Prevalence of Substance Use and Delinquent Behavior in Adolescents From Victoria, Australia and Washington State, United States

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Prevalence of Substance Use and Delinquent Behavior in Adolescents From Victoria, Australia and Washington State, United States

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This article compares prevalence estimates of substance use and delinquent behavior in Washington State, United States and Victoria, Australia, two states chosen for their different policy environments around problem behavior. Few comparisons of international differences on rates of multiple problem behavior exist, and most are based on methods that are not matched, raising the question of whether findings are based on methodological differences rather than actual rate differences. The International Youth Development Study used standardized methods to recruit and administer an adaptation of the Communities That Care Youth Survey to representative state samples of fifth-, seventh-, and ninth-grade students in each state. Rates of delinquent behavior were generally comparable. However, striking differences in substance use were noted, with Victoria students reporting higher rates of alcohol use, alcohol misuse, smoking, and inhalant use, whereas Washington State students reported higher rates of marijuana use. Implications for conducting international comparisons are discussed.

Keywords: *adolescence; substance use; delinquent behavior; problem behavior; epidemiology; cross-national comparison*

Because of the U.S. investment in understanding drug use among children and adolescents, research on adolescent substance use, related problem behavior, and effective prevention strategies has been dominated by studies of U.S. samples (e.g., Alsaker & Flammer, 1999; Hunt & Barker, 2001). Studies that compare samples from two or more countries are essential to distinguish between universal and context-specific influences on behavior across countries and cultures (Jessor et al., 2003; Unger et al., 2002). Cross-national studies of adolescence can make significant contributions to the field of prevention science (Hosman & Clayton, 2000) because comparisons identify similarities and differences in levels of these unhealthy adolescent behaviors (Denny, Clark, & Watson,

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2003) and allow us to investigate underlying factors that explain differences in prevalence. Nations with differing cultural and political environments are of substantial research interest. This article focuses on two states (Washington State and Victoria) in the United States and Australia that are similar on a number of characteristics but have different substance abuse and violence policies.

Australia has adopted a harm minimization approach in relation to substance use, which contrasts markedly with the abstinence approach adopted in the United States. Harm minimization emphasizes the reduction of health and social costs associated with drug use and other health-compromising behavior by reducing the risk of adverse consequences rather than reducing the behavior itself (e.g., Caulkins & Reuter, 1997), although the approach may also include abstinence. This strategy encourages the provision of student welfare services in schools and emphasizes both that substance use is part of normal adolescent development and that responsible use is learned in families through adult supervision of child substance use. In contrast, abstinence-based drug policy in the United States aims at reducing the prevalence of drug use and delaying its onset among children and adolescents. At the school level, in particular, such goals are manifested by exclusively abstinence-based prevention efforts and school drug policies that tend to reflect zero tolerance for substance use (Beyers, Evans-Whipp, Mathers, Toumbourou, & Catalano, 2005; Evans-Whipp et al., 2004).

A zero-tolerance orientation also characterizes U.S. school policies toward guns and weapons and has been extended to cover fighting (Skiba & Peterson, 1999), as high levels of interpersonal violence have mobilized many communities and schools to prioritize violence prevention. Physical fighting and access to potentially lethal weapons have become the focus of major health initiatives such as Healthy People 2010 (U.S. Department of Health and Human Services, 2000). Although Australia's rates of firearm-related youth violence are far below U.S. levels (Pritchard & Evans, 2001), adolescent aggression and antisocial behavior in Australia are still a similar source of concern for community well-being and adjustment of youth (Vassallo et al., 2002). However, schools in Australia tend to focus on ensuring that disciplinary actions for antisocial behavior do not negatively affect students' studies (Directorate of School Education, 1994).

Within the different policy and cultural environments of the United States and Australia, the two states of Washington and Victoria were selected for comparison because of their similarities. The two states share English origins and similar sociodemographics. Washington and Victoria are both considered progressive states in their countries. Both have higher-than-national levels of educational participation and are relatively prosperous, with approximately 11% of residents living below the poverty level (Carson & Martin, 2001; U.S. Census Bureau, 2000). The two states have similar population sizes (5.9 million in Washington and 4.6 million in Victoria), with equal distributions of male and female persons. Proportions living in urban centers (80%) are equivalent, and industry mix is also remarkably similar (Australia Bureau of Statistics, 2001; U.S. Census Bureau, 2000). More important, the demographics of their school-age youth populations are also comparable (Hibbert, Caust, Patton, Rosier, & Bowes, 1996; Office of Superintendent for Public Instruction, 2002).

Youth Problem Behavior in Australia and the United States

Only a few comparative studies of specific problem behaviors between the United States and Australia exist. For example, Verhulst et al. (2003) compared Achenbach's

Youth Self Report summary scores on delinquent and aggressive behavior in U.S. and Australian youth samples. They found similar mean levels on the self-report scales, and the bicultural correlation between the two countries' total problem scores was .92, suggesting the relative magnitude of scores was very similar. However, frequencies of specific behaviors were not reported, the age ranges of the sample differed slightly (12-16 in Australia, 11-18 in the United States), and sampling frames contained different numbers of states (1 in Australia, 48 in the United States).

