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Original quantitative research

Micro-level factors associated with alcohol use and binge drinking among youth in the COMPASS study (2012/13 to 2017/18)

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Abstract

Introduction: This study examined the associations of micro-level factors with current alcohol use and binge drinking among a large sample of Canadian youth.

Methods: This descriptive-analytical study was conducted among high school students enrolled in the COMPASS study between 2012/13 and 2017/18. We used generalized estimating equations modelling to determine associations between micro-level factors and likelihood of current versus non-current alcohol use and binge drinking among respondents.

Results: Students reporting current cannabis use were more likely to report current alcohol use over never use (odds ratio [OR] = 4.46, 95% confidence interval [CI]: 4.33–4.60) compared to students reporting non-current cannabis use. Students reporting current smoking of tobacco products were more likely to report current binge drinking over never binge drinking (OR = 2.52, 95% CI: 2.45–2.58), compared to non-smoking students. Students reporting weekly disposable incomes of more than $100 were more likely to report current over never binge drinking (OR = 2.14, 95% CI: 2.09–2.19), compared to students reporting no weekly disposable income.

Conclusion: Higher disposable incomes, smoking of tobacco products and use of cannabis were associated with current alcohol use and binge drinking among youth. Findings may inform design of polysubstance use prevention efforts in high schools.

Keywords: *youth, alcohol, binge drinking, cannabis, marijuana, smoking*

Highlights

- Prevalence of current alcohol use ranged between 52% and 58%, and rates of current binge drinking ranged between 34% and 41% for students in the COMPASS study between 2012/13 and 2017/18.
- Current cannabis use was associated with a 4.5-fold increased likelihood of current versus never alcohol use, and a 4-fold increased likelihood of current versus never binge drinking compared to non-using students, between 2012/13 and 2017/18.
- Current smoking was associated with a 2-fold increased likelihood of current versus never alcohol use, and a 2.5-fold increased likelihood of current versus never binge drinking compared to non-smoking students between 2012/13 and 2017/18.
- Weekly disposable incomes of more than $100 were associated with an 87% increased likelihood of current versus never alcohol use, and a 2-fold increased likelihood of current versus never binge drinking compared to students with no disposable income between 2012/13 and 2017/18.

Introduction

Heavy alcohol use in adolescents can negatively affect their mental and physical development.[1] Heavy drinking, defined as males consuming five or more and women consuming four or more alcoholic drinks on one occasion,[2] has been associated with lower academic performance and other risk behaviours including smoking and use of illicit drugs among youth.[3] Data from the 2014-15 Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) indicated that while rates of alcohol use were similar among girls and boys, the rates rose with increasing grade levels.[3] Additional studies have shown that binge drinking tended to emerge between 13 and 15 years of age and peaked during late adolescence and early adulthood,[4,5] and that binge drinking during adolescence was predictive of binge drinking into early adulthood. Youth were also more likely to engage in binge drinking if they were smokers or used cannabis, were in a higher grade, or had more spending money.[4] Data from the USA's National Longitudinal Survey of Youth 1979 indicated that binge drinking between the ages of 17 and 20 years increased the relative risk of binge drinking between ages 30 and 31 years by over 2-fold for males and over 3-fold for females.[6]

Heavy alcohol use in youth has also been associated with behaviours that are health-compromising and have future social costs.

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Harmful alcohol use that begins in adolescence and carries on into adulthood has been associated with lifestyle-related cancers, liver disease and cardiovascular disease, with harmful alcohol use defined as > 4 standard drinks per day for men, and > 2 standard drinks per day for women in the past month.[6] Other work has shown associations between binge drinking and low levels of school engagement in terms of skipping classes and not completing assigned homework.[7] Alternatively, positive well-being in youth has been associated with decreased likelihood of binge drinking.[8] Indeed, tendency for alcohol use and binge drinking may indicate how well an individual is navigating the adolescent life-stage in terms of physical health, mental health and psychosocial development.[9]

COMPASS (Cohort study on Obesity, Marijuana use, Physical activity, Alcohol use, Smoking and Sedentary behaviour) is a prospective cohort study enabling the evaluation of health behaviours and psychosocial functioning of a large sample of Canadian youth.[10] COMPASS collects hierarchical and longitudinal data from a convenience sample of secondary schools and the students between Grades 9 and 12 who attend these schools. The objective of our repeated, cross-sectional study was to determine whether the alcohol use and binge drinking statuses of Canadian youth were associated with their sex, ethnicity, grade level, smoking status, cannabis use and level of disposable income, over a six-year period. Findings may inform primary prevention efforts for reducing alcohol use among youth.

