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Original article

## Examining the Impact of the COVID-19 Pandemic on youth Alcohol Consumption: longitudinal Changes From Pre-to Intra-pandemic Drinking in the COMPASS Study

 Mahmood R. Gohari, Ph.D.<sup>a,\*</sup>, Thepikaa Varatharajan, M.P.H.<sup>a</sup>, James MacKillop, Ph.D.<sup>b,c</sup>, and Scott T. Leatherdale, Ph.D.<sup>a</sup>
<sup>a</sup> School of Public Health Sciences, University of Waterloo, Ontario, Canada<sup>b</sup> Peter Boris Centre for Addictions Research, St Joseph's Healthcare Hamilton, McMaster University, Hamilton, Ontario, Canada<sup>c</sup> Homewood Research Institute, Guelph, Ontario, Canada

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## A B S T R A C T

**Purpose:** To date, there are few longitudinal studies on the COVID-19 pandemic's ongoing impact on youth drinking. This study examines the changes in drinking during two phases of the pandemic in a sample of Canadian youth.

**Methods:** We used four-year longitudinal data from the COMPASS study, including 14,085 secondary school students from Quebec and Ontario, Canada who provided linked data for any two consecutive years between 2017/18 and 2018/19 (pre-pandemic) waves, and 2019/20 and 2020/21 (during the initial and ongoing pandemic). A difference-in-difference (D-I-D) model was used to compare changes in the frequency of drinking and binge drinking between pre-COVID-19 to initial- and ongoing-pandemic period, while adjusted for age-related effects.

**Results:** The expected escalation in the frequency of drinking and binge drinking from the pre-pandemic wave (2018/19) to the initial pandemic (2019/20) was less than the changes seen across the 2017/18 to 2018/19 waves among sex and age groups. However, the second year of COVID was associated with an increase in the frequencies of both drinking and binge drinking. Male and younger students (aged 12–14) differentially increased their consumption.

**Discussion:** After a reduction in the initial pandemic period, the frequency of drinking and binge drinking rebounded in the second year, indicating that the pandemic's effects are not singular and have changed over time. Further examination is needed to understand the ongoing effects of the pandemic by continuing to monitor drinking in youth toward informing public health measures and harm reduction strategies.

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**IMPLICATIONS AND CONTRIBUTION**

Evidence from this large prospective sample indicate that the pandemic's initial effects on youth drinking have changed over time. This highlights the needs for ongoing surveillance associate with the onset and progression of youth drinking patterns throughout the pandemic response to inform public health measures and harm-reduction strategies.

**Conflicts of interest:** JM is a principal in BEAM Diagnostics, Inc. The authors have no other conflicts of interest relevant to this article to disclose.

\* Address correspondence to: Mahmood R. Gohari, Ph.D., School of Public Health Sciences, University of Waterloo, 200 University Avenue West, Waterloo, Ontario, Canada, N2L 3G1.

E-mail address: [mgohari@uwaterloo.ca](mailto:mgohari@uwaterloo.ca) (M.R. Gohari).

Underage drinking is common among Canadian youth, with individuals typically trying their first alcoholic beverage during early adolescence [1]. Results from the 2019 Canadian Student Tobacco, Alcohol and Drugs Survey indicated that by grade 12, 63.5% of youth reported ever using alcohol and 38.5% engaged in

binge drinking in the past 12 months (CSTADS, 2019). Youth alcohol consumption can have immediate and long-term adverse consequences, such as using other substances [2], performing poorly at school [3], and developing mental health disorders [4]. Therefore, understanding youth alcohol consumption patterns and trajectories is critical for informing future prevention efforts.

In response to the onset of the COVID-19 pandemic on March 11, 2020, Canada's government implemented a range of public health measures to contain the spread of the virus (e.g., stay-at-home policies, closure of in-person learning). After the first school closure announcement, schools in most provinces were closed until the end of the school year. In the following school year (2020/21) various models of educational delivery (i.e., fully remote, hybrid online and in-person learning, and fully in person learning) were instituted across provinces. For many youth, the prolonged and recurring restrictive measures has created an unprecedented disruption to their daily routines and social life; with youth spending more time confined at home with their family and less time engaging with their friends/peers and community networks [5]. This situation would influence changes in the alcohol-use behaviours of the youth population in one of the two directions [6]: (a) increased consumption as a coping mechanism in response to pandemic stresses and anxiety; or (b) decreased consumption due to reduced social drinking contexts in which youth drinking often occurs.

