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Rural Adolescent Alcohol, Tobacco and Illicit Drug Use: A Comparison of Students in Victoria, Australia and Washington State, United States

Abstract

Purpose—There are inconsistent research findings regarding the impact of rurality on adolescent alcohol, tobacco, and illicit substance use. Therefore, the current study reports on the effect of rurality on alcohol, tobacco and illicit drug use among adolescents in 2 state representative samples in 2 countries, Washington State (WA) in the United States and Victoria (VIC) in Australia.

Participants—The International Youth Development Study (IYDS) recruited representative samples of students from Grade 7 (aged 12 to 13 years) and Grade 9 (aged 14 to 15) in both states. A total of 3,729 students responded to questions about alcohol, tobacco, cannabis, and other illicit substance use ($n_{VIC} = 1,852$; $n_{WA} = 1,877$). In each state, males and females were equally represented and ages ranged from 12– 15-years.

Methods—Data were analyzed to compare lifetime and current (past 30 days) substance use for students located in census areas classified as urban, large or small town, and rural. Findings were adjusted for school clustering and weighted to compare prevalence at median age 14 years.

Findings—Rates of lifetime and current alcohol, tobacco and cannabis use were significantly higher in rural compared to urban students in both states (odds ratio for current substance use = 1.31).

Conclusions—In both Washington State and Victoria, early adolescent rural students use substances more frequently than their urban counterparts. Future studies should examine factors that place rural adolescents at risk for alcohol, tobacco and illicit drug use.

Keywords

adolescent; alcohol use; illicit drug use; rural; tobacco use

In 2004, the use of alcohol, tobacco and illicit drugs (substance use) was estimated to contribute 12.6% of the worldwide global burden of disease.¹ Hazardous alcohol use alone is estimated to have contributed to 86% of the 3.6 million substance-related deaths of 15- to 29-year-old males and females worldwide.^{2–3} Although data are mixed, there are suggestions that adolescents within rural areas begin using alcohol and other drugs at younger ages and engage in heavier patterns of use relative to adolescents in urban areas.⁴ However, there are limited epidemiological data that investigate rural substance use.⁵ Therefore, the aim of the present paper is to compare rates of alcohol, tobacco and illicit drug use for early adolescent youth within rural areas to the rates of their urban counterparts in state-representative samples from Washington State in the United States and Victoria in Australia—2 states identified to be similar on many demographic and economic domains⁶ but with contrasting youth substance policies. Youth alcohol and illicit drug policies in the US reflect an abstinence approach, whereby any use is discouraged. Policies in Australia have been based on harm minimization approaches, seeking to reduce harms rather than use per se (but while also including abstinence as an option).⁷

Previous Studies of Youth Substance Use in Rural Areas

The Australian Context

There have been few previous studies that have compared rates of youth substance use in rural areas in Australia,⁸ with much of the literature becoming quite dated. Overall, risky alcohol consumption within Australia increases with remoteness. Approximately 19% of people in metropolitan areas engage in risky drinking compared to 31% in remote/very remote regions,⁹ a finding which applies equally for adolescents and young adults (16- to 24-years old).¹⁰ This risky alcohol use within the rural population has been increasing at a rate that exceeds metropolitan areas.¹¹ While these findings suggest a consistent rural effect, it is important to consider that rural areas are heterogeneous with some being coastal resort towns and others being inland agricultural towns.

There is also limited research examining tobacco and illicit drug use within the rural adolescent population. Australian adolescents (aged 15–24) in regional and remote areas are equally likely as adolescents in urban areas to smoke tobacco or use cannabis.¹² On the other hand, male adolescents aged 12–19 living in remote areas are up to two-thirds less likely to use illicit drugs other than cannabis, while females aged 12–19 in remote areas are equally as likely as urban female adolescents to use illicit drugs other than cannabis.¹²

The US Context

Variations in rates of substance use according to rurality within the US are not as clear. In the 1980s, rural youth consumed less alcohol than their urban counterparts.¹³ However, by the mid 1990s, general substance use within older adolescents (11th grade students) did not differ between rural, suburban, and urban locations,¹⁴ and more recent data suggest that rural adolescents between 12 and 17 years of age report greater past month alcohol use, binge drinking and heavy drinking (20.4%, 13.8%, and 3.3%, respectively) compared to metropolitan youths (17.2%, 10.3%, and 2.5%, respectively).⁵