Methods

Survey description

COMPASS facilitates assessment of the influence of the built environment, policies and programming on various student-level outcomes. COMPASS collects hierarchical and longitudinal data based on intrapersonal, interpersonal, school-level, and community-level factors across years. Student-level assessments are made on rates of alcohol use, cannabis and tobacco use, obesity, school connectedness, bullying, academic achievement and mental health. COMPASS data collection commenced in the 2012/13 school year and occurs annually, with collection from over 100 000 students from 162 schools in Alberta, British Columbia, Ontario, Quebec and Nunavut. Recruitment began with schools in Ontario in 2012/13, and schools from Alberta were included in 2013/14. Recruitment increased over 2014/15 and 2015/16. In 2016/17, schools from Quebec, British Columbia and Nunavut were added. More schools in Quebec and British Columbia were recruited in 2017/18. Further details on COMPASS, including the sample and data collection process, are available online (www.compass.uwaterloo.ca). Ethics approval for this study was obtained from the University of Waterloo's Office of Research Ethics (ORE # 17264) and relevant school boards.

Analytical sample

This repeated, cross-sectional study used data on alcohol use and binge drinking among a large sample of high school students from schools in Alberta, British Columbia, Ontario, Nunavut and Quebec between 2012/13 and 2017/18; no data were obtained for Grade 12 students in Quebec between 2016/17 and 2017/18. Student-level assessment of alcohol use and binge drinking was conducted via the COMPASS Student Questionnaire, described elsewhere.[10] The sample size generally increased across years, with a total of 24 173 student respondents in 2012/13; 45 298 student respondents in 2013/14; 42 355 student respondents in 2014/15; 40 436 student respondents in 2015/16; 46 957 student respondents in 2016/17; and 66 501 student respondents in 2017/18.

Measures

Demographic variables included: sex (girls, boys); ethnicity (White, Black, Asian, off-reserve Aboriginal, Latino/Hispanic and Other/Mixed/Missing); grade level (Grade 9, Grade 10, Grade 11 and Grade 12); and level of disposable income each week ($0, $1–$20, $21–$100 and more than $100). A response of "Mixed" for ethnicity was deduced from more than one selection from the ethnicity query.

Frequency of alcohol use was determined using the question, "In the last 12 months, how often did you have a drink of alcohol that was more than just a sip?" Responses were grouped as *Never user* ("I have never drunk alcohol"), *Non-current user* ("I did not drink alcohol in the last 12 months" or "I have only had a sip of alcohol"), and *Current user* ("Less than once a month" or "Once a month" or "2 or 3 times a month" or "Once a week" or "2 to 3 times a week" or "4 to 6 times a week" or "Every day"). Frequency of binge drinking was determined using the question, "In the last 12 months, how often did you have 5 drinks of alcohol or more on one occasion?" Responses were grouped as *Never user* ("I have never done this"), *Non-current user* ("I did not have 5 or more drinks on one occasion in the last 12 months"), and *Current user* ("Less than once a month" or "Once a month" or "2 to 3 times a month" or "Once a week" or "2 to 5 times a week" or "Daily or almost daily").

Current smoking status was determined using the question, "On how many of the last 30 days did you smoke one or more cigarettes?" Responses were grouped as *Non-smoker* ("None"), and *Current smoker* ("1 day" or "2 to 3 days" or "4 to 5 days" or "6 to 10 days" or "11 to 20 days" or "21 to 29 days" or "30 days ([every day]").

Current cannabis use was determined using the question, "In the last 12 months, how often did you use marijuana or cannabis? (a joint, pot, weed, hash)" with responses grouped as *Non-current* ("I have never used marijuana" or "I have used marijuana but not in the last 12 months"), and *Current use* ("Less than once a month" or "Once a month" or "2 or 3 times a month" or "Once a week" or "2 or 3 times a week" or "4 to 6 times a week" or "Every day").

Statistical analysis

We conducted descriptive statistics for all study variables. We fitted generalized estimating equations (GEE) models using the SAS PROC GEE procedure with a binomial distribution and a logit function. Given the repeated cross-sectional nature of this study resulting in correlated and clustered data, working correlation structures of compound symmetry, autoregressive, independent, unstructured and exchangeable were tested to ensure model fit. All models used an exchangeable working correlation structure based on the results of these analyses. Empirical standard error estimates were used to calculate confidence intervals and test statistics. Concordance statistics provided goodness-of-fit estimates for the logistic models. All analyses were conducted using the statistical software package SAS 9.4 (SAS Institute Inc., Cary, NC, USA). Statistical significance for the logistic models was set at $p < .05$.

