legal age limit of 18 years for consuming alcohol.

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