

Alcohol use and related harms in school students in the USA and Australia

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SUMMARY

Recognizing there have been few methodologically rigorous cross-national studies of youth alcohol and drug behaviour, state student samples were compared in Australia and the USA. Sampling methods were matched to recruit two independent, state-representative, cross-sectional samples of students in Grades 5, 7 and 9 in Washington State, USA, ($n = 2866$) and Victoria, Australia ($n = 2864$) in 2002. Of Washington students in Grade 5 (age 11), 10.3% (95% CI 7.2–14.7) of boys and 5.2% (95% CI 3.4–7.9) of girls reported alcohol use in the past year. Prevalence rates were markedly higher in Victoria (34.2%, 95% CI 28.8–40.1 boys; 21.0%, 95% CI 17.1–25.5 girls). Relative to Washington, the students in Victoria demonstrated a two to three times increased

likelihood of reporting substance use (either alcohol, tobacco or illicit drug use), and by Grade 9, experiences of loss-of-control of alcohol use, binge drinking (frequent episodes of five or more alcoholic drinks), and injuries related to alcohol were two to four times higher. The high rates of early age alcohol use in Victoria were associated with frequent, heavy and harmful alcohol use and higher overall exposure to alcohol or other drug use. These findings reveal considerable variation in international rates of both adolescent alcohol misuse and co-occurring drug use and suggest the need for cross-national research to identify policies and practices that contribute to the lower rate of adolescent alcohol and drug use observed in the USA in this study.

Key words: alcohol use; alcohol abuse; adolescents; alcohol policy

INTRODUCTION

Underage consumption and misuse of alcohol are a significant public health problem globally. Youth alcohol misuse is among the highest contributors to preventable mortality and morbidity in developed and developing nations (Ezzati *et al.*, 2002). It is important to monitor adolescent alcohol and drug use as these behaviours

contribute not just to problems in adolescence but also increase the likelihood of harmful alcohol and drug use later in life (Fergusson *et al.*, 1995).

In recent years, increasing efforts have been made to conduct international surveys that enable youth alcohol and drug use behaviours to be compared in different nations. The European School Survey Project on Alcohol

and Other Drugs (ESPAD) was initiated in 1995 and collects data in European nations every 4 years in a form comparable with the US Monitoring the Future (MTF) survey (Andersson *et al.*, 2007). Comparisons with the USA are important given the large investment in prevention research and the distinctive nature of US abstinence-based youth alcohol and drug policies (Toumbourou *et al.*, 2005).

The ESPAD study does not include Australia where explicit harm minimization policies have been outlined to address youth alcohol and drug use (Ministerial Council on Drug Strategy, 1998). Previous comparative studies of youth alcohol and drug use in the USA and Australia (Makkai, 1994; Pirkis *et al.*, 2003; Beyers *et al.*, 2004; Toumbourou *et al.*, 2005) have failed to provide clear evidence of behavioural differences, because they have been based on opportunistic analyses of existing surveys that have not been equivalent in sample design, instruments or administration procedures (Pirkis *et al.*, 2003).

The current study improves upon previous comparative studies by analysing student self-report data on a broad range of alcohol and drug behaviours collected through a survey administered to representative state-wide student samples using matched recruitment and administration procedures to compare Washington State, a northwestern state in the USA and Victoria, a southeastern state in Australia. A previous report using the present data found higher rates of alcohol use in Victoria but similar levels of anti-social behaviour in the two states (McMorris *et al.*, 2007).

The states of Washington and Victoria were selected for comparison due to their many demographic and economic similarities. Washington and Victoria had similar populations in 2001 (5.9 million in Washington and 4.6 million in Victoria), similar proportions living in urban centres (82% in Washington vs. 80% in Victoria), both were considered progressive states with higher than national levels of educational participation and similarly low proportions living in poverty (~11%).