Results

Demographics

Table 1 shows that the sample of high school students was balanced between boys and girls across years; approximately 50.0% for each. Distribution of student respondents by grade level varied between 21.6% and 27.3% between 2012/13 and 2015/16, while proportions of Grade 12 students decreased in 2016/17 (19.3%) and in 2017/18 (17.6%). Most students identified as White, with proportions ranging from 65.4% to 73.8% across years; mean proportions for other ethnicities across years were 4.3% for Black, 6.9% for Asian, 3.2% for off-reserve Aboriginal, and 2.3% for Latino/Hispanic; the proportion of students who identified as Asian in 2017/18 was approximately double that of previous school years. Prevalence of current smoking behaviour ranged between 10.1% and 11.7% across years, while prevalence of current cannabis use ranged between 23.0% and 26.0% across years. The proportion of students reporting a disposable income between $1 and $20 per week varied between 30.2% and 34.9% between 2012/13 and 2017/18. Prevalence of current alcohol use and current binge drinking ranged between 51.5% and 57.5%, and between 33.6% and 40.5% across years, respectively; prevalence was lowest in 2017/18.

Factors associated with alcohol use

Compared to students reporting non-current cannabis use, students reporting current cannabis use were more than four times more likely to report current versus never alcohol use (odds ratio [OR] = 4.46, 95% confidence interval [CI]: 4.33–4.60; Table 2). Students who identified as current smokers were more likely than non-smoking students to report current versus never alcohol use (OR = 2.11, 95% CI: 2.03–2.21). Compared to females, males were less likely to display current versus never alcohol use (OR = 0.87, 95% CI: 0.86–0.88), and non-White students were less likely than White students to display current versus never alcohol use (OR = 0.65, 95% CI: 0.64–0.66). Compared to Grade 9 students, Grade 11 (OR = 1.34, 95% CI: 1.31–1.37) and Grade 12 (OR = 1.62, 95% CI: 1.58–1.66) students were more likely to display current versus never alcohol use, while Grade 10 students were less likely to display current versus never alcohol use (OR = 0.93, 95% CI: 0.91–0.95). Compared to students with no weekly disposable income, students with more than $100 were more likely (OR = 1.87, 95% CI: 1.82–1.92) and students with $1 to $20 were less likely (OR = 0.78, 95% CI: 0.76–0.79) to report current versus never alcohol use. Compared to the baseline year of 2012/13, students were more likely to report current versus non-current alcohol use in 2013/14 (OR = 1.12, 95% CI: 1.09–1.15), and less likely to report current versus non-current alcohol use in 2015/16 (OR = 0.87, 95% CI: 0.85–0.90), 2016/17 (OR = 0.93, 95% CI: 0.90–0.95), and 2017/18 (OR = 0.96, 95% CI: 0.94–0.99).

We saw similar results for associations with non-current versus never alcohol use (Table 2). Compared to non-current users, current cannabis users were more likely to report non-current versus never alcohol use (OR = 1.69, 95% CI: 1.64–1.75). Current smokers were also more likely to report non-current versus never alcohol use, compared to non-smoking students (OR = 1.32, 95% CI: 1.26–1.39). Compared to students with no weekly disposable income, students with weekly disposable income of $21 to $100 (OR = 1.08, 95% CI: 1.05–1.11) and more than $100 (OR = 1.11, 95% CI: 1.08–1.15) were more likely to report non-current versus never alcohol use.

Factors associated with binge drinking

Compared to students reporting non-current cannabis use, students reporting current cannabis use were four times more likely to report current binge drinking versus never binge drinking (OR = 3.99, 95% CI: 3.92–4.06) (Table 2). Students who identified as current smokers were also more likely than non-smoking students to report current versus never binge drinking (OR = 2.52, 95% CI: 2.45–2.58). Compared to females, males were more likely to report current versus never binge drinking (OR = 1.02, 95% CI: 1.00–1.03), and non-White students were less likely than White students to report current versus never binge drinking (OR = 0.74, 95% CI: 0.73–0.75). Compared to Grade 9 students, Grade 11 (OR = 1.37, 95% CI:

TABLE 1
Demographics and substance use prevalence of student respondents in the COMPASS study, Canada, between the 2012/13 and 2017/18 school years