The early reports on youth alcohol consumption during the pandemic have produced mixed results. Dumas and colleagues [5] found that the percentage of binge-drinking among 1,054 Canadian high school students significantly decreased in the first three weeks after physical distancing measures were implemented. These findings support the notion that youth are less likely to be exposed to situations that involve drinking (e.g., parties) or people who drink (e.g., friends, peers) under pandemic restrictions, and as a result, are delaying their initiation and/or continued use of alcohol [7]. Contrasting results were found in a cross-sectional study surveying 6,721 Canadians aged 16–25 through social media [8]. Chaiton et al., (2021) indicated an increase in alcohol consumption during the initial pandemic period among daily alcohol users (72%) [8]. This preliminary finding suggests that during the pandemic, drinking may have been used, especially among marginalized and vulnerable youth, to cope with COVID-19-induced boredom, depression, anxiety, and stress. Although these studies explored changes in youth alcohol consumption during the pandemic, it is important to understand the ongoing impacts of the pandemic using longitudinal data and explore the dynamics of this complex, multi-dimensional behaviour over time.

To our knowledge, no Canadian study has longitudinally assessed the ongoing impact of the COVID-19 pandemic on youth alcohol use beyond the initial pandemic response. Given this research gap, this study aims to use longitudinal data from a large sample of Canadian high school students to examine the impact of the ongoing pandemic response on youth alcohol consumption behaviours. Considering that the level and drinking patterns of male and female students differ [9,10] and the fact that alcohol consumption tends to escalate during adolescence [11,12], this study also examines whether changes in alcohol use during the pandemic are tending to differ by sex and age group. All procedures in this study received ethics approval from the University of Waterloo, Brock University, CIUSSS de la Capitale-Nationale Université Laval, and participating school boards.

## Methods

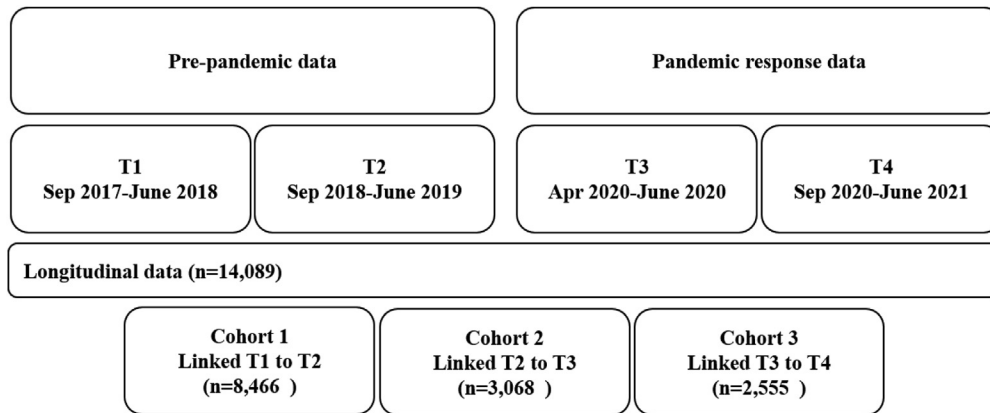
The Cannabis use, Obesity, Mental health, Physical activity, Alcohol use, Smoking, and Sedentary behavior (COMPASS) study (2012–2027) is a large school-based learning system collecting hierarchical data from a large sample of students in grades 9 through 12 (secondary I/V in Quebec) [13]. Students attending a convenience sample of participating schools are recruited using an active-information passive-consent parental permission protocol [13].

### Design and participants

To evaluate the effect of the ongoing COVID-19 responses on youth (defined here as secondary school students aged 13–18) alcohol use and binge drinking, we used linked data from the COMPASS host study from students in a convenience sample of 42 schools ( $n = 24$  Quebec,  $n = 18$  Ontario) that participated in year 2017/18 (T1, from September to June), 2018/19 (T2, from September to June), 2019/20 (T3, April to June), and 2020/21 (T4, from September to June) (Figure 1). Data from students that completed the survey between September 2019 to March 11, 2020 (i.e. prior to schools closing due to COVID-19) were not included in this study, as the goal was to examine changes from the year before the pandemic to during the pandemic period.

Student data in T1 and T2 were collected from September–June using a paper-based survey (Cq-p) completed during one classroom period by whole-school samples (Reel et al., 2020). In T3, Cq-p was administered until March 2020, when the pandemic restrictions came into effect. At that point, schools shut down in-person learning, and surveys were then conducted online using the Qualtrics XM survey software (Provo, UT, USA) starting in April 2020 (Cq-q). Each participating school emailed a survey link to all their participating students, followed by a reminder email 1 week after [14,15]. Online data collection continued in T4 using Cq-q. T3 data that were collected pre-pandemic were excluded to clearly measure difference in alcohol scores between T2 and T3.