Tobacco use, particularly smokeless tobacco, has increased in rural adolescents although smoking rates in urban adolescents declined.¹⁵ This trend has recently been confirmed by research which shows that 12- to 18-year-olds living in urban or suburban areas of the northwest US were less likely to smoke (odds ratio = 0.33) on a daily basis relative to their rural counterparts.¹⁶ Further, older adolescents were more likely to have smoked tobacco cigarettes in the last 30 days (rural odds ratio = 1.09).¹⁷

Rates of illicit drug use in rural versus urban areas in the US are unclear. Overall, adolescent use of illicit drugs is higher in metropolitan (8.5%) areas as compared to non-metropolitan (6.3%) areas,¹⁸ although availability of such drugs within rural areas has been shown to be increasing⁴ and rural adolescents' (12- to 17-years-old) past-year use of methamphetamines was significantly higher than that of young urban adolescents (1.2% compared to 0.7%).¹⁹ These variable trends within rural areas could be attributable to diversity in population, such as fishing, farming or coastal communities being included in the definition of rural, a problem identified in regard to alcohol use.⁸

Given the inconsistency in research findings examining rural adolescent substance use, the present study will extend upon the current literature by examining the effect of rural location on alcohol, tobacco and illicit drug use within adolescents (aged 12 to 15 years old) in both Washington State, US, and Victoria, Australia. It is hypothesized that adolescents living in regional and rural areas within both Victoria and Washington State drink alcohol at a significantly greater rate than their urban counterparts. Secondly, it is expected that regional and rural adolescents within both Victoria and Washington State smoke tobacco and use illicit substances at similar rates to their urban counterparts. Lastly, it is expected that this

pattern of rural and urban substance use differences will be similar in Washington State and Victoria.

METHOD

Participants

Participants were recruited using a 2-stage cluster sampling approach for schools and students in 2002 for both states. 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.²⁰ Within each school one class was randomly selected in the grade levels included in the International Youth Development Study (IYDS) sample. The IYDS was explicitly designed to have matched methods of sampling, survey design, subject recruitment, and survey administration to allow international comparisons that were not confounded by method differences.²¹ More details about recruitment and participation rates are described by McMorris and associates.⁶

Parents provided written consent for their adolescent to participate in the study and adolescents provided assent to complete the survey. Across the 3 age cohorts (grades 5, 7 and 9), 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, of whom 2,884 (73.5%) consented and participated.

Data from the grade 7 ($n_{VIC} = 984$, $n_{WA} = 961$) and grade 9 ($n_{VIC} = 973$, $n_{WA} = 981$) cohorts are reported due to the focus on adolescence when alcohol and substance use prevalence are higher. In each state, the grade 7 cohort comprised almost entirely 12- and 13-year-olds, and the grade 9 cohort comprised 14- to 15-year-olds. Males and females were equally represented.

Procedure

Self-report student data were collected under protocols approved by the University of Washington Human Subjects Review Committee and in Victoria by the Royal Children's Hospital Ethics in Human Research Committee. Permission to conduct research in schools in Washington State was obtained from the school districts containing sampled schools and subsequently from principals. In Victoria, permission was obtained from the Department of Education and Training for government (public) schools and the Catholic Education Office for some private schools, and then from principals. Permission to undertake data analysis was obtained from the University of Melbourne Human Research Ethics Committee.

The IYDS surveys in 2002 were administered in equivalent seasons (February to June in Washington State and May to November in Victoria) by study staff using identical procedures.⁶ Surveys were group-administered in classrooms during a 50- to 60-minute period. Students absent from school 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. Upon survey completion, students in Washington State received \$10. Victorian students received a small thank-you gift (a small pocket calculator) upon return of consent forms.

Measures

The IYDS survey is a modified version of the Communities that Care youth survey that has been widely used in the US and adapted for use in Australia.³

Substance Use—The self-reported measures of alcohol and drug use were drawn from the *Monitoring The Future* survey, an annually conducted student survey of a representative sample of US 8th, 10th and 12th grade students.²²

Lifetime substance use for alcohol, tobacco, cannabis, other illicit drugs, and any substance use (licit or illicit substance use) was measured by asking participants on how many occasions (if any) they had used each of these substances. Current substance use for alcohol, tobacco, cannabis, other illicit drugs, and any substance use was measured by asking participants, “In the *past 30 days* on how many occasions (if any)” have they had any of these substances. Response options ranged from “*Never*” to “*40 or more times*” on an 8-point scale and were recoded to reflect never versus any use in the specified period (lifetime and past 30 days). Illicit drug use included inhalants, LSD, cocaine/crack, stimulants, ecstasy, and heroin.