Characteristics		2012/13 (N[a] = 24 173)		2013/14 (N[a] = 45 298)		2014/15 (N[a] = 42 355)		2015/16 (N[a] = 40 436)		2016/17 (N[a] = 46 957)		2017/18 (N[a] = 66 501)	
		n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Sex	Girls	11 886	49.6 (49.0–50.2)	22 149	49.4 (48.9–49.9)	20 663	49.3 (48.8–49.8)	19 279	48.3 (47.8–48.8)	22 975	49.6 (49.1–50.1)	33 015	50.1 (49.7–50.5)
	Boys	12 076	50.4 (49.8–51.0)	22 712	50.6 (50.1–51.1)	21 263	50.7 (50.2–51.2)	20 601	51.7 (51.2–52.2)	23 319	50.4 (49.9–50.9)	32 923	49.9 (49.5–50.3)
Grade	9	6 305	26.2 (25.6–26.8)	11 793	26.2 (25.8–26.6)	11 070	26.3 (25.9–26.7)	10 585	26.3 (25.9–26.7)	11 945	27.1 (26.7–27.5)	15 950	27.8 (27.4–28.2)
	10	6 179	25.7 (25.2–26.3)	11 817	26.2 (25.8–26.6)	11 493	27.3 (26.9–27.7)	10 612	26.4 (26.0–26.8)	12 437	28.2 (27.8–28.6)	16 107	28.0 (27.6–28.4)
	11	5 894	24.5 (24.0–25.0)	11 229	24.9 (24.5–25.3)	10 489	24.9 (24.5–25.3)	10 179	25.3 (24.9–25.7)	11 238	25.4 (25.0–25.8)	15 291	26.6 (26.2–27.0)
	12	5 699	23.7 (23.2–24.2)	10 233	22.7 (22.3–23.1)	9 078	21.6 (21.2–22.0)	8 807	21.9 (21.5–22.3)	8 538	19.3 (18.9–19.7)	10 112	17.6 (17.3–17.9)

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TABLE 1 (continued)
Demographics and substance use prevalence of student respondents in the COMPASS study, Canada, between the 2012/13 and 2017/18 school years