The aim of the present study was to extend the comparative analysis of students in Washington and Victoria (McMorris *et al.*, 2007) to examine the prevalence of specific alcohol use behaviours including alcohol-related harms and the co-occurrence of alcohol use with tobacco and illicit drug use. For the entire

sample, and specifically for students who drank alcohol, the present paper also explores whether there were cross-state differences in high-dose (binge) alcohol use (five or more drinks in a session), experiences of loss-of-control while using alcohol and alcohol-related social problems and consequences. On the basis of the previous comparisons, (Makkai, 1994; Pirkis *et al.*, 2003; Beyers *et al.*, 2004; Toumbourou *et al.*, 2005), it was hypothesized that the prevalence of alcohol use would be higher among students in Victoria compared with Washington State, but rates of alcohol misuse would be similar in the two states.

METHODS

Participants

Data were collected from 5769 students from Washington State and Victoria participating in the International Youth Development Study, an investigation of the development of a range of adolescent behaviours including alcohol and drug use. In 2002, a two-stage cluster sample design was used to recruit students in both states. In the first stage, schools were selected at random, based on a probability proportional to grade-level size from a stratified sampling frame of all schools in Victoria (government, Catholic and independent) and Washington (public, private and alternative). At Stage 2, single intact classes from each school for the selected grade level (Grade 5, 7 or 9) were chosen at random. In Victoria, 152 schools agreed to participate (165 classes or 65% of 254 eligible classrooms). In Washington, 153 schools participated (155 classes or 73% of 212 classrooms approached). In Washington, a number of school districts refused survey permission, however, analyses of school characteristics revealed few significant differences on measures of student disadvantage or ethnicity for schools that did and did not agree to participate (McMorris *et al.*, 2007). Student recruitment used active parental consent procedures. Classes in Washington yielded a total of 3856 eligible students, of whom 2885 (74.8%) consented to and participated in the survey. In Victoria, 3926 students were eligible for consent, of whom 2884 (73.5%) consented and participated.

Of the 5769 students in the sample, few ($n = 39$) met the criteria for completing the survey

Table 1: Student sample characteristics for each cohort in 2002

	Grade 5		Grade 7		Grade 9		Total sample	
	WA	VIC	WA	VIC	WA	VIC	WA	VIC
Mean age ^a	11.1	11.0	13.1	12.9	15.1	14.9	13.1	13.0
SD	0.4	0.4	0.4	0.4	0.5	0.4	1.7	1.6
Range	9.7–12.9	9.8–12.4	12.0–16.6	11.8–14.5	13.6–17.2	13.8–16.5	9.7–17.2	9.8–16.5
Male	458 (49.1%)	440 (47.7%)	470 (49.2%)	478 (49.1%)	493 (50.4%)	460 (47.5%)	1421 (49.6%)	1378 (48.1%)
Female	474 (50.9%)	482 (52.3%)	485 (50.8%)	496 (50.9%)	486 (49.6%)	508 (52.5%)	1445 (50.4%)	1486 (51.9%)
Total <i>n</i>	932	922	955	974	979	968	2866	2864

WA designates Washington State students, VIC refers to students in Victoria.

^a*t*-tests of state differences in age by each grade were all significant ($p < 0.01$).

dishonestly (i.e. they reported that they had ever or recently used a fake drug and/or reported that they were dishonest when answering the survey). Dishonest students were excluded from the analyses, giving a final sample size of 5730.

Table 1 shows that males and females were equally represented in the total sample and in each cohort. The average age of students in Victoria was slightly younger than the average age of Washington students. In terms of ethnicity, 65.3% of students in Washington reported that they were White, 12.4% Hispanic, 7.3% Asian/Pacific Islander, 5.7% Native American, 4.3% African-American and 3.2% belonged to other ethnic groups. In Victoria, ethnicity was measured differently; the majority of students reported that they were Australian (88.2%), 5.9% Asian/Pacific Islander, 1.0% Aboriginal, less than 1.0% each were African or Spanish and 1.7% reported other ethnicity.

Results of a parent phone survey in 2002 (response rate 95% in Victoria and 98% in Washington State) suggested that the samples in the two states were comparable in terms of socioeconomic status. In both states, the rate of students living in low-income households (income \leq \$AUS30 000) was less than a quarter (22% in Victoria and 23% in Washington State). Less than a third (31% in Victoria and 30% in Washington State) were living in a household that had received government welfare assistance in the past year. Less than 10% lived in households where no parent was employed (9% in Victoria and 8% in Washington State). Students in Washington State (25%) were slightly more likely to be living in a sole-parent household compared with students in Victoria (20%, $p < 0.001$).