Longitudinal linked student data have been obtained through an anonymous linking process that allows matching of student responses over time through a self-generated identification code created from five measures asked at the beginning of the questionnaire [16]. As Shown in Figure 1, data were linked between any two consecutive years to construct three cohorts: Cohort one includes students who provided linked data between T1 and T2 (pre pandemic period,  $n = 8,466$ ), Cohort two includes students who provided linked data between T2 and T3 (initial pandemic period,  $n = 3,068$ ), and Cohort three includes students who provided linked data between T3 and T4 (ongoing pandemic period,  $n = 2,555$ ) (Figure 1). The students in each cohort provided 2 years of linked data. A large proportion of the non-linked data was attributed to students either not being at school when Cq-p were administered or did not complete the online survey after switching from paper to online. In total, 14,089 students provided linked data across the four years over the study period. The linked longitudinal sample had more female participants during the pandemic period, with an increasing proportion of younger and White students over the years (Table 1). Among the students in Cohort 1, 98.9% in T1 and 99% in T2 reported their alcohol consumption, and among students in Cohort two and Cohort 3, 92.4% in T3 and 94.5% in T4 provided this data.



<sup>a</sup>Data collected from September 2019 to March 20, 2020 (pre-pandemic) were not included in the analysis

**Figure 1.** Data collection periods and longitudinal data linkage.

### Measures

**Alcohol consumption:** Consistent with national surveillance measures used for substance use among Canadian youth [17], students' were asked "In the last 12 months, how often did you have a drink of alcohol that was more than just a sip?" and responded on a 10-option measure from "I have never drunk alcohol" to "every day". Due to the low frequency of responses within the upper categories and consistent with our previous research [9], each option was classified into one of six outcomes: 0 (noncurrent drinking; if reported "never," did not drink in the last 12 months, or only had a sip of alcohol), 1 (less than once a month), 2 (drink once a month), 3 (drink 2–3 times a month), 4 (drink once a week), and 5 (drink more than once a week if reported use was 2–3 times a week or every day). In line with the AUDIT measure [18], these scores were considered a continuous variable measuring the alcohol use behaviour of each participant and enabled us to present and model the overall behaviour changes with a single value. For the explanatory analysis, however, we reported the frequency of categories separately in descriptive tables.

**Binge drinking.** The frequency of binge drinking was assessed by the question "In the last 12 months, how often did you have five drinks of alcohol or more on one occasion?" and eight possible responses. Due to low frequency of "2 to 5 times a week" ( $n = 152$ , 0.5%) and "daily or almost daily" ( $n = 58$ , 0.2%), the responses were classified into six outcomes and scored as: 0 (non-current binge drinking if reported never drink or never

done binge drinking, did not have 5 + drinks in the last 12 months), or any categories of current-binge drinking as: 1 (less than once a month), 2 (once a month), 3 (2–3 times a month), 4 (once a week), and 5 (more than once a week if reported use was 2–5 times a week or daily).

### Statistical analysis

We examined the prevalence of drinking and binge drinking 2 years pre-pandemic (T1 and T2) and compared it with the prevalence during the initial pandemic period (T3) and ongoing pandemic period (T4). Longitudinal-linked student-level data from the 42 schools were used to examine the adjusted annual changes in drinking and binge drinking among students in the pre-pandemic periods and during the initial- and ongoing pandemic periods using a difference-in-difference (D-I-D) model [19]. This study design measures pre-post changes in an outcome within an exposed group and a control group (first difference), then subtracts the change in the control group from those in the exposed group (second difference). The D-I-D estimate presents the average impact of intervention, here the COVID-19 pandemic. A positive D-I-D estimate indicates escalation in consumption/ binge drinking score during the following year compared to the baseline of each cohort.