Characteristics		2012/13 (N[a] = 24 173)		2013/14 (N[a] = 45 298)		2014/15 (N[a] = 42 355)		2015/16 (N[a] = 40 436)		2016/17 (N[a] = 46 957)		2017/18 (N[a] = 66 501)	
		n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Ethnicity	White	17 124	70.8 (70.2–71.4)	33 414	73.8 (73.4–74.2)	30 836	72.8 (72.4–73.2)	28 641	70.8 (70.4–71.2)	32 993	70.3 (69.9–70.7)	43 510	65.4 (65.0–65.8)
	Black	1 102	4.6 (4.3–4.9)	1 785	3.9 (3.7–4.1)	1 892	4.5 (4.3–4.7)	1 991	4.9 (4.7–5.1)	1 936	4.1 (3.9–4.3)	2 593	3.9 (3.8–4.1)
	Asian	1 423	5.9 (5.6–6.2)	2 303	5.1 (4.9–5.3)	2 313	5.5 (5.3–5.7)	2 466	6.1 (5.9–6.3)	3 018	6.4 (6.2–6.6)	8 125	12.2 (12.0–12.5)
	Aboriginal	721	3.0 (2.9–3.2)	1 596	3.5 (3.3–3.7)	1 416	3.3 (3.1–3.5)	1 288	3.2 (3.0–3.4)	1 606	3.4 (3.2–3.6)	1 854	2.8 (2.7–2.9)
	Latino/ Hispanic	551	2.3 (2.1–2.5)	856	1.9 (1.8–2.0)	888	2.1 (2.0–2.2)	942	2.3 (2.2–2.5)	1 201	2.6 (2.5–2.8)	1 663	2.5 (2.4–2.6)
	Other/ mixed/ missing	3 252	13.5 (13.1–13.9)	5 344	11.8 (11.5–12.1)	5 010	11.8 (11.5–12.1)	5 108	12.6 (12.3–12.9)	6 203	13.2 (12.9–13.5)	8 756	13.2 (12.9–13.5)
Smoking status	Non-current	21 587	89.3 (88.9–89.7)	40 027	88.4 (88.1–88.7)	37 592	88.8 (88.5–89.1)	35 689	88.3 (88.0–88.6)	41 167	88.8 (88.5–89.1)	59 266	90.0 (89.8–90.2)
	Current	2 586	10.7 (10.3–11.1)	5 271	11.6 (11.3–11.9)	4 763	11.3 (11.0–11.6)	4 747	11.7 (11.4–12.0)	5 182	11.2 (10.9–11.5)	6 625	10.1 (9.9–10.3)
Cannabis use	Non-current	17 332	71.7 (71.1–72.3)	32 780	72.4 (72.0–72.8)	30 698	72.5 (72.1–72.9)	29 475	72.9 (72.5–73.3)	34 359	73.2 (72.8–73.6)	50 176	75.5 (75.2–75.8)
	Current	6 273	26.0 (25.5–26.6)	11 434	25.2 (24.8–25.6)	10 716	25.3 (24.9–25.7)	9 960	24.6 (24.2–25.0)	11 508	24.5 (24.1–24.9)	15 265	23.0 (22.7–23.3)
	Missing	568	2.3 (2.1–2.5)	1 084	2.2 (2.1–2.3)	941	2.2 (2.1–2.3)	1 001	2.5 (2.4–2.7)	1 090	2.3 (2.2–2.4)	1 060	1.6 (1.5–1.7)
Disposable income	$0	3 775	18.0 (17.5–18.5)	7 192	18.3 (17.9–18.7)	6 921	18.8 (18.4–19.2)	6 721	19.1 (18.7–19.5)	7 520	18.8 (18.4–19.2)	10 611	19.3 (19.0–19.6)
	$1–$20	7 325	34.9 (34.3–35.5)	12 911	32.8 (32.3–33.3)	11 836	32.1 (31.6–32.6)	10 781	30.6 (30.1–31.1)	12 345	30.8 (30.4–31.3)	16 628	30.2 (29.8–30.6)
	$21–$100	6 475	30.8 (30.2–31.4)	11 978	30.5 (30.0–31.0)	10 805	29.3 (28.8–29.8)	10 056	28.6 (28.1–29.1)	11 487	28.7 (28.3–29.1)	15 565	28.3 (27.9–28.7)
	More than $100	3 426	16.3 (15.8–16.8)	7 236	18.4 (18.0–18.8)	7 326	19.9 (19.5–20.3)	7 655	21.7 (21.3–22.1)	8 691	21.7 (21.3–22.1)	12 282	22.3 (22.0–22.7)
Any alcohol use	Never user	4 865	20.7 (20.2–21.2)	9 687	21.9 (21.5–22.3)	9 849	23.8 (23.4–24.2)	10 137	25.7 (25.3–26.1)	12 076	26.3 (25.9–26.7)	17 943	27.4 (27.1–27.7)
	Non-current user	5 535	23.6 (23.1–24.1)	9 108	20.6 (20.2–21.0)	8 624	20.8 (20.4–21.2)	8 060	20.4 (20.0–20.8)	9 114	19.9 (19.5–20.3)	13 794	21.1 (20.8–21.4)
	Current user	13 075	55.7 (55.1–56.3)	25 444	57.5 (57.0–58.0)	22 985	55.4 (54.9–55.9)	21 291	53.9 (53.4–54.4)	24 715	53.8 (53.3–54.3)	33 684	51.5 (51.1–51.9)
Binge drinking status	Never binger	12 539	52.1 (51.5–52.7)	22 766	50.4 (49.9–50.9)	22 201	52.6 (52.1–53.1)	21 934	54.5 (54.0–55.0)	25 700	55.0 (54.6–55.5)	38 776	58.5 (58.1–58.9)
	Non-current	2 058	8.6 (8.2–9.0)	4 075	9.0 (8.7–9.3)	3 705	8.8 (8.5–9.1)	3 383	8.4 (8.1–8. 7)	4 102	8.8 (8.5–9.1)	5 221	7.9 (7.7–8.1)
	Current binger	9 481	39.4 (38.8–40.0)	18 291	40.5 (40.1–41.0)	16 300	38.6 (38.1–39.1)	14 963	37.2 (36.7–37.7)	16 971	36.3 (35.9–36.7)	22 278	33.6 (33.2–34.0)

Abbreviations: CI, confidence interval; COMPASS, Cohort Study on Obesity, Marijuana Use, Physical Activity, Alcohol Use, Smoking and Sedentary Behaviour.

[a] Sampling frame.

TABLE 2
GEE multinomial logistic regression models examining micro-level factors associated with alcohol use and binge drinking among high school students in the COMPASS study, Canada, 2012/13 to 2017/18