Patterns of youth drug use are the focus of previous studies that demonstrate higher rates of alcohol and tobacco use in Australia than the United States (Beyers, Toumbourou, Catalano, Arthur, & Hawkins, 2004; Makkai, 1994; Maxwell, 2003), although Maxwell (2003) found similar rates of binge drinking. Rates of lifetime marijuana use were similar, and the use of other drugs was slightly higher in the United States than Australia (Beyers et al., 2004; Maxwell, 2003). These studies used existing data sets with different methodologies including differences in instruments, sampling, recruitment, consent procedures and interviewing methods, and response rates. They also focused on a broad age range that included the legal age (18) for drinking in Australia. To date, we know of no studies that focused on multiple problem behavior comparisons across the two countries.

One study by Pirkis, Irwin, Brindis, Patton, and Sawyer (2003) clearly illustrates the inherent limitations in the opportunistic use of existing data sets for international comparisons. Focusing on a narrower age range (14-17 years), they compared substance use data from the 1999 U.S. Youth Risk Behavior Survey, the 1998 U.S. National Household Survey on Drug Abuse, and the 1998 National Survey of Mental Health and Wellbeing Australia. Depending on the U.S. data set, Australian adolescents were either less likely to report smoking cigarettes, drinking, and using marijuana, or were no different from their American counterparts. These discrepancies led Pirkis et al. to conclude that future international collaborations should focus on consistency of methods, including surveys that are identical in design and implementation.

This article reports on prevalence estimates of youth problem behavior from a study designed to overcome the problems of previous cross-cultural comparisons between Australia and the United States. The International Youth Development Study (IYDS) uses a prospective, standardized research design to assess levels and predictors of multiple youth behaviors in representative student samples in Victoria, Australia and Washington State, United States. Our objectives for the current article are twofold: first, to provide an example of the standardized design and methods that can be used to make valid international comparisons, and second, to be the first study to compare prevalence estimates of substance use and delinquent behavior by gender and grade. Given previous findings from other studies, we hypothesize that higher prevalence rates of substance use, especially alcohol use, will be reported by Victoria adolescents because experimentation is considered more normative in Victoria in contrast to Washington State, where abstinence is strongly encouraged. We also hypothesize higher rates of violent behaviors in Washington State, given the acceptance of guns and the higher rates of violence previously documented in the United States, and the more restrictive approach to guns and the lower rates of violence in Australia (Reuter & Mouzos, 2003).

STUDY DESIGN AND METHOD

School Recruitment

A two-stage cluster sampling approach for school recruitment was used in 2002. Schools were randomly selected in the first stage, and a target classroom within each school was randomly selected in the second stage. Within each state and grade level, public and private schools containing Grades 5, 7, or 9 were randomly selected using a probability proportionate to grade-level size-sampling procedure (Kish, 1965). To achieve a desired sample of 1,000 students in each grade, 60 schools having students at each of the three grade levels were randomly selected, and one class was randomly selected at each school. For each grade level in each state, replacement schools were also selected to be contacted if recruitment of sampled schools was unsuccessful.

In Washington State, permission to recruit was first sought from school districts containing sampled schools and then from principals. Although letters of support from the Lieutenant Governor and the Deputy Director of the Office of Superintendent of Public Instruction were included in recruitment materials, one third of districts declined to let their schools participate in the study, eliminating more than 120 of our eligible pool of schools. To reach the recruitment goal, replacement schools were added. One hundred fifty-five classes in 153 schools agreed to participate. This constituted 42% (155/368) of the eligible classes selected in Washington State and 73% of the 212 classes in schools with district approval to contact. Schools (and districts) in Washington State refused because of anticipated parental objections to survey content, school overinvolvement in other research efforts, and staff unwillingness to give up instruction time. In Victoria, prior to approaching individual schools, permission to conduct the research in schools was first sought from the Department of Education and Training for government (public) schools and from the Catholic Education Office for some private schools. The 165 classes in the 152 schools that agreed to participate in the study constituted 65% (165/254) of the eligible classes selected in Victoria. Reasons for school refusal in Victoria were similar to those of Washington State schools, including busy workload and concern about sensitive questions.

Representativeness of IYDS School Samples

We compared participating IYDS schools to overall state statistics on three school-level indicators, school type, economic disadvantage, and student diversity, measured by both states. Data were obtained from the Washington State Office of Superintendent of Public Instruction and the Victoria Department of Education and Training, the Association of Independent Schools, and the Catholic Education Office.