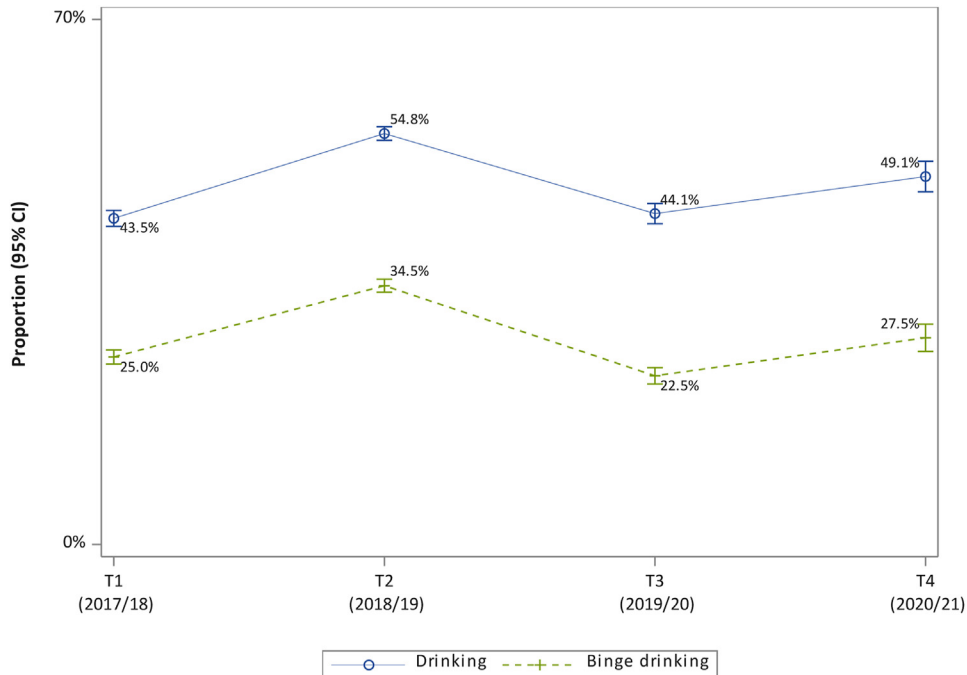
Since all students were exposed to COVID-19 restrictions, we have no control group. Thus, consistent with past studies [20] we assume that without the impact of the COVID-19 pandemic, the annual change in drinking score among students would be the same between the pre- and post-pandemic intervals. To examine

**Table 1**

Distribution of characteristics of the three cohorts of students attending the 44 linked-longitudinal COMPASS schools across the four study waves (2017/18, 2018/19, 2019/20, 2020/21)

Characteristics, n(%)	Cohort 1 (T1–T2 <sup>a</sup> , n = 8,466)	Cohort 2 (T2–T3, n = 3,068)	Cohort 3 (T3–T4, n = 2,555)
Sex (female)	4,460 (52.9)	1,928 (63.1)	1,575 (62.3)
Age			
12–13	1,874 (22.2)	977 (32.0)	926 (36.6)
14	2,238 (26.5)	674 (22.0)	597 (23.6)
15–18	4,339 (51.3)	1,405 (46.0)	1,009 (39.9)
Race (white)	6,472 (76.5)	2,369 (77.2)	2,073 (81.5)

<sup>a</sup> T1: 2017/18, T2: 2018/19, T3:2019/20, T4: 2020/21.



**Figure 2.** Estimated proportion of current drinking (current binge drinking) using four cross-sectional data (2017/18 to 2020/21) among secondary school students participating in the COMPASS study using repeated cross-sectional data.

the difference in development of alcohol consumption as a function of COVID-19 between pre pandemic (Cohort 1) and initial pandemic (Cohort 2) periods, we obtained the first difference by subtracting the drinking score of a student in T1 and T2 (pre-pandemic), and the score of a student in T2 and T3 (initial pandemic), then compared the changes pre- and initial-pandemic. Similarly, the ongoing impacts of the pandemic as different patterns of alcohol consumption developed between the initial pandemic (Cohort 2) and ongoing pandemic (Cohort 3) were examined by comparing changes in consumption scores from T2 to T3 with those from T3 to T4. To control for population characteristics, we included (biological) sex, grade and race/ethnicity in our models as time-invariant covariates in the overall model to adjust the outcome predictions. We modeled changes in sex and age subgroups in separate models. We adjusted the standard errors by including school as the random effect in the models to consider the hierarchical structure of student data were nested within schools. The D-I-D analysis was conducted using Proc Mixed in SAS V9.4 statistical software.

## Results

The proportion of students who reported current drinking was 43.5% in T1 (2017/18), with an increase to 54.8% in T2, a crude escalation rate of 11.3% (Figure 2). This proportion decreased to 44.1% in the initial pandemic period, meaning 10.7% less engaging in alcohol consumption in the first year of the pandemic. The escalation rate then rose by 5.0% as the pandemic continued, with the proportion of current drinking increasing to 49.1%. Nevertheless, the proportion was lower than that in the last year pre-pandemic.