Variable	Level[a]	Alcohol use				Binge drinking			
		OR	Lower	Upper	*p*-value	OR	Lower	Upper	*p*-value
Current vs. never									
Sex	Male	0.87	0.86	0.88	< .001	1.02	1.00	1.03	.008
Grade level	10	0.93	0.91	0.95	< .001	0.91	0.89	0.93	< .001
	11	1.34	1.31	1.37	< .001	1.37	1.34	1.40	< .001
	12	1.62	1.58	1.66	< .001	1.77	1.73	1.81	< .001
Ethnicity	Non-White	0.65	0.64	0.66	< .001	0.74	0.73	0.75	< .001
Smoking	Current	2.11	2.03	2.21	< .001	2.52	2.45	2.58	< .001
Cannabis use	Current	4.46	4.33	4.60	< .001	3.99	3.92	4.06	< .001
Disposable income	$1–$20	0.78	0.76	0.79	< .001	0.70	0.68	0.71	< .001
	$21–$100	1.35	1.32	1.37	< .001	1.42	1.39	1.45	< .001
	More than $100	1.87	1.82	1.92	< .001	2.14	2.09	2.19	< .001
Year of collection	2013/14	1.12	1.09	1.15	< .001	1.22	1.19	1.26	< .001
	2014/15	0.98	0.95	1.00	.097	1.06	1.03	1.09	< .001
	2015/16	0.87	0.85	0.90	< .001	0.93	0.90	0.96	< .001
	2016/17	0.93	0.90	0.95	< .001	0.91	0.89	0.94	< .001
	2017/18	0.96	0.94	0.99	.004	0.78	0.76	0.80	< .001
Concordance statistic		0.834				0.893			
Non-current vs. never									
Sex	Male	0.90	0.89	0.91	< .001	0.88	0.87	0.89	< .001
Grade level	10	0.99	0.97	1.02	.596	0.92	0.90	0.94	< .001
	11	1.04	1.01	1.07	.002	1.29	1.26	1.31	< .001
	12	1.04	1.01	1.07	.005	1.50	1.47	1.54	< .001
Ethnicity	Non-White	0.88	0.86	0.89	< .001	0.76	0.75	0.77	< .001
Smoking	Current	1.32	1.26	1.39	< .001	1.48	1.44	1.52	< .001
Cannabis use	Current	1.69	1.64	1.75	< .001	2.43	2.39	2.47	< .001
Disposable income	$1–$20	1.00	0.98	1.02	.937	0.84	0.82	0.86	< .001
	$21–$100	1.08	1.05	1.11	< .001	1.23	1.20	1.25	< .001
	More than $100	1.11	1.08	1.15	< .001	1.55	1.51	1.58	< .001
Year of collection	2013/14	1.06	1.03	1.09	< .001	1.10	1.07	1.13	< .001
	2014/15	0.98	0.95	1.01	.204	1.01	0.98	1.03	.605
	2015/16	0.90	0.87	0.93	< .001	0.94	0.92	0.97	< .001
	2016/17	0.88	0.86	0.91	< .001	0.98	0.96	1.01	.157
	2017/18	0.94	0.91	0.96	< .001	0.95	0.92	0.97	< .001
Concordance statistic		0.586				0.747			

Abbreviations: GEE, generalized estimating equations; OR, odds ratio.

[a] Reference categories: Female; Grade 9; White; Non-smoker; Non-current cannabis user; $0; 2012/13.

1.34–1.40) and Grade 12 students (OR = 1.77, 95% CI: 1.73–1.81) were more likely to report current versus never binge drinking. Compared to students with no weekly disposable income, students with weekly disposable incomes of $21 to $100 (OR = 1.42, 95% CI: 1.39–1.45) and more than $100 (OR = 2.14, 95% CI: 2.09–2.19) were more likely to report current versus never binge drinking. Compared to the baseline year of 2012/13, students were more likely to report current versus never binge drinking in 2013/14 (OR = 1.22, 95% CI: 1.19–1.26) and in 2014/15 (OR = 1.06, 95% CI: 1.03–1.09), and less likely to report current versus never binge drinking in 2015/16 (OR = 0.93, 95% CI: 0.90–0.96), 2016/17 (OR = 0.91, 95% CI: 0.89–0.94), and in 2017/18 (OR = 0.78, 95% CI: 0.76–0.80).

Similar results were seen for associations with non-current versus never binge drinking (Table 2). Compared to non-current users, current cannabis users were more likely to report non-current versus never binge drinking (OR = 2.43, 95% CI:

2.39–2.47). Current smokers were also more likely to report non-current versus never binge drinking, compared to non-smoking students (OR = 1.48, 95% CI: 1.44–1.52). Compared to students with no weekly disposable income, students with weekly disposable income of $21 to $100 (OR = 1.23, 95% CI: 1.20–1.25) and more than $100 (OR = 1.55, 95% CI: 1.51–1.58) were more likely to report non-current versus never binge drinking.