In Washington State, private schools were underrepresented in the IYDS school sample compared to state figures (9.2% vs. 19.0%, $p < .05$). This difference was due to the probability-proportional-to-size (PPS) sampling technique because private schools tend to have fewer students than public schools. On average, IYDS schools reported that almost one third (32.8%) of their students participate in the free or reduced school lunch program in Washington State. This is almost equivalent to the state figure (31.2%). The IYDS schools were also similar to state figures in their enrollment of minority students, although IYDS schools tend to have a slightly more diverse student population, with slightly higher (but not significantly higher) proportions of Hispanic (12.2%) and Native

American (3.6%) students than the state as a whole (9.8% Hispanic and 2.7% Native American, respectively).

In Victoria, IYDS school types are almost identical to proportions of government/public, (69.3%), independent (9.0%), and Catholic (21.7%) schools in the state. IYDS schools overrepresent schools in which medium levels (defined as 28%-43%) of students' families receive low-income assistance in the form of an educational maintenance allowance (EMA), compared to Victoria state figures (41.2% vs. 30.7%, $p < .05$). Finally, IYDS schools tend to match overall state levels of student diversity measured by the proportion of students who come from homes where the primary language is other than English (LOTE). For example, 17.7% of IYDS schools reported medium-high proportions of students from LOTE homes, compared to the state figure of 16.6%. In general, the IYDS school samples are good representations with only a few differences compared to the school-age population of each state.

Student Recruitment and Participation Rates

Upon completion of school recruitment, we randomly selected a target classroom at each school and asked for a copy of the class list by fax or mail. For Grade 5 classrooms, the target class was selected at random from a list of all Grade 5 classes. For Grades 7 and 9, English classes were targeted as this subject is required, and students are not assigned to English classes on the basis of ability. If English classes were unavailable, an alternate required class such as health or social studies was selected.

Student recruitment used the active parental consent procedures found to be most efficient by a pilot study conducted with independent samples in Washington State and Victoria (McMorris et al., 2004). Teachers distributed information packets to students who took them home to parents and returned signed forms back to school during a 2-week period. Parents consented for their child to participate in the longitudinal study and to their own participation in a short telephone interview during the first year of the study. Classes in Washington State yielded a total of 3,856 eligible students, of whom 2,885 (74.8%) consented to and participated in the survey. In Victoria, 3,926 students were eligible for consent and survey administration, of whom 2,884 (73.5%) consented and participated. In both states, higher participation rates characterized the older cohorts (range = 76% to 78%), whereas parents of the youngest cohort members (in Grade 5) were equally less likely to consent for their fifth graders to take part (69% participation). Recruitment and participation rates are shown in Table 1. In general, nonparticipation was more likely to be due to nonreturn of consent forms in Washington State (11%) than in Victoria (5%). However, parents were more likely to refuse to give consent in Victoria (21%) than in Washington State (14%).

In each state, the youngest cohort (Grade 5) is composed almost entirely of 10- and 11-year-olds, the middle cohort (Grade 7) of 12- and 13-year-olds, and the oldest cohort (Grade 9) of 14- and 15-year-olds (see Table 2). Students in Victoria were significantly younger, by about 1 to 2½ months, than students in Washington State. This was due to two factors: (a) State regulations allow children in Victoria to begin attending school about 3 months younger than in Washington State, and (b) students in Victoria were surveyed on average 2 months earlier in the school year than in Washington State. Gender distributions are equivalent in the two states. Sixty-five percent of Washington State students are White, 12% are Hispanic, 7% are Asian/Pacific Islander, 6% are Native American, 4% are African American, and 3% belong to other groups. In Victoria, race and ethnicity are measured slightly differently. The majority self-reported themselves as Australian

Table 1. IYDS Recruitment and Participation Rates by State and Grade

	Grade 5		Grade 7		Grade 9		Total	
Washington State	*n*	%	*n*	%	*n*	%	*N*	%
Eligible sample	1,360	100.00	1,226	100.00	1,270	100.00	3,856	100.00
Did not return consent	137	10.07	112	9.14	178	14.02	427	11.07
Refusal rate	278	20.44	152	12.40	107	8.43	537	13.93
Unaccounted/absent	2	0.15	1	0.08	4	0.31	7	0.18
Participation rate	943	69.34	961	78.38	981	77.24	2,885	74.82
	Grade 5		Year 7		Year 9		Total	
Victoria	*n*	%	*n*	%	*n*	%	*N*	%
Eligible sample	1,337	100.00	1,301	100.00	1,288	100.00	3,926	100.00
Did not return consent	65	4.86	61	4.69	78	6.06	204	5.20
Refusal rate	342	25.58	251	19.29	233	18.09	826	21.04
Unaccounted/absent	3	0.22	5	0.38	4	0.31	12	0.31
Participation rate	927	69.33	984	75.63	973	75.54	2,884	73.46

NOTE: IYDS = International Youth Development Study.

(88%), 6% as Asian/Pacific Islander, 1% as Aboriginal, less than 1% each as African or Spanish, and 2% belong to other groups.