Table 2 indicates changes in the level of drinking among current drinkers across T1 to T4 by cohorts. As shown, the

proportion of students who were engaged in each level of drinking decreased between the pre-pandemic and initial pandemic periods. It appears that less frequent users reported greater changes than more frequent ones. An increase of 4.4% in occasional drinking (less than once a month) pre-pandemic in Cohort 1 reduced to 1.8% in Cohort 2. Occasional drinking then increased by 5.3% in the ongoing pandemic period among Cohort three students; a greater change than those observed pre-pandemic. From pre-pandemic to initial pandemic, escalation in proportions of once a week drinking (2.6%–2.2%) or reported more than once a week drinking (1.9%–1.8%) was minimal. The escalation rate of these two levels of consumption remained stable in Cohort 3.

Figure 3A shows that the adjusted estimate of escalation in alcohol consumption score was 0.30 pre pandemic, whereas that in the initial pandemic decreased to 0.19, resulting in  $-0.11$  (95% CI:  $-0.15, -0.05$ ) less escalation during the initial pandemic than pre-pandemic. Thus, overall, the pandemic appears to have helped reduce the expected frequency of alcohol use escalation among our sample students. The magnitude of escalation difference between the initial (Cohort 2) and ongoing period (Cohort 3) was 0.01 (95% CI:  $-0.04, 0.05$ ), showing a non-significant change from what we observed during the initial pandemic.

Table A1 indicates changes in the proportion of students engaged in different levels of alcohol consumption and binge drinking stratified by sex. During the initial pandemic period (Cohort 2), the proportion of current drinking among females decreased 1.5 times more than that of males (12.9% vs. 8.6%). Figure 3B shows the examination of possible differential impacts of the pandemic on alcohol use scores stratified by sex. It appears that there was a greater reduction in the expected escalation of alcohol consumption among males than females ( $-0.18$  [95%

**Table 2**

Proportion of students engaged in different levels of alcohol consumption and binge drinking and their changes over the time among students attending the 44 linked-longitudinal COMPASS schools across the four study waves (2017/18, 2018/19, 2019/20, 2020/21)

Variable	Cohort 1 <sup>a</sup> (T1–T2, n = 8,466)			Cohort 2 (T2–T3, n = 3,068)			Cohort 3 (T3–T4, n = 2,555)		
	Baseline (2017/18)	Follow-up (2018/19)	% dif. <sup>d</sup>	Baseline (2018/19)	Follow-up (2019/20)	% dif.	Baseline (2019/20)	Follow-up (2020/21)	% dif.
Current drinking <sup>b,e</sup>	<b>3,637 (43.5)</b>	<b>5,041 (60.1)</b>	<b>16.6</b>	<b>1,215 (40.0)</b>	<b>1,443 (51.4)</b>	<b>11.4</b>	<b>846 (35.4)</b>	<b>1,138 (49.1)</b>	<b>13.7</b>
Less than once a month	1,627 (19.4)	2,004 (23.8)	4.4	556 (18.3)	565 (20.1)	1.8	352 (14.7)	463 (20.0)	5.3
Once a month	656 (7.8)	944 (11.3)	3.5	246 (8.1)	277 (9.9)	1.8	169 (7.1)	212 (9.1)	2.0
2 or 3 times a month	921 (11.0)	1,285 (15.3)	4.3	283 (9.3)	370 (13.2)	2.9	216 (9.1)	271 (11.7)	2.6
Once a week	256 (3.1)	476 (5.7)	2.6	76 (2.5)	131 (4.7)	2.2	70 (2.9)	115 (5.0)	2.1
More than once a week	177 (2.1)	332 (4.0)	1.9	54 (1.8)	100 (3.6)	1.8	39 (1.6)	77 (3.3)	1.7
Current binge drinking <sup>c</sup>	<b>2,107 (25.0)</b>	<b>3,295 (39.3)</b>	<b>14.3</b>	<b>675 (21.9)</b>	<b>843 (27.9)</b>	<b>6.0</b>	<b>408 (16.1)</b>	<b>636 (27.6)</b>	<b>11.5</b>
Less than once a month	1,128 (13.5)	1,652 (19.6)	3.2	399 (13.0)	485 (16.1)	3.0	238 (9.5)	353 (15.3)	5.8
Once a month	464 (5.5)	701 (8.3)	2.8	130 (4.2)	158 (5.2)	1.0	86 (3.4)	126 (5.5)	1.1
2 or 3 times a month	357 (4.2)	629 (7.4)	3.2	107 (3.5)	134 (4.4)	0.9	59 (2.3)	98 (4.2)	1.9
Once a week	113 (1.3)	197 (2.3)	1.0	26 (0.8)	47 (1.5)	0.7	19 (.7)	48 (2.1)	1.4
More than once a week	45 (0.5)	116 (1.4)	0.9	13 (0.4)	19 (0.6)	0.2	6 (0.2)	11 (0.5)	0.3

<sup>a</sup> T1: 2017/18, T2: 2018/19, T3:2019/20, T4: 2020/21.