Procedures

Standard data collection protocols were approved by the University of Washington Human Subjects Review Committee and the Royal Children's Hospital Ethics in Human Research Committee in Melbourne, Australia. The self-report student survey was adapted from an instrument that has shown good reliability and validity in large samples and assesses alcohol and drug behaviour using items from the MTF study (Pollard *et al.*, 1999; Arthur *et al.*, 2002; Glaser *et al.*, 2005). Adaptations were minimal and aimed to ensure items used language suitable for the cultural context and were developmentally appropriate. Surveys were administered by trained study staff in classrooms during a 45- to 60-minute period. To maintain seasonal equivalence, surveys were conducted in the winter and spring months of each state's school year in 2002. Where possible, students absent from school were followed up and surveyed separately. Students in Victoria received a small pocket calculator upon return of their consent forms, while students in Washington State received \$10 upon completion of the survey (McMorris *et al.*, 2007).

Measures

Alcohol and drug behavioural measures were equivalent to those used in the MTF youth survey (Johnston *et al.*, 2003). Alcohol and drug use in the Grade 5 cohort was measured by asking the following developmentally appropriate questions: 'have you ever had more than just a sip or two of an alcoholic drink (like beer, wine or liquor/spirits)?'; 'have you ever smoked a cigarette, even just a puff?'; 'have you ever

used marijuana (pot, weed, grass)?' and 'have you ever used other illegal drugs?' Response alternatives separated past year from lifetime use. Responses were reclassified into three dichotomous variables assessing past year: alcohol use; both alcohol and tobacco use; alcohol or drug use (use of any alcohol, tobacco or illicit drugs).

To assess alcohol use, older students were asked 'in the past 30 days on how many occasions (if any) have you': had more than just a few sips of an alcoholic beverage (like beer, wine or liquor/spirits)? Response options ranged from 'Never' to '40+ times.' Student responses were dichotomized to produce estimates of recent use (any use in the past month—30 days), regular use (3+ times in the past month) and frequent use (6+ times in the past month). Estimates of alcohol misuse were derived from self-reported frequency of binge drinking (i.e. over the past 2 weeks—how many times have you had five or more alcoholic drinks in a row?). Response options for the binge drinking item ranged from 'None' to '10 or more times' in the last 2 weeks. Responses were dichotomized to provide estimates of frequent binge drinking (three or more times in the past 2 weeks). Nine harmful consequences due to use of alcohol were examined with response options ranging from 'Never' to '40+ times' over the past year. Loss-of-control (uncontrolled drinking) was measured by a single item asking how many times over the past year 'did you find that you were not able to stop drinking once you had started?' Three items measured social conflict: 'trouble at school the next day'; 'arguments with your family' and 'become violent and get into a fight.' Other alcohol-related problems included 'went to school drunk or high'; 'got injured or had an accident'; 'had sex with someone which you later regretted' (regret sex); 'got so drunk you were sick or passed out' and 'were unable to remember the night before because you had been drinking' (blackout). Responses were dichotomized to indicate those who had ever experienced a particular alcohol-related harm in the past year. To assess other substance use, respondents were asked 'in the past 30 days on how many occasions (if any) have you': used marijuana (pot, weed, grass); LSD (acid/trips, tabs) or other psychedelics; cocaine or crack; stimulants ('speed,' 'amphetamines,' 'uppers,' 'meth,' 'crystal,' 'crank'); ecstasy (XTC, E, X/MDMA, eccies, dove); heroin (Bomb, H, Smack, Junk); other illegal drugs? and

'how frequently have you smoked cigarettes in the past 30 days?' Responses were reclassified into five dichotomous variables assessing past month: tobacco use, illicit drug use, both alcohol and tobacco use, both alcohol and illicit drug use and any alcohol or drug use (any alcohol, tobacco or illicit drug use).

Statistics

Prevalence estimates and logistic regression measures of association were conducted using STATA 8 (Stata Corporation, 2003), controlling for sample design weighting, school clustering and state differences in distributions for age. Prevalence rates and 95% confidence intervals (CI) were disaggregated by state, grade and gender.