Survey Development and Administration

The IYDS student survey is a self-report instrument, adapted and extended from the Communities that Care (CTC) Youth Survey, which has shown good reliability and cross-sectional validity in large samples of U.S. students in Grades 6-12 (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Glaser, Van Horn, Arthur, Hawkins, & Catalano, 2005; Pollard, Hawkins, & Arthur, 1999). It assesses a broad array of risk and protective factors predictive of problem behaviors, including substance use. In 2000-2001, pilot testing of survey measures and administration procedures occurred following recommended guidelines for cross-national instrument adaptation (Hambleton, 1994; Segall, Lonner, & Berry, 1998). This included language review and cognitive pretesting with small groups of adolescents in Grades 5 and 7 to ensure that younger students understood survey questions and that item adaptation to the Australian context was appropriate. For example, language review led to changing the wording for skipping school to "wag" school in Victoria. Similarly, the cognitive pretest demonstrated that many fifth graders did not understand some complex questions. This led to the design of a simplified, shorter survey for this cohort. A pilot administration of the student survey was then conducted with samples of more than 300 students in the targeted grades in each state. Findings were used to revise and finalize measures and procedures.

To maintain seasonal equivalence of data collection periods and to account for state differences in the start of the school year, the Washington field period extended between February and June, whereas the Victoria field period extended between May and November. Self-report student data were collected under protocols approved by the University of Washington Human Subjects Review Committee and the Royal Children's Hospital

Table 2. IYDS Student Sample Characteristics

	Grade 5		Grade 7		Grade 9		Total Sample	
	Washington State	Victoria	Washington State	Victoria	Washington State	Victoria	Washington State	Victoria
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	13.4-17.2	13.8-16.5	9.6-17.2	9.8-16.5
Male	466	445	473	484	494	465	1,433	1,394
	(49.3%)	(48.0%)	(49.1%)	(49.2%)	(50.5%)	(47.8%)	(49.6%)	(48.3%)
Female	477	482	488	500	487	508	152	1,490
	(50.7%)	(52.0%)	(50.9%)	(50.8%)	(49.5%)	(52.2%)	(50.4%)	(51.7%)
Total *N*	943	927	961	984	981	973	2,885	2,884
	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

NOTE: IYDS = International Youth Development Study.

a. *t* tests of age differences in each grade by state were all significant ($p < .01$).

Ethics in Human Research Committee. Data were also covered by a certificate of confidentiality approved by the U.S. Department of Health and Human Services.

During the late winter of 2002, surveys were coordinated and implemented by study staff from the Social Development Research Group at the University of Washington and the Centre for Adolescent Health at the Murdoch Children's Research Institute, Royal Children's Hospital, the University of Melbourne. Data collection personnel were trained in a single protocol to minimize differences introduced by different data collection procedures. Prior to survey administration, standardized instructions on how to answer the questions and assurances of confidentiality were presented to the students. Surveys were administered in classrooms during a 50- to 60-minute period. Absent students were administered surveys later under the supervision of trained school personnel, or, in a small percentage of cases (less than 3%), over the telephone by study staff. To ensure accurate responses from fifth-grade students, a staff interviewer read aloud each survey question to the entire class, while a second staff member was available to help individual students. Both states included an incentive or "gift," although the timing and nature of the incentive was different. Upon survey completion, students in Washington State received $10. Students in Victoria received a small pocket calculator upon return of consent forms as a "thank-you" gift, irrespective of their participation in the study.

Data Management and Exclusion Criteria

Some evidence demonstrates that editing procedures may affect point estimates and cross-study comparability (Bauer & Johnson, 2000; Gfroerer, Wright, & Kopstein, 1997). In particular, Fendrich and Johnson (2001) stressed that study differences in editing protocols beg for increased methodological research into the validity of school-based drug surveys. The IYDS protocol for data preparation and management was designed to achieve standardization of processing and cleaning of data collected in each state and to produce fully documented data sets for analysis. Although handled separately at each site, data cleaning and management steps, including reconciling inconsistent survey responses, were guided by written protocols. Meetings and conference calls were held to discuss protocols and resolve problematic cases.

There were few cases with missing data on behaviors examined here (e.g., nonresponse averaged 2.3% for all Wave 1 student survey data). Students were excluded from the analyses if their survey responses were determined to be unreliable or dishonest (i.e., 39 students total [0.7%, $n = 19$ in Washington and 20 in Victoria] indicated that they were "not honest at all" in filling out the survey, or reported use of a fake drug, or reported having used illicit drugs on more than 120 occasions in the past 30 days). These low rates of exclusion demonstrate that in general, students answered the questions honestly. The sample size available for analysis was 5,730: 1,854 fifth graders, 1,929 seventh graders, and 1,947 ninth graders.