<sup>b</sup> Current drinking is defined as frequency of drinking from less than once a month to more than once a week.

<sup>c</sup> Current binge drinking is defined as frequency of binge drinking from less than once a month to more than once a week.

<sup>d</sup> Percentage difference.

<sup>e</sup> The proportions of overall current drinking and binge drinking are highlighted in bold.

CI:−0.27, −0.09] vs. −0.05 [95% CI: −0.01, 0.11]) during the first year of the pandemic (Cohort 2). This sex difference was continued in the ongoing period, with the drinking score of males escalating by 0.08 (95% CI: −0.02, 0.19), while conversely, female scores decreased by −0.06 (95% CI: −0.14, 0.01).

During the initial pandemic, there was a greater reduction in the escalation rate of current drinking among the two younger groups (Table A2). In Cohort 1, the rates were 19.4% and 20.8% among students aged 12–13 and 14 years, respectively, but reduced to 8.3% and 5.5% during the initial pandemic period (Cohort2, Table A2). The results of D-I-D in Figure 3C show that the escalation in the drinking score of Cohort 2 students aged 12–13 and aged 14 significantly decreased by −0.20 (95% CI:−0.34, −0.05) and −0.27 (95% CI:−0.43, −0.12), respectively, compared to the −0.03 (95% CI:−0.11, 0.04) decrease in students aged 15+. It appears that the drinking score of Cohort three students ages 15 + continued to decrease by 0.20 (95% CI: −0.31, −0.08), while the score of the other two age groups started to increase.

#### The COVID-pandemic and binge drinking

Consistent with changes in drinking, escalation in the frequency of binge drinking reduced in the initial pandemic period and then increased in the ongoing pandemic (Figure 2). The results of Table 2 show that the proportion of binge drinkers in Cohort 1 increased by 14.3%, whereas this proportion increased only 6.0% in Cohort 2. A greater reduction was observed in less frequent binge drinkers, who reported once a month or 2–3 times a month binge drinking (Table 2). The results of D-I-D in Figure 3D show that the adjusted estimate of escalation in binge drinking scores was 0.20 pre pandemic (Cohort 1), but by a significant reduction of −0.19 (−0.23, −0.15) decreased to 0.01 (95% CI:−0.03, 0.04) among Cohort 2 students, meaning that the pandemic appears to have lessened the escalation of binge drinking. The binge drinking scores, however, significantly increased during the second year of the pandemic (Cohort 3), showing 12% (95% CI: 0.07, 0.17) growth.