Socioeconomic status—Parents were contacted through phone interviews completed in 2002 and asked to provide details of parent education and family income. A family socioeconomic status variable was formed by averaging responses to parent education and income. For Victoria, parents in rural and regional areas had a lower level of education and income than parents in urban areas. For example, 57% of parents in rural areas had not completed high school, compared to only 40% in urban regions, and 44% of parents in urban areas earned more than \$70,000 per annum, compared to 27% in rural areas. Similar patterns were found for Washington State. Due to the differential patterns of income and education, socioeconomic status was adjusted for within the analyses.

Location definition—To examine the differences between place of residence and substance use, participants were categorized according to the location of their school. Three categories were used: urban and urban fringe, large and small towns, and rural areas. These categories were based upon the United States National Center for Education Statistics school-level definitions of urban city, towns, and rural areas. Thus, for the current study the urban and urban fringe category is defined based on a school's location within a central city (population $\geq 50,000$ and population density $\geq 1,000$ people per square mile). Schools located in the large and small “town” category were located in an area $\geq 2,500$ and $< 50,000$ people, with population density $\geq 1,000$ people per square mile and were outside an urban area as defined previously. Lastly, “rural” located schools were in areas with $< 2,500$ people located outside the areas defined above. To maintain consistency between the 2 states, Victorian data were coded using the same categories as the Washington State data. Of the sample providing responses to one or more substance use questions, and family socioeconomic status ($n=3,729$), the Washington State sample included 1,143 urban, 267 town and 467 rural located students. The Victoria sample consisted of 985 urban, 418 town and 449 rural located students.

Statistical Analysis

All statistical analyses were conducted using STATA 11.0 (StataCorp LP, College Station, Texas). Prevalence estimates and 95% confidence intervals (CI) were derived from logistic regression models, after fixing the continuous variable of age at 14 years old (the median) and controlling for state, gender and school clustering. Logistic regression analyses were utilized to test the hypotheses relating to substance use within regional and rural areas versus urban areas. Logistic regression analyses were also used to examine differences in rates of substance use between the 2 states. Both sets of logistic regression analyses were adjusted for age, gender, school clustering, and socioeconomic status. Lastly, tests for interactions between state and rurality were conducted.

RESULTS

The prevalence rates for lifetime and current (past 30 days) alcohol, tobacco, cannabis, and other illicit drug use for Victorian and Washington State students are presented in Table 1. As shown, alcohol has the highest prevalence rates for both states, with cannabis and illicit drug use being the least used substances.

Adjusted odds ratios and 95% CIs for comparisons between rural, regional (town) and urban, and the 2 states, are presented in Table 2. Table 2 demonstrates that when adolescents across the 2 states are combined, those in rural areas are significantly more likely to report ever using or past 30-day use of alcohol, tobacco, and cannabis relative to urban areas. The greatest difference is for cannabis use, with rural adolescents almost twice as likely to ever use cannabis. No significant differences were found for alcohol, tobacco and illicit drugs for urban areas relative to small and large towns (regional). Lastly, both lifetime and past 30-day use of any substance (alcohol, tobacco or illicit drugs) were significantly higher within rural areas relative to urban areas.

The lifetime and past 30-day use of alcohol, tobacco and any substance were significantly lower within Washington State than Victoria. For tobacco, alcohol and any substance use (alcohol, tobacco or illicit drugs), adolescents in Washington State are approximately one-half and two-thirds less likely to report these behaviors, respectively. The use of cannabis, however, was found to be significantly higher within Washington State, with students approximately twice as likely to use cannabis. There was no significant difference between Victoria and Washington State for lifetime illicit drug use.

Lastly, higher family socioeconomic status had a protective effect in reducing the likelihood of all substance use behaviors with adjusted odds ratios for lifetime use ranging between 0.40 and 0.69, and odds ratios for past 30-day use ranging between 0.48 and 0.74.

Tests for interactions between state and rurality revealed that the effect of town or rural location on substance use was similar in both Washington State and Victoria for all but one type of drug. The exception was lifetime and recent use of illicit drugs other than cannabis, where the risk was significantly higher in towns relative to urban locations in Washington State, while town location showed lower risk in Victoria relative to urban location. Closer inspection revealed that these patterns were mostly apparent in the grade 7 cohort. For example, prevalence estimates adjusted to reflect average age 13 revealed that recent rates of other illicit drug use were as follows: Washington State urban 5.4% (95% CI, 4.0%–7.1%) and 10.4% (6.8%–15.8%) for towns; Victoria urban 8.4% (6.5%–10.9%) and 3.6% (1.9%–6.6%) in towns.