Measures

Lifetime measures of *substance use* parallel measures of drug frequency found on the Monitoring the Future surveys (Johnston, O'Malley, Bachman, & Schulenberg, 2004). Older students were asked about frequency of substance use, including alcohol, marijuana, LSD, cocaine, stimulants, ecstasy, heroin, and other illegal drugs in their lifetime. Response options ranged from *never* to *40+ times* for all substances except for cigarettes, where the response ranged from *never* to *regularly now*. Responses were dichotomized to

produce estimates of lifetime use of alcohol, cigarettes, marijuana, and inhalants. Because of low reports of using LSD, cocaine or crack, stimulants, ecstasy, heroin, and other illegal drugs, we combined responses into one dichotomous measure of lifetime illicit drug use other than marijuana and inhalants. Finally, our estimate of binge drinking was derived from the question, "How many times have you had five or more alcoholic drinks in a row?" Response options ranged from *none* to *10+ times* in the last 2 weeks and were dichotomized to provide prevalence estimates of *binge drinking* (at least once in the past 2 weeks). Measures on the fifth-grade survey diverged from Monitoring the Future, which does not assess youth at this age. We asked whether youth "had ever . . . smoked a cigarette, even just a puff; had more than just a sip or two of an alcoholic drink (like beer, wine, or liquor/spirits); gotten drunk; used marijuana; sniffed, breathed, or inhaled anything else in order to get high; and used other illegal drugs." Response alternatives included *no, never*; *yes, but not in the last year*; *yes, 1 or 2 times in the last year*; and *yes, 3 or more times in the last year.* Responses were dichotomized to produce estimates of lifetime use.

Problem behavior was measured on the fifth-grade survey by four items asking whether the student had ever carried a weapon, stolen something worth more than $5 ($10AUD to adjust for current currency differences), attacked someone with the idea of seriously hurting them, and whether a respondent ever beat up someone so badly that they probably needed a doctor or nurse. Response options, similar to the fifth-grade substance-use questions, were dichotomized to produce estimates of lifetime antisocial behavior. These four questions were also asked of the seventh- and ninth-grade students; however, the time frame was in the past year rather than lifetime frequency. Additional items for the older cohorts asked whether or not students had carried a handgun, carried a weapon, and threatened someone with a weapon. Response options were an 8-point scale, ranging from *never* to *40 or more times*, and were dichotomized to produce past-year prevalence estimates of problem behaviors.

Analysis

Analyses used STATA 8.0 for Windows (STATA Corporation, 2003) and accounted for the nesting of students within schools and the sampling design. Sample weights were calculated separately for each class as the inverse probability of selection in a particular grade at a school. Separate logistic regression analyses for each grade/year level were conducted for boys and girls to test for state differences in prevalence estimates by regressing state and age on each binary outcome. Prevalence estimates and 95% confidence intervals (CI) were derived from logistic regression models' predicted values, after fixing the continuous measure of age at the average age for each grade level (i.e., Age 11, 13, and 15 for fifth, seventh, and ninth grades, respectively). A parallel analysis without sample weights demonstrated that the majority did not change significantly, with a few exceptions (e.g., narrower confidence intervals for seventh-grade girls' and ninth-grade boys' reports of carrying a handgun and beating up someone in the past year resulted in significant state differences). Weighted prevalence estimates are presented as they are likely to be accurate estimates of statewide rates of behavior. Unweighted results are available upon request. Statistically significant differences were assessed by the significance of the odds ratio (OR) for the dichotomous state variable (Victoria "1" vs. Washington "0") in each equation ($p < .05$).

Table 3. Lifetime Substance Use Prevalence Comparisons Across Fifth, Seventh, and Ninth Grades