RESULTS

Owing to the different items used for Grade 5 compared with Grades 7 and 9 students, results are reported separately for Grade 5. Table 2 shows the prevalence estimates for Grade 5 students' alcohol and drug use and Table 3 displays estimates for Grades 7 and 9 students.

Grade 5 students' alcohol and drug use

The prevalence estimates of past year use of alcohol were two to four times higher for Grade 5 students in Victoria relative to their same-sex counterparts in Washington (Table 2). Logistic regression analyses demonstrated that Grade 5 students in Victoria had between a four- to five-fold increased likelihood of alcohol use relative to students in Washington (past year use, state OR for boys, 4.5, 95% CI 2.8–7.2; state OR for girls, 4.9, 95% CI 2.9–8.2). Grade 5 Victorian students also had a four-fold increased likelihood of any alcohol or drug use (use of either alcohol, tobacco or illicit drugs) relative to their same-age counterparts in Washington (state OR for boys, 4.3, 95% CI 2.6–6.9; state OR for girls, 4.5, 95% CI 2.7–7.5). The prevalence estimates for past year use of both alcohol and tobacco were low in both states. In both Washington State and Victoria, a significantly higher proportion of males than females had consumed alcohol in the past year and had used any alcohol or drugs in the past year.

Table 2: Weighted substance use prevalence estimates for Grade 5 students by state and gender

	Grade 5 males						Grade 5 females					
	Washington			Victoria			Washington			Victoria		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
		Low	High		Low	High		Low	High		Low	High
Past year alcohol use	10.3*	7.2	14.7	34.2*	28.8	40.1	5.2*	3.4	7.9	21.0*	17.1	25.5
Past year tobacco use	2.4	1.2	4.7	2.8	1.7	4.7	0.8	0.3	1.9	2.3	1.1	4.5
Past year use of both alcohol and tobacco	1.4	0.5	3.8	2.4	1.3	4.2	0.2	0.02	1.2	1.4	0.6	3.2
Past year any alcohol or drug use	11.3*	8.0	15.9	35.4*	29.0	42.6	5.9*	4.0	8.7	21.9*	17.5	27.2

Point estimates and CI were derived using STATA ‘svyset’ procedures. Estimates are adjusted for sample design weights, school nesting and state age differences. Non-overlapping CI for state comparisons of same-sex prevalence estimates indicated in bold with an asterisk.

Table 3: Weighted substance use prevalence estimates across seventh and ninth grades by state and gender

	Grade 7 males						Grade 7 females					
	Washington			Victoria			Washington			Victoria		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
		Low	High		Low	High		Low	High		Low	High
Recent alcohol use (past month)	11.5*	8.0	16.4	35.3*	30.0	40.9	13.2*	10.3	16.8	26.6*	22.3	31.3
Regular alcohol use (3+ past month)	3.4*	1.6	7.4	10.6*	7.6	14.6	2.9*	1.8	4.6	6.6*	4.6	9.4
Frequent alcohol use (6+ past month)	0.9*	0.3	2.2	4.6*	2.9	7.2	0.8	0.3	2.0	2.6	1.4	4.7
Frequent binge drinking (3+ times)	0.5	0.1	2.0	2.6	1.5	4.4	0.3	0.03	2.0	1.5	0.7	3.3
Past month use of tobacco	4.7	2.5	8.7	7.1	4.8	10.2	5.1	3.0	8.7	9.4	6.4	13.6
Past month use of illicit drugs	5.3	3.3	8.4	1.7	0.9	3.3	5.6	3.8	8.1	2.1	1.0	4.2
Past month use of both alcohol and tobacco	3.6	1.7	7.7	5.2	3.2	8.1	3.4	1.9	6.1	6.4	4.5	9.2
Past month use of both alcohol and illicit drugs	2.8	1.3	5.9	1.1	0.5	2.4	4.0	2.6	6.0	1.4	0.6	3.0
Past month any alcohol or drug use	14.3*	10.4	19.4	37.2*	31.7	43.1	15.6*	12.3	19.6	30.5*	25.8	35.8
	Grade 9 males						Grade 9 females					
Recent alcohol use (past month)	23.4*	19.6	27.7	53.4*	47.6	59.1	25.9*	21.5	30.9	55.0*	48.3	61.5
Regular alcohol use (3+ past month)	9.4*	7.0	12.5	24.1*	20.0	28.7	9.1*	6.4	12.8	20.0*	15.6	25.3
Frequent alcohol use (6+ past month)	3.4*	2.2	5.1	11.8*	9.0	15.3	3.5	2.2	5.4	8.0	5.2	12.1
Frequent binge drinking (3+ times)	2.4*	1.5	3.9	6.5*	4.6	9.2	2.2	1.1	4.3	6.6	4.2	10.1
Past month use of tobacco	8.3	4.7	14.1	17.2	13.6	21.5	10.9*	7.7	15.1	26.1*	20.6	32.5
Past month use of illicit drugs	13.1	10.0	17.0	9.7	6.4	14.4	14.4	10.9	18.7	7.5	5.1	10.8
Past month use of both alcohol and tobacco	4.3*	2.6	6.8	15.2*	12.0	19.1	8.7*	6.0	12.3	22.0*	16.9	28.1
Past month use of both alcohol and illicit drugs	7.3	5.4	9.8	9.4	6.2	14.1	11.7	8.8	15.4	7.1	4.7	10.5
Past month any alcohol or drug use	31.3*	26.3	36.7	55.5*	49.6	61.3	31.2*	25.6	37.6	59.5*	52.7	66.0