Discussion

This paper shows distinct associations between micro-level factors and alcohol use and binge drinking among a large sample of Canadian high school students. Current cannabis use was associated with a four-fold increased likelihood of both alcohol use and binge drinking, while current smoking was associated with a two-fold increased likelihood of both behaviours. Data from the Canadian Alcohol and Drug Use Monitoring Survey (CADUMS) and the Canadian Community Health Survey (CCHS) showed significantly higher prevalence of binge drinking and problem drinking (based on the AUDIT scale) in current smokers versus non-smokers.[11,12] Using data from CADUMS and CCHS, Kirst and colleagues reported that the magnitude of association between current smoking and binge drinking was larger for adolescents aged between 12 and 17 years compared to those aged 18 years and older.[11] The difference in this association for the two age groups is striking and indicates a need for interventions among youth who use multiple substances. Taking all of this together, we suggest that youth may be negotiating use of various substances, perhaps driven by peer pressure and nonconforming attitudes displayed during adolescence.[4]

In terms of sex, girls were more likely to report current alcohol use compared to boys, while boys were slightly more likely to report current binge drinking than girls. These results can be juxtaposed with findings from the 2016-17 CSTADS, in which prevalence of alcohol use was similar for girls and boys at 44% for both groups, while prevalence of high-risk drinking (five or more drinks on one occasion) was 25% for boys and 23% for girls.[13] Moreover, McCarty and colleagues also showed that cannabis use in youth predicted harmful drinking into adulthood across sexes, and predicted binge drinking during adulthood for those who identified as males.[6]

We also saw differences in prevalence of alcohol use and binge drinking between ethnic groups. Non-White students were less likely to report current alcohol use and binge drinking compared to students who identified as White. Data from the Toronto Youth Crime and Victimization Survey showed that, compared to students who identified as South Asian and East Asian, the likelihood of weekly drinking was significantly higher for students who identified as Canadian, Western European, Eastern European, Southern European, South American or Chinese.[14] Taken together, these results indicate that cultural factors and traditional norms, along with the current social environment, may be influencing alcohol use among Canadian youth. Given that non-White students represented only 29% of the overall sample in our study, our findings may not be generalizable.

Alcohol use and binge drinking also varied by reported levels of weekly disposable income. Students reporting more than $100 of disposable income were approximately twice as likely to report alcohol use and binge drinking. Previous work has shown that family financial resources were a strong predictor of substance use in youth (mean age approximately 17 years); youth with high socioeconomic status were more likely to use alcohol than youth with low socioeconomic status.[15] Students with higher levels of disposable income may view drinking as an economically feasible activity. Moreover, data from the Canadian Community Health Survey showed that youth (aged 15–19 years) who worked longer hours were more likely to exhibit heavy episodic drinking, but this only applied to youth from families with moderate to high incomes.[16] While youth may work for various reasons, from obtaining living essentials to purchasing luxury items, minimum pricing strategies may serve as effective barriers against alcohol consumption among youth.[17]

The recruitment of schools from new geographical locations over the duration of the study resulted in fewer Grade 12 students in 2016/17 and 2017/18, along with fewer students who identified as White and more students who identified as Asian in 2017/18. Moderate decreases in overall prevalence of current alcohol use and current binge drinking in 2016/17 and 2017/18 were subsequently observed. These results highlight the need for a large and diverse sample of youth for future cohort studies.

Strengths and limitations

Data from COMPASS' student questionnaire are self-reported. The data collection procedures employed limit social desirability bias by use of an active-information, passive-consent permission approach, and further maintain confidentiality and minimize underreporting.[18] COMPASS also utilizes purposive sampling for recruitment of participating schools from different geographical locations—Ontario, Alberta, British Columbia, Quebec and Nunavut.[10] While the sampling approach may have impacted external validity, many of the findings presented here are comparable with other large-scale studies on alcohol use and binge drinking prevalence among Canadian youth, namely the Canadian Community Health Survey and the Canadian Alcohol and Drug Use Monitoring Survey (42% prevalence of alcohol use),[11] and the Canadian Student Tobacco, Alcohol and Drugs Survey (44% prevalence of alcohol use and 24% prevalence of high-risk drinking).[13]

Conclusion

This study provides insight on the associations of micro-level factors with alcohol use and binge drinking behaviour among Canadian youth. Cannabis use, smoking of tobacco products and higher disposable incomes were associated with reporting of current alcohol use and binge drinking among high school students in COMPASS. Results may inform polysubstance use prevention efforts that target youth.

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Conflicts of interest

The authors have no conflicts of interest to report.