	Grade 5 Boys						Grade 5 Girls					
	Washington State			Victoria			Washington State			Victoria		
		95% CI			95% CI			95% CI			95% CI	
	%	Low	High	%	Low	High	%	Low	High	%	Low	High
Cigarettes	9.8	7.0	13.7	12.9	9.5	17.2	4.6	2.9	7.2	5.8	3.5	9.3
Alcohol use	*25.7**	21.3	30.7	*60.4**	54.9	65.6	*16.1**	12.7	20.3	*41.4**	35.3	47.6
Been drunk	*1.0**	0.4	2.2	*7.5**	4.8	11.4	1.6	0.7	3.7	3.2	1.5	6.8
Marijuana use	1.0	0.4	3.1	0.4	0.1	1.6	0.5	0.1	1.5	0.0	0.0	0.0
Inhalants	4.2	2.3	7.6	4.8	2.9	7.7	2.7	1.5	4.8	1.4	0.6	3.5
Other illicit drug use	0.3	0.0	3.4	0.4	0.1	1.7	0.2	0.0	1.6	0.0	0.0	0.0
	Grade 7 Boys						Grade 7 Girls					
	Washington State			Victoria			Washington State			Victoria		
		95% CI			95% CI			95% CI			95% CI	
	%	Low	High	%	Low	High	%	Low	High	%	Low	High
Cigarettes	21.4	16.5	27.1	28.8	23.7	34.4	25.3	20.7	30.4	27.0	21.1	33.8
Alcohol use	*38.1**	31.8	44.9	*65.7**	60.0	71.0	*39.4**	34.3	44.6	*56.2**	51.6	60.8
Binge drinking (past 2 weeks)	*4.2**	2.1	8.2	*11.5**	8.3	15.7	*5.1**	3.5	7.4	*8.8**	6.1	12.4
Marijuana use	*8.2**	5.7	11.8	*3.8**	2.4	6.0	*8.2**	6.0	11.0	*1.9**	0.7	4.6
Inhalants	7.9	5.6	11.0	11.4	8.7	15.0	13.0	10.2	16.3	10.1	7.4	13.5
Other illicit drug use	3.1	1.8	5.0	1.3	0.6	2.7	1.6	0.6	4.1	2.5	1.3	4.7
	Grade 9 Boys						Grade 9 Girls					
	Washington State			Victoria			Washington State			Victoria		
		95% CI			95% CI			95% CI			95% CI	
	%	Low	High	%	Low	High	%	Low	High	%	Low	High
Cigarettes	*33.8**	28.9	39.0	*55.1**	49.8	60.3	*35.1**	29.2	41.5	*60.8**	53.6	67.7
Alcohol use	*56.7**	52.0	61.2	*81.0**	74.8	86.0	*58.5**	52.1	64.6	*84.8**	78.9	89.3
Binge drinking (past 2 weeks)	*9.1**	6.7	12.2	*30.1**	24.6	36.3	*11.7**	8.8	15.5	*31.1**	25.1	37.9
Marijuana use	*26.8*	22.0	32.2	*19.2*	14.3	25.1	23.8	18.8	29.7	16.9	12.4	22.6
Inhalants	*4.3**	2.7	7.0	*10.0**	7.1	14.0	*5.7**	4.0	8.2	*14.2**	10.2	19.3
Other illicit drug use	5.4	3.3	8.6	3.1	1.9	4.9	7.9	5.6	11.0	6.2	4.1	9.2

NOTE: Point estimates and confidence intervals were derived using STATA "svyset" procedures. Estimates take into account sample design weights, school nesting (strata), and age. Other illicit drugs include LSD, cocaine or crack, stimulants, ecstasy, heroin, and other illegal drugs. CI = confidence interval.

* Significant state odds ratio (Victoria vs. Washington State): $p < .05$. Numbers in italics indicate significant difference between state odds ratios.

RESULTS

Prevalence rates of lifetime substance use and binge drinking in the last 2 weeks are shown in Table 3, by grade and gender. Most striking are the significant differences in alcohol-use rates between the two states. Fifth-grade boys and girls in Victoria were significantly more likely to report ever having tried alcohol compared to their classmates in Washington State (state OR for boys = 4.4, CI = 3.2-6.2; state OR for girls = 3.7, CI = 2.5-5.4). Differences in reports of lifetime alcohol use persist in the two older grades. For example, almost 80% of Victoria ninth-grade boys and 85% of Victoria ninth-grade girls reported ever using alcohol, compared with slightly more than half of Washington State ninth graders (state OR for boys = 3.3, CI = 2.1-5.0; state OR for girls = 3.9, CI = 2.5-6.3). In terms of alcohol misuse, fifth-grade boys in Victoria reported higher rates of ever having been drunk (7.5%) compared with fifth-grade boys in Washington State (1%) (state OR = 8.5, CI = 3.3-21.9). Likewise, rates of binge drinking in the past 2 weeks were higher among seventh-grade boys and girls in Victoria (state OR for boys = 2.9, CI = 1.3-6.6; state OR for girls = 1.8, CI = 1.0-3.1). By ninth grade, this difference in reported alcohol binging is even greater, with prevalence rates more than three times higher among ninth-grade boys and girls in Victoria, compared with youths in Washington State (state OR for boys = 4.3, CI = 2.8-6.6; state OR for girls = 3.4, CI = 2.2-5.3).

Reports of using the other licit drug, tobacco, also demonstrated significant state differences. Although smoking rates are higher in Victoria among fifth- and seventh-grade students, the difference is not significant until ninth grade, where students in Victoria were more than twice as likely to report ever smoking than their peers in Washington State (state OR for boys = 2.4, CI = 1.7-3.3; state OR for girls = 2.9, CI = 1.9-4.3). Ninth-grade boys and girls in Victoria also report significantly more inhalant use than their counterparts in Washington State (state OR for boys = 2.5, CI = 1.3-4.7; state OR for girls = 2.7, CI = 1.6-4.7). No significant differences were noted in reports of other illicit drug use.

In contrast, marijuana initiation is more prevalent in Washington State. Reports were significantly higher among both seventh-grade boys and girls compared with seventh graders in Victoria (state OR for boys = 0.4, CI = 0.2-0.8; state OR for girls = 0.2, CI = 0.1-0.6). However, this significant gap narrows among older students. Marijuana use rates were significantly higher among ninth-grade boys in Washington State (state OR = 0.6, CI = 0.4-1.0) compared with their classmates in Victoria, but the difference between ninth-grade girls' reports of marijuana use, although higher in Washington, was not statistically significant.