Point estimates and CI were derived using STATA ‘svyset’ procedures. Estimates are adjusted for sample design weights, school nesting and adjust for state age differences. Figures in bold indicate statistically significant state differences ($p < 0.05$). Non-overlapping CI for state comparisons of same-sex prevalence estimates indicated with an asterisk.

Grades 7 and 9 students' alcohol and drug use

A similar pattern of increased alcohol use was found for the older cohorts in Victoria. Comparison of the prevalence estimates showed rates of recent and regular use in Victoria more than double those in Washington for the Grades 7 and 9 students (Table 3). Logistic regression demonstrated that relative to Washington students, the likelihood of recent alcohol use for students in Victoria was two- to four-fold higher for the Grade 7 students (state OR for boys, 4.2, 95% CI 2.6–6.7; state OR for girls, 2.4, 95% CI 1.7–3.4) and over three-fold increased for the Grade 9 students (state OR for boys, 3.8, 95% CI 2.7–5.2; state OR for girls, 3.5, 95% CI 2.4–5.0). The likelihood of any alcohol or drug use in the past month was more than doubled for students in Victoria (state OR for boys, 3.5, 95% CI 2.3–5.7; state OR for girls, 2.4, 95% CI 1.6–3.4). By Grade 9, the prevalence rate of frequent binge drinking was around three times

higher in Victoria compared with reports in Washington. The likelihood of Grade 9 students reporting any alcohol or drug use in the past month showed elevations in Victoria similar to those for Grade 7 students (state OR for boys, 2.7, 95% CI 2.0–3.9; state OR for girls, 3.2, 95% CI 2.2–4.8). In Grade 7, the prevalence estimates for the use of both alcohol and tobacco and both alcohol and illicit drugs were similar in the two states, whereas in Grade 9, rates of past month alcohol and tobacco use were higher for Victorian students than for Washington students.

Few significant gender differences were noted. In Victoria only, more Grade 7 males than females had used alcohol in the past month. In Grade 9, more Victorian females than males had used tobacco in the past month, in both states more females than males had used both alcohol and tobacco, and in Washington State only, more females than males had used alcohol and illicit drugs.