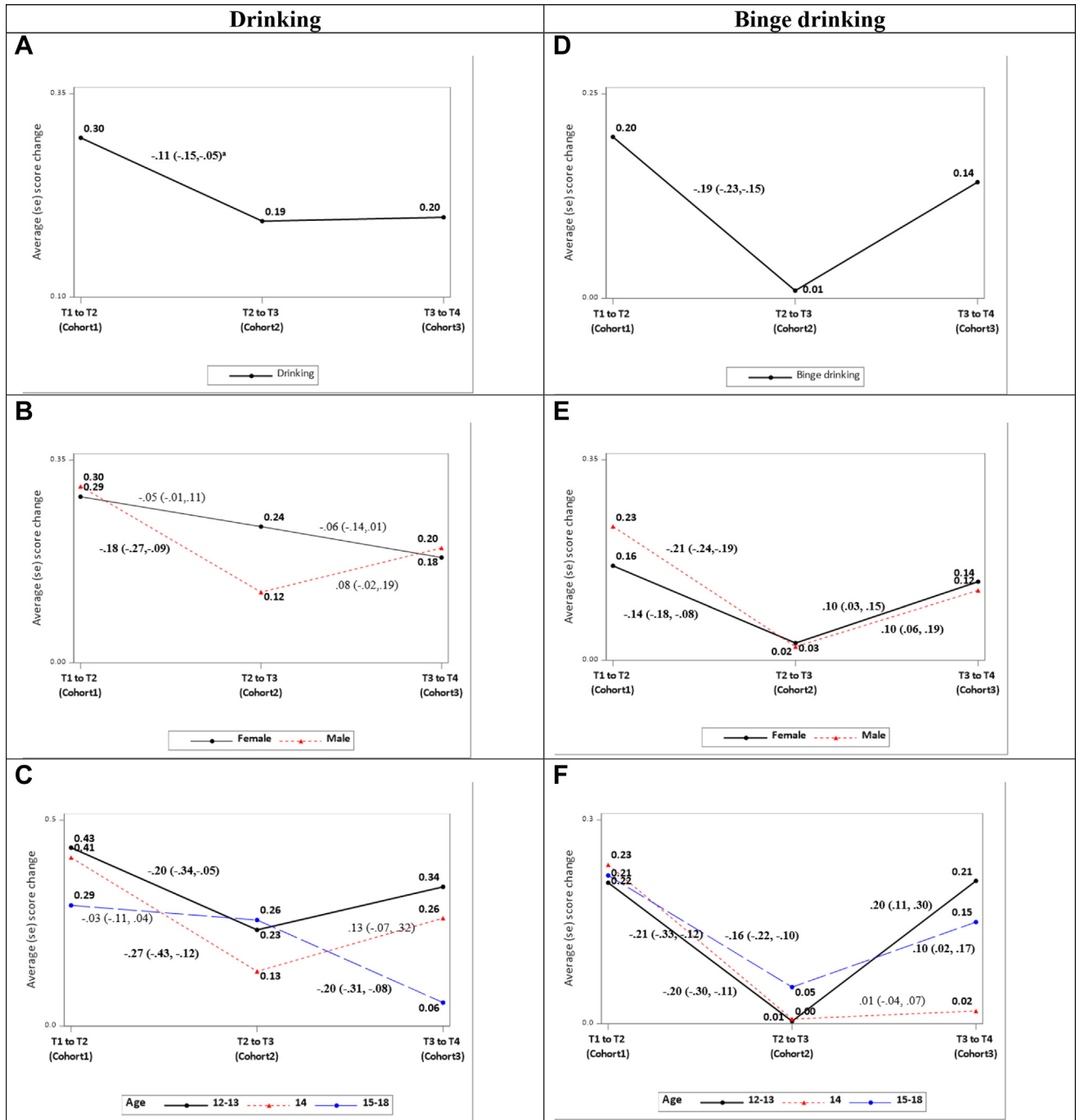
Table A1 reveals that during the initial pandemic, male students had a greater reduction in their expected binge drinking

score escalation than females (14.2%–4.1% in males vs. 13.7%–6.8% in females); however, from the initial to ongoing periods, male students rebounded in their binge drinking more strongly than females. The results of the model indicate that during the initial period, the male binge drinking score reduced by −0.21 (95% CI: −0.24, −0.19) compared to only −0.14 (95% CI: −0.18, −0.08) reduction in females (Figure 3E).

#### Discussion

The present study has examined the ongoing effect of the COVID-19 pandemic on youth drinking behaviour by investigating three cohorts of youth across four years. As such, this evidence is among the first to examine the extended impacts of the pandemic, not just those that presented during its first year. Using survey data linked across four study waves, and adjusting for the age and sex of students, the study suggests that the first year of the pandemic (2019/20, T3) saw attenuation of the frequency of drinking and binge drinking, whereas the second year (2020/21, T4) was associated with a rebound in the frequency of current drinking and the frequency of current binge drinking, even though the escalation rates are still lower than pre-pandemic. Of concern, such a rapid increase in the escalation rates, especially in binge drinking, can be a starting point for more risky drinking behaviours and more subsequent risk for later alcohol-related harm among the youth; warranting ongoing investigation.

Since alcohol consumption, similar to use of other substances, tends to escalate during adolescence, we expected an increase in the frequency of drinking as our linked sample of participants aged. Instead, the escalation rate during the initial pandemic was lower than that pre-pandemic, a finding consistent with observations found by Dumas et al., (2020) that reported binge drinking among Canadian 16–18 year-olds decreased in early weeks of the pandemic. Thorisdottir and colleagues (2021) also found decreases in alcohol consumption of 15–18 years old in Iceland during the early pandemic period [21]. Previous literature focusing on young adults (aged 18–19) and adults has also reported decreased rates of alcohol use and binge drinking during the initial pandemic period [22,23]. One possible explanation



**Figure 3.** Adjusted estimates of changes in drinking and binge drinking scores among students attending the 42 linked-longitudinal COMPASS schools across the four study waves (2017/18 [T1], 2018/19 [T2], 2019/20 [T3], 2020/21 [T4]) in total (A, D) and stratified by sex (B, E) and age (C, F). Significant differences are bolded. Significant difference between Cohort one and two indicates that escalation rates during the initial pandemic was lower than pre pandemic. Significant changes between Cohort two and three indicates that escalation rates from the initial to ongoing pandemic period was different from the observed rates from pre-pandemic to initial pandemic period.

for this reduction can be fewer social opportunities for drinking due to social isolation [5,24]. Youth are more likely to drink with peers and close friends in social events, often binge drinking [24]. As such, restricted in-person learning in schools, limited parties

and social gatherings, and increased time at home with parents have reduced the number of occasions and drinking partners.