Table 4 displays reports of problem behavior. It is notable that few differences in behavior exist. Where differences do appear, there is a lack of a consistent pattern of differences across states, grades, and gender. Fairly equivalent rates of violence and aggression were reported, with some exceptions. In fifth-grade reports, about three times as many boys in Victoria as in Washington State report attacking someone (OR = 3.1, CI = 1.8-5.3). In contrast, more than three times as many seventh-grade girls in Washington State as in Victoria report attacking someone in the past year (OR = 0.3, CI = 0.1-0.7). Both ninth-grade boys and girls in Victoria were more likely than their classmates in Washington State to report threatening someone with a weapon in the past year (boys OR = 2.3, CI = 1.2-4.5; girls OR = 4.4, CI = 2.0-10.1). However, ninth-grade girls in Washington State were more likely than their Victoria classmates to report beating someone up badly in the past year (OR = 0.4, CI = 0.2-0.9).

Table 4. Problem Behavior Prevalence Comparisons Across Fifth, Seventh, and Ninth Grades

	Grade 5 Boys						Grade 5 Girls					
	Washington State			Victoria			Washington State			Victoria		
		95% CI			95% CI			95% CI			95% CI	
	%	Low	High	%	Low	High	%	Low	High	%	Low	High
Ever carried a weapon	15.6	12.2	19.7	21.5	15.7	28.7	4.1	2.4	7.0	3.0	1.6	5.5
Ever stolen something > $5	7.7	5.4	10.8	5.3	3.5	8.1	3.8	2.5	5.8	2.7	1.4	5.3
Ever attacked someone	*5.5**	3.6	8.5	*15.2**	11.6	19.8	2.0	1.0	4.0	4.2	2.5	7.0
Ever beat someone up badly	4.9	3.2	7.5	6.2	4.0	9.5	0.4	0.0	2.6	2.4	1.0	6.0
	Grade 7 Boys						Grade 7 Girls					
	Washington State			Victoria			Washington State			Victoria		
		95% CI			95% CI			95% CI			95% CI	
Past year . . .	%	Low	High	%	Low	High	%	Low	High	%	Low	High
Carried a handgun	*7.8**	5.3	11.3	1.7*	0.8	3.9	2.1	1.0	4.4	0.4	0.1	1.5
Carried a weapon	22.3	18.1	27.2	18.4	14.4	23.2	5.0	3.4	7.1	2.2	1.1	4.4
Stolen something > $5	*16.5**	12.5	21.6	*10.1**	6.9	14.5	8.3	6.2	11.0	7.4	4.9	11.2
Attacked someone	8.5	5.8	12.3	8.8	6.3	12.0	*5.2**	3.5	7.7	*1.5**	0.7	3.1
Beat someone up badly	4.6	2.5	8.2	6.4	4.1	9.8	3.7	2.2	6.0	1.4	0.5	3.4
Threatened with weapon	5.0	2.8	8.8	5.7	3.7	8.7	1.9	1.0	3.6	2.1	1.1	3.8
	Grade 9 Boys						Grade 9 Girls					
	Washington State			Victoria			Washington State			Victoria		
		95% CI			95% CI			95% CI			95% CI	
Past Year . . .	%	Low	High	%	Low	High	%	Low	High	%	Low	High
Carried a handgun	4.9	3.2	7.5	2.6	1.5	4.5	1.0	0.5	2.2	1.5	0.7	3.4
Carried a weapon	19.4	15.1	24.7	18.9	15.7	22.6	4.3	2.7	6.9	8.1	5.2	12.4
Stolen something > $5	19.3	15.3	24.0	17.0	13.8	20.7	12.5	8.9	17.1	17.7	13.8	22.4
Attacked someone	8.0	5.5	11.3	11.3	8.6	14.7	5.0	3.2	7.8	7.2	4.4	11.4
Beat someone up badly	6.0	4.2	8.6	8.6	6.5	11.4	*4.0**	2.5	6.2	*1.7**	0.9	3.2
Threatened with weapon	*3.7**	2.1	6.5	*8.0**	5.8	10.9	*1.5**	0.8	2.9	*6.4**	4.1	9.8

NOTE: Point estimates and confidence intervals were derived using STATA "svyset" procedures. Estimates take into account sample design weights, school nesting (strata), and age. CI = confidence interval.
* Significant state odds ratio (Victoria vs. Washington): $p < .05$. Numbers in italics indicate significant difference between state odds ratios.

Rates of carrying handguns were lower in Victoria, as expected, but the state difference is only significant among seventh-grade boys (OR = 0.2, CI = 0.1-0.5). Rates of carrying other weapons were not significantly different. Finally, reports of stealing were not significantly different, with the one exception of seventh-grade boys in Washington State reporting higher rates than their counterparts in Victoria (OR = 0.6, CI = 0.3-0.9).