Table 4: Weighted alcohol-related harm prevalence estimates for past year across seventh and ninth grades by state and gender

	Grade 7 males						Grade 7 females					
	Washington			Victoria			Washington			Victoria		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI	
		Low	High		Low	High		Low	High		Low	High
Uncontrolled drinking	2.1*	1.1	4.0	10.9*	7.8	15.1	4.7	3.2	6.7	5.3	3.2	8.7
Blackout due to drinking	2.8*	1.5	5.1	8.0*	5.5	11.5	5.8	3.9	8.4	5.6	3.7	8.4
Sickness/pass out	2.3	1.2	4.3	4.8	3.1	7.4	3.4	2.1	5.5	3.6	2.0	6.2
Trouble at school	1.3	0.6	2.9	4.9	2.8	8.4	3.9	2.4	6.1	2.3	1.2	4.2
Drunk/high at school	3.2	1.7	5.7	2.6	1.2	5.5	3.6	2.1	5.9	2.3	1.3	4.2
Arguments with family	4.6	2.2	9.5	6.6	4.6	9.5	6.6	4.6	9.4	3.9	2.2	6.7
Accident/injury	1.3	0.6	2.9	4.6	2.9	7.1	2.0	0.1	4.1	2.4	1.3	4.3
Violence/fight	2.7	1.7	4.4	4.6	2.5	8.4	3.5	2.1	5.7	1.2	0.5	2.9
Regret sex	0.9	0.4	2.2	0.6	0.2	2.1	1.6	0.8	3.2	0.6	0.2	1.8
	Grade 9 males						Grade 9 females					
Uncontrolled drinking	6.1*	4.1	9.0	16.5*	13.0	20.7	9.2*	6.5	12.8	23.7*	18.5	29.8
Blackout due to drinking	11.2*	7.9	15.6	25.5*	20.7	31.2	12.2*	9.2	16.0	27.1*	21.8	33.3
Sickness/pass out	9.9*	7.2	13.3	17.7*	13.5	22.8	13.4	10.2	17.4	20.9	15.9	26.9
Trouble at school	5.6	3.8	8.1	7.6	5.5	10.4	4.8	3.1	7.4	10.5	7.4	14.7
Drunk/high at school	7.9	5.7	10.9	7.0	4.5	10.8	10.2	7.2	14.3	10.1	6.8	14.6
Arguments with family	5.8	4.1	8.3	11.1	7.7	15.7	9.5	6.7	13.2	17.4	12.6	23.5
Accident/injury	2.2*	1.1	4.5	8.8*	6.2	12.3	3.4*	2.1	5.4	9.3*	6.3	13.5
Violence/fight	4.5*	2.9	6.8	10.8*	7.9	14.5	5.0	3.3	7.5	8.7	5.6	13.1
Regret sex	2.9	1.7	5.1	6.1	3.9	9.4	3.5	2.1	5.8	6.0	3.4	10.6

Point estimates and CI were derived using STATA 'svyset' procedures. Estimates are adjusted for sample design weights, school nesting and state age differences. Figures in bold indicate statistically significant state differences ($p < 0.05$).

Non-overlapping CI for state comparisons of same-sex prevalence estimates indicated with an asterisk.

Grades 7 and 9 students' alcohol misuse

The prevalence estimates for Grades 7 and 9 student reports of harmful consequences due to alcohol use are shown in Table 4. In Grade 7, compared with Washington male students, male students in Victoria reported around three to five times higher rates of uncontrolled drinking, blackouts due to drinking, trouble at school and accidents or injuries. Female students did not report differences on these measures. However, by Grade 9, both males and females in Victoria reported around two to four times higher rates of uncontrolled drinking, blackouts and accidents or injuries than their Washington counterparts. Relative to their same-sex Washington peers, Grade 9 females in Victoria also reported over twice the rate of trouble at school, and Grade 9 males in Victoria reported more sickness/passing out and violence/fighting due to alcohol.

Alcohol misuse among students who drank in the past year

The prevalence of negative consequences following alcohol use was also examined in the restricted group of students who reported that they had

used alcohol in the past year (results available upon request). For this subgroup, there were fewer differences between the two states. Grade 7 males in Victoria reported more than double the rate of uncontrolled drinking relative to Washington males. Grade 7 Washington females reported around three times higher rates of arguments with family and violence/fighting relative to Grade 7 females in Victoria. Grade 9 students in Victoria reported higher rates of binge drinking in the past 2 weeks, whereas Washington Grade 9 males reported higher rates of being drunk or high at school over the past year.