This study has identified that over the first year of the pandemic, a more-pronounced decrease occurred in the

escalation of the drinking and binge drinking frequencies among participants inclined to less-frequent consumption (once or less a month) than in the escalation frequency of those inclined to more-frequent consumption (more than once a month). This finding is consistent with past studies [25], where less-frequent users were more likely to decrease or discontinue their consumption. The same results have been reported for use of other substances. For example, Leatherdale et al., (2021) reported slower rates of escalation among less-frequent cannabis users in early stages of the pandemic among Canadian students. Our results also indicate that a considerable portion of drinking occasions in the first year may have been binge drinking as the trajectories for drinking and binge drinking were similar. This finding is in line with previous research suggesting that binge drinking is the common pattern of youth alcohol consumption [26].

During the initial pandemic period, our results showed that males appeared to reduce their alcohol consumption more than females, who tended to escalate/maintain their consumption similar to pre-pandemic levels. However, male consumption rates rebounded in the ongoing pandemic wave as COVID-19 continued. The apparent sudden decrease when social restrictions were implemented and then the sharp escalation as restrictions were removed can partly be attributed to the evidence that male alcohol consumption and binge drinking may be more socially driven than that of females. For example, Smith and colleagues [27] indicated that males tend to consume alcohol to have fun (i.e., enhance one's ability to experience positive emotions), whereas females drink to diminish their experience of negative emotions and relieve stress or depression [26]. Recently, the study by Romano et al., [28] found that some female Canadian high school students used alcohol to cope during the early months of the pandemic, particularly those with poorer psychosocial well-being. Future studies may need to explore associations between the mental health of students and any changes in their alcohol use over the pandemic period.

Findings also indicates that during the pandemic, younger students appeared to have greater changes in their alcohol use behaviours than their older peers. During the initial pandemic students aged 12–14 decreased their frequency of both drinking and binge drinking and then rebounded in their consumption in the ongoing pandemic period, while 15 + year olds reported a decrease in their consumption, but rebounded in their binge drinking. Possible explanations for this trajectory difference between age groups is that the drinking habits tend to become more established as people age [29].

The current study offers several strengths. It is among the first of its kind to use linked data from two years pre-pandemic to two years of the ongoing pandemic, allowing an examination of within-person effects and age-related changes on alcohol consumption behaviours beyond just the first year of COVID-19. Our use of continuous scores for drinking and binge drinking behaviours have allowed us to capture and incorporate more information into our analysis, including any changes in the levels of use. Lastly, the passive-consent protocol used in the study provides robust results as this protocol is essential in self-reported data to mitigate possible self-selection and social desirability biases [30].

The study's findings should be viewed within the context of its limitations. First, the COMPASS study was not intended to be representative of the population, however, we expect that the results will be similar to those of more-representative studies in

view of our sample's diversity and size. Second, as previously reported [31], COMPASS students who could not be linked were more likely to report use of alcohol and other substances, leading to an underestimation of alcohol consumption. Third, transitioning from an in-person classroom survey to an online survey, may have introduced participation bias, as it has been shown that people who are more likely to participate in surveys typically consume less alcohol [32]. As a result, the effects of the pandemic on alcohol consumption during the studied time period may be underestimated.

In conclusion, in this large study, after adjusting for age-related changes, we have identified that the initial COVID-19 pandemic temporarily reduced the expected escalation in frequency of alcohol consumption and binge drinking of our linked sample of youth. However, as the pandemic continued, the frequency of drinking and binge drinking increased, and escalation rates were more consistent with pre-pandemic rates. The trajectory of return suggests future rates may even exceed pre-pandemic rates, highlighting that the pandemic's effects are not singular and have changed over time. As a result, there is need for a nuanced perspective to understand the ongoing effects of the pandemic. Subsequent studies can usefully inform public health measures and harm-reduction strategies by continuing to monitor the onset and progression of youth drinking patterns.

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## Supplementary Data

Supplementary data related to this article can be found at <http://doi.org/10.1016/j.jadohealth.2022.07.007>.

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