DISCUSSION

The current study aimed to examine the impact of rurality on alcohol, tobacco, cannabis, and other illicit drug use in early adolescent youth in Washington State, US, and Victoria, Australia. A strength of this study was the use of large, state-representative samples of young adolescents surveyed using the same methods and measures cross-nationally, allowing comprehensive epidemiological analysis and comparison. Such epidemiological analyses are likely to reflect cross-national prevalence differences that are unconfounded by survey administration or method differences.

The main finding of this study was that early adolescent students aged 12–15 years of age in rural areas showed higher rates of lifetime and current use of alcohol, tobacco and cannabis than adolescents living in urban areas in both states. Considering the differences in policies towards substance use in the 2 states, these findings are striking. These findings support our

first hypothesis, that adolescents living in regional and rural areas within both Victoria and Washington State drink alcohol at a significantly greater rate than their urban counterparts. The results of this study do not support the second hypothesis that regional and rural adolescents within both Victoria and Washington State smoke tobacco and use illicit substances at similar rates to their urban counterparts. The present findings extend prior research by demonstrating for the first time cross-national similarities in the effect of rural location on early substance use. However, one exception was illicit drug use (other than cannabis), where Washington State town location was a higher risk compared to urban location for younger adolescents, a pattern not found in Victorian adolescents. There was no state interaction effect of rural location on alcohol, tobacco, cannabis, or any substance use (use of alcohol, tobacco, or illicit drugs).

The pattern of greater tobacco use by rural adolescents, as compared to urban adolescents, was not previously found in large Australian household surveys, but it has been observed in some US studies.^{16,17} The previous Australian household studies have relatively low response rates and rely on household adults to recruit adolescent respondents into telephone surveys, a procedural step that may introduce bias because confidentiality or privacy of adolescent responses cannot be assured. Therefore, adolescents may not give truthful responses due to a worry that their answers may be monitored by or discussed with the household adult. In the IYDS, questions were developed to measure the honesty of adolescents' responses and very low rates of dishonest responding were detected.

The finding that rural adolescents use more cannabis was inconsistent with the limited prior research. The present finding conflicts with the Australia-wide Australian Institute of Health and Welfare (AIHW) report on rural drug use, which found that rural Australian adolescents used illicit substances to an equal degree, or less so, than their urban counterparts.¹² The differences observed in the present study may be due to the AIHW study being based on a low-response household survey or due to state variation within different Australian states. The present results conflict with findings in the United States, by Hanson et al¹⁷ and Substance Abuse and Mental Health Services Administration (SAMHSA),¹⁸ showing that students in the rural US were less likely to use illicit substances. Although the contrasting findings may be attributable to the state-specific nature of the current study, previous analyses of the IYDS reveal student patterns of substance use are similar to national student sample estimates, suggesting that it is unlikely that Washington State and Victoria differ from their respective national populations.²³

Lastly, the exploration of state differences in rates of consumption indicated that adolescents in Washington State were less likely to use alcohol and smoke tobacco, but they were more likely to use cannabis compared to adolescents in Victoria. The findings accord with prior comparisons in revealing that US students report lower overall rates of alcohol and tobacco use but slightly higher illicit substance use relative to Australia.^{23–25} Greater use of cannabis within Washington State is contrary to the goals of the abstinence approach to illicit drug use within the US. Further, given the lack of state differences on the use of illicit drugs other than cannabis, it may be speculated that the abstinence approach to drug use does not provide a greater protective effect than the harm minimization approach to illicit drug use implemented within Australia.⁷ On the other hand, it is apparent that harm minimization does not provide a protective effect for adolescent alcohol, tobacco or any substance use.²⁴

Limitations and Future Directions

Although the current findings support the link between rural location and higher adolescent substance use, there are some limitations that need to be taken into account. The present study was relevant to the study period of 2002. To detect the possibility that rural trends may

differ across time would require a series of surveys to be conducted and analyzed across years. Although the present study was based on relatively large samples in each state, there was a lack of power to attain significance for the observable trend for students attending schools located in towns (regional areas) to have higher rates of adolescent alcohol, tobacco and illicit substance use relative to urban areas. The effects presented in the current study can be used to estimate sample sizes needed to demonstrate these effects of town location in future research. Further, while the current study provides estimates of use within regions, differentiation between estimates of prevalence between towns within rural, regional or urban areas is not possible. Another important limitation was the use of state samples in each nation. Future national research should seek to replicate the current findings by exploring rural versus urban differences in well-conducted national student surveys in the US and Australia. Additionally, future research should aim to investigate issues of policy and country context as important sources for explaining cross-national differences in rural substance use.