Frequency of lifetime alcohol use in Grades 7 and 9 students

To further explore patterns of alcohol use, the Grades 7 and 9 estimates for the frequency of lifetime alcohol use were graphed. The findings displayed in Figure 1 revealed that the distribution of frequent lifetime alcohol use followed an almost identical profile for the Grade 7 students in Victoria relative to the 2-year older Grade 9 Washington students, consistent with a delay in alcohol use in the US context.

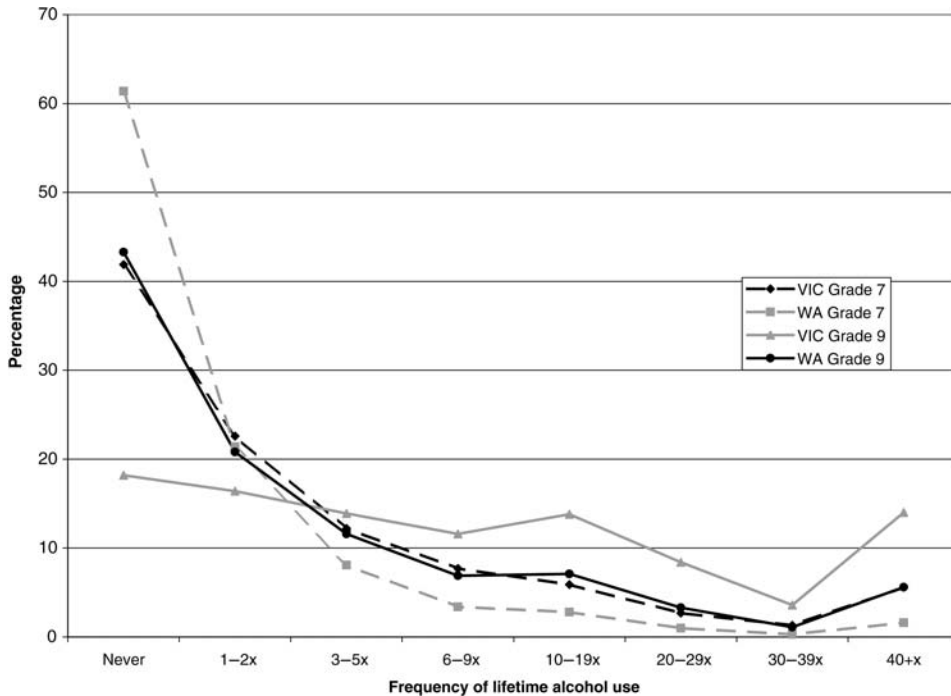


Fig. 1: Frequency of lifetime alcohol use for Grades 7 and 9 students in different states.

DISCUSSION

In common with previous research, higher rates of early age alcohol use were observed in Victoria relative to Washington State. Previous research has suggested that the lower rates of youth alcohol use in the USA may be compensated by higher rates of involvement in illicit drug use (Makkai, 1994; Beyers *et al.*, 2004). The present paper is unique in demonstrating that the lower rate of youth alcohol use in Washington State was associated with an overall lower rate of youth exposure to substance use (either alcohol, tobacco or illicit drug use) relative to Victoria.

Differences in rates of alcohol use were apparent from Grade 5 (age 10–11), where use of alcohol in the past year was two to four times higher in Victoria than in Washington. The findings demonstrated the high rates of early alcohol use in Victoria were associated with higher alcohol misuse. Comparisons revealed higher rates of co-occurring tobacco use (Grade 9) and similar co-occurring illicit drug use. The high rate of alcohol use was the major factor explaining the finding that students in Victoria had a two- to four-fold increased risk of reporting any substance use (either alcohol, tobacco or illicit drug use) relative to Washington students. The high prevalence of early age alcohol use in Victoria was associated with a higher proportion reporting being unable to stop drinking alcohol once they had started. More Victoria than Washington students also reported engaging in binge drinking (Grade 9), experiencing blackouts due to drinking (Grade 7 boys, Grade 9 students) or drinking to the point of becoming sick and passing out (Grade 7 boys, Grade 9 students). In Victoria, social conflicts were higher on the indicator of trouble at school (Grade 7 males, Grade 9 females), as were reports of fights and violence for the Grade 9 males. The prevalence of accidents and injury as a result of drinking was two to four times more common for the Victoria Grade 9 students and Grade 7 boys relative to their Washington counterparts.