Authors' contributions and statement

SH conceptualized the study and wrote the manuscript. WQ conducted the data analyses. SL designed the survey and collected the study data. All authors contributed to the interpretation of the findings, development of manuscript drafts, and approved the final version of the manuscript.

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References

1. Butt P, Beirness D, Gliksman L, et al. Alcohol and health in Canada: a summary of evidence and guidelines for low risk drinking. Ottawa (ON): Canadian Centre on Substance Abuse; 2011. 66 p.

2. Stockwell T, Beirness D, Butt P, et al. Canada's low-risk drinking guidelines [letter]. CMAJ. 2012;184(1):75.

3. Health Canada. Canadian Student Tobacco, Alcohol and Drugs Survey: detailed tables for 2014–15 [Internet]. Ottawa (ON): Government of Canada; [modified 2016 Sep 09; cited 2019 Jun]. Available from: https://www.canada.ca/en/health-canada/services/canadian-student-tobacco-alcohol-drugs-survey/2014-2015-supplementary-tables.html

4. Herciu AC, Laxer RE, Cole A, et al. A cross-sectional study examining factors associated with youth binge drinking in the COMPASS study: year 1 data. J Alcohol Drug Depend [Internet]. 2014 [cited 2019 Jun];2(4):172. Available from: https://www.longdom.org/open-access/a-crosssectional-study-examining-factors-associated-with-youth-binge-drinking-in-the-compass-study-year-data-2329-6488.1000172.pdf

5. Thompson K, Stockwell T, Leadbeater B, et al. Association among different measures of alcohol use across adolescence and emerging adulthood. Addiction. 2014;109(6):894–903.

6. McCarty CA, Ebel BE, Garrison MM, et al. Continuity of binge and harmful drinking from late adolescence to early adulthood. Pediatrics. 2004;114(3):714-9.

7. Patte KA, Qian W, Leatherdale ST. Binge drinking and academic performance, engagement, aspirations, and expectations: a longitudinal analysis among secondary school students in the COMPASS study. Health Promot Chronic Dis Prev Can. 2017;37(11):376-85.

8. Hoyt LT, Chase-Lansdale PL, McDade TW, et al. Positive youth, healthy adults: does positive well-being in adolescence predict better perceived health and fewer risky health behaviors in young adulthood? J Adolesc Health. 2012;50(1): 66-73.

9. Tucker JS, Ellickson PL, Orlando M, et al. Substance use trajectories from early adolescence to emerging adulthood: a comparison of smoking, binge drinking, and marijuana use. J Drug Issues. 2005;35(2):307-22.

10. Leatherdale ST, Brown S, Carson V, et al. The COMPASS study: a longitudinal hierarchical research platform for evaluating natural experiments related to changes in school-level programs, policies and built environment resources. BMC Public Health [Internet]. 2014 [cited 2019 Jun];14:331. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-14-331

11. Kirst M, Mecredy G, Chaiton M. The prevalence of tobacco use co-morbidities in Canada. Can J Public Health. 2013;104(3):e210-e215.

12. Babor TF, Higgins-Biddle JC, Saunders JB, et al. AUDIT: the Alcohol Use Disorders Identification Test: guidelines for use in primary care. 2nd ed. Geneva (CH): World Health Organization; 2001.

13. Government of Canada. Summary of results for the Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) 2016-2017 [Internet]. Ottawa (ON): Government of Canada; [modified 2018 Jun 12; cited 2019 Jun]. Available from: https://www.canada.ca/en/health-canada/services/canadian-student-tobacco-alcohol-drugs-survey/2016-2017-summary.html

14. Brown C, Langille D, Tanner J, et al. Health-compromising behaviors among a multi-ethnic sample of Canadian high school students: risk-enhancing effects of discrimination and acculturation. J Ethn Subst Abuse. 2014;13(2):158-78.

15. Hanson MD, Chen E. Socioeconomic status and substance use behaviors in adolescents: the role of family resources versus family social status. J Health Psychol. 2007;12(1):32-5.

16. Breslin FC, Adlaf EM. Part-time work and adolescent heavy episodic drinking: the influence of family and community context. J Stud Alcohol Drugs. 2005;66(6):784-94.

17. Stockwell T, Auld MC, Zhao J, et al. Does minimum pricing reduce alcohol consumption? The experience of a Canadian province. Addiction. 2011;107(5):912-20.

18. Thompson-Haile A, Bredin C, Leatherdale ST. Rationale for using active-information passive-consent permission protocol in COMPASS. COMPASS Tech Rep Ser [Internet]. 2013 [cited 2019 Jun];1(6). Available from: https://uwaterloo.ca/compass-system/publications/rationale-using-active-information-passive-consent