DISCUSSION

The IYDS is the first international study to provide comparable epidemiological data using a standardized methodology for statewide representative samples of fifth-, seventh-, and ninth-grade students. The study's rigorous methodology ensures that any differences found in levels of problem behavior are not artifacts of study design and method differences. A striking finding is that Victoria teenagers drink more and at earlier ages than Washington State teens. This may not be surprising given the younger legal drinking age and orientation toward harm minimization in Australia, as noted by Makkai (1994), Maxwell (2003), and Beyers et al. (2004). However, the rates of binge drinking are also higher in Victoria, counter to the expectations of harm minimization advocates who expect higher rates of alcohol use, but lower levels of harmful patterns of drinking because of learning responsible use patterns and not being removed from positive socialization influences through suspension and expulsion (Beyers et al., 2005; Ministerial Council on Drug Strategy, 1998). Despite both countries considering any tobacco use harmful, the IYDS data demonstrate that older adolescents in Victoria report higher rates of lifetime smoking than their Washington State classmates. Fewer cross-national differences were noted for illicit drug use, although significantly higher rates of ever trying marijuana were reported by seventh graders and ninth-grade boys in Washington State, and higher rates of ever using inhalants were reported by ninth-grade students in Victoria.

Likewise, small differences in reports of stealing, fighting, and violence characterize these two samples. This consistency in patterns of antisocial behavior suggests that these levels of involvement may be universal characteristics of adolescent development (Smith-Khuri et al., 2004). Only one significantly higher difference in weighted self-reports of carrying a handgun was noted in the case of Washington State seventh-grade boys, compared with their Victoria classmates, although unweighted estimates did demonstrate significant state odds ratios for seventh-grade girls and ninth-grade boys. This suggests some evidence for our original hypothesis that Washington State adolescents would report higher levels of carrying a weapon or a handgun than Victoria youths because guns are more readily available in the United States.

Confidence in these findings is enhanced because of the standardized design and rigorous methodology used. However, some limitations exist. First, samples are drawn from state samples of students. As such, they do not represent youths in Australia or the United States as a whole or other grade levels. Second, the school response rates were not optimal. However, our comparison of IYDS school characteristics to state figures suggests that the IYDS school samples are representative of their respective states' populations. Third, in all cross-national research, there exists the possibility that some survey items have different meanings across different cultures. To minimize differences, we cognitively pretested and piloted the student survey extensively and thus are confident of the item meaning equivalence. Fourth, our data rely on self-report measures and therefore suffer from common method variance. However, adolescent research has generally shown self-report to be a valid and reliable method (Hindelang, Hirschi, & Weis, 1981;

Huizinga & Elliott, 1986; Johnston et al., 2004; Needle, McCubbin, Lorence, & Hochhauser, 1983), and dishonesty criteria were used to exclude some students' reports identified as deceitful. Fifth, the number of comparisons tested may call for a correction factor such as Bonferroni adjustments. Epidemiologists (e.g., Perneger, 1998; Rothman, 1990; Savitz & Olshan, 1985), however, suggest that the Bonferroni method has limited applications and corrections "are at best unnecessary and at worst, deleterious to sound statistical inference" (Perneger, 1998, p. 1236) because they increase Type II errors.

The question of whether or not the greater likelihood of using licit substances in Australia is due to cultural and policy differences is an important direction for future study. Are level differences in empirically identified predictors such as parental attachment and family and peer attitudes toward drugs and antisocial behavior the source of cultural differences in levels of problem behaviors, or are different levels associated with unique country conditions? Answers to these questions will facilitate understanding of whether there is common etiology or whether there are unique causal processes that are country dependent.

Implications for Practice

This comparative study of two states in different countries contributes preliminary evidence regarding differences in effects of harm minimization and abstinence norms and policies on adolescent substance-use. Information gained from this project may help develop public health programs in substance use prevention that aid in the healthy development of young people. Findings suggest that, in the Victoria context, adolescent alcohol use contributes less to antisocial behavior than in the United States. The processes that have led to the greater prevalence of alcohol use and binge drinking have apparently not increased overall levels of antisocial behavior in Victoria. Whether Washington State youths continue to drink less alcohol or instead demonstrate higher rates of increase in alcohol and other drug misuse in later adolescence and young adulthood than their Victoria counterparts is also an important empirical question. Perhaps as children mature into late adolescence and early adulthood, harm minimization policies lead to higher use prevalence but less harm associated with alcohol (Chikritzhs & Pascal, 2004) and other drugs (Commonwealth Department of Health and Ageing, 2002), despite earlier levels of harmful use as suggested here. In fact, there is evidence of increasing rates of harm among U.S. college-age youth (Hingson, Heeren, Winter, & Wechsler, 2005), many of whom experienced abstinence-based policies as adolescents. Longitudinal follow-up of the IYDS samples will enable important questions to be investigated, including the longer term implications of differences in early alcohol use in the two countries.

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