The current comparisons are supported by previous research demonstrating lower rates of student alcohol use in the USA relative to Europe (Hibell *et al.*, 2004; World Health Organisation, 2004) and other western nations (Makkai, 1994; Pirkis *et al.*, 2003; Beyers *et al.*, 2004, 2005; Toumbourou *et al.*, 2005). Available comparisons also demonstrate that fewer students in the USA engage in tobacco use

(Makkai, 1994; Beyers *et al.*, 2004, 2005), whereas rates of illicit drug use appear higher in the USA relative to Europe (Hibell *et al.*, 2004; World Health Organisation, 2004) and Australia (Beyers *et al.*, 2004).

Findings from the present study indicated that once youth had initiated alcohol use, the proportion escalating to patterns of misuse was similar in both states. The distribution of lifetime drinking frequencies for Grade 9 Washington students were very similar to those of the Grade 7 students in Victoria (Figure 1), consistent with a 2 years 'lag' in alcohol use in Washington State. Comparison of the Grade 7 Victoria students and the Grade 9 Washington students found that CI also generally overlapped for binge drinking. When analyses focused on alcohol misuse for those students who used alcohol in the past year, few state differences were noted.

In discussing the implications of the present findings, it is pertinent to consider potential study limitations and strengths. The study relied on youth self-report. An immediate question is the potential effect of cultural pressures within each state on student reports of alcohol and drug use. Surveys included a fictitious drug to identify inflated responses and equally low rates of falsification characterized students in the two states. There was no evidence of a systematic reporting bias in either state. Although the Washington students reported lower alcohol use, there were similar and, in some year groups, higher reports of marijuana and illicit drug use (McMorris *et al.*, 2007). The study appeared to provide an excellent basis for inter-country comparison. Surveys and procedures were carefully matched, each of the samples was state representative on major domains, socioeconomic variation appeared cross-nationally similar, and prevalence estimates were carefully weighted, further reducing bias (McMorris *et al.*, 2007).

With respect to the question of generalizability, available evidence suggests that the state estimates yielded through the current study accord with national estimates. For example, the Australian national school survey in 2002 reported that rates of past month alcohol use for 13-year-old students were 32% for males and 29% for females in Victoria (White *et al.*, 2004). These estimates were similar to the present survey and equated the Australian national rates (35% males, 31% females)

(White and Hayman, 2004). The CI for rates of recent alcohol use in the Washington State Grade 9 cohort (Table 3) overlapped the midpoint between the 2002 MTF national estimates for Grade 8 (19.1% males; 20.0% females) and Grade 10 (35.3% males; 35.7% females) (Johnston *et al.*, 2003).

An extended consideration of cross-national differences in race and ethnicity associations is beyond the scope of the present analysis, but is planned for future papers. It is important to note that our main cross-national finding of higher rates of substance use in Australia tend to be slightly strengthened, when differences in minority youth substance use are excluded. Our analyses show that racial minorities in the USA tend to diverge from 'Whites' in showing higher rates of substance use, while those reporting non-Australian racial status tend to report lower substance use relative to 'Australians'.

Given the vast majority of research addressing interventions to reduce youth substance use have originated in the USA, there are advantages in cross-national comparative studies that can establish similarities and differences with the USA. As the present study is cross-sectional and did not examine the influence of policy exposure, it is not possible to determine the extent to which the observed cross-national differences in behaviour were influenced by the policy context in the two countries. Although no causal inference is implied, it is apparent that the Washington State findings accord with the stated intention of USA policies such as zero-tolerance and age 21 minimum drinking age laws that encourage youth to delay or abstain from alcohol and drug use, while the finding that high levels of early age alcohol use in Victoria were associated with alcohol misuse and a higher prevalence of substance use is discordant with the stated objectives of harm minimization policies (Toumbourou *et al.*, 2005; Evans-Whipp *et al.*, 2007). The current findings having clearly identified cross-national differences in behaviour suggest that future research should seek to identify the specific policies and practices that contribute to the lower rate of adolescent alcohol and drug use observed in the USA.

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