The current study shows that early adolescents living in rural areas in Victoria and Washington State in 2002 used alcohol, tobacco and cannabis more than their urban counterparts, with the effect of rural location similar in both states. Where rural-urban differences are observable, future research should focus on investigation into why rural adolescents use alcohol, tobacco and illicit substances at a greater rate than urban adolescents.

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Table 1

Prevalence Rates (and 95% confidence intervals) for Lifetime and Past 30 Days Substance Use for Victoria and Washington State

Victoria			
	Urban or urban fringe	Large or small town	Rural
Lifetime alcohol use	70.5 (67.0–73.8)	73.9 (69.2–78.1)	77.9 (74.4–81.0)
Lifetime tobacco use	37.4 (33.3–41.7)	43.0 (37.5–48.5)	49.6 (44.5–54.7)
Lifetime cannabis use	6.6 (5.4–8.2)	7.8 (5.2–11.5)	12.6 (9.7–16.1)
Lifetime other illicit drug use	11.5 (9.8–13.5)	11.5 (8.7–15.0)	14.5 (12.0–17.5)
Lifetime any substance use	75.1 (72.0–77.9)	78.1 (73.7–81.9)	82.1 (79.0–84.8)
Past 30 days alcohol use	41.0 (37.5–44.7)	45.2 (40.0–50.6)	50.0 (45.4–54.7)
Past 30 days tobacco use	11.2 (9.0–13.9)	12.0 (8.8–16.2)	16.8 (13.1–21.2)
Past 30 days cannabis use	2.8 (2.0–3.8)	4.1 (2.5–6.6)	5.1 (3.6–7.2)
Past 30 days other illicit drug use	6.1(4.9–7.6)	5.5 (3.6–8.1)	7.6 (5.6–10.2)
Past 30 days any substance use	44.8 (41.2–48.4)	48.2 (42.5–54.0)	53.8 (49.0–58.6)

Washington State			
	Urban or urban fringe	Large or small town	Rural
Lifetime alcohol use	43.6 (40.3–47.1)	48.4 (42.5–54.3)	52.3 (47.8–56.8)
Lifetime tobacco use	24.2 (21.1–27.7)	29.9 (24.8–35.6)	32.4 (28.5–36.4)
Lifetime cannabis use	11.1 (9.1–13.4)	13.5 (9.6–18.7)	18.7 (15.6–22.2)
Lifetime other illicit drug use	10.3 (8.9–11.9)	10.5 (7.5–14.6)	12.6 (10.4–15.2)
Lifetime any substance use	49.9 (46.3–53.5)	54.9 (48.8–60.9)	58.8 (54.9–62.6)
Past 30 days alcohol use	15.4 (13.5–17.5)	18.1 (14.8–21.9)	20.2 (17.3–23.4)
Past 30 days tobacco use	5.1 (4.0–6.5)	5.7 (3.7–8.6)	7.5 (5.5–10.3)
Past 30 days cannabis use	5.8 (4.5–7.5)	8.9 (6.1–12.8)	9.8 (7.7–12.3)
Past 30 days other illicit drug use	5.2 (4.2–6.4)	4.8 (2.9–7.8)	6.1 (4.5–8.2)
Past 30 days any substance use	20.6 (18.2–23.2)	23.4 (19.2–28.2)	26.2 (22.5–30.2)

NOTE: Point estimates and confidence intervals were derived using STATA “svyset” procedures. Estimates take into account school clustering, socioeconomic status, age and gender. Other illicit drugs include inhalants, LSD, cocaine or crack, stimulants, ecstasy, heroin, and other illegal drugs.

Table 2Adjusted Odds Ratios From Logistic Regression Models for Lifetime and Past 30 Days Substance Use^a

(n=analytic sample)	Town compared to Urban	Rural compared to Urban	Washington State compared to Victoria
	AOR ^b (95% CI)	AOR ^b (95% CI)	AOR ^b (95% CI)
Lifetime alcohol use (n=3729)	1.15 (0.90–1.48)	1.37 (1.12–1.67)	0.34 (0.29–0.42)
Lifetime tobacco use(n=3647)	1.17 (0.90–1.53)	1.37 (1.09–1.71)	0.63 (0.51–0.77)
Lifetime cannabis use (n=3724)	1.13 (0.74–1.71)	1.72 (1.32–2.24)	1.99 (1.50–2.65)
Lifetime other illicit drug use (n=3709)	0.96 (0.68–1.35)	1.20 (0.95–1.52)	0.96 (0.77–1.19)
Lifetime any substance use (n=3729)	1.14 (0.88–1.47)	1.36 (1.12–1.65)	0.36 (0.30–0.43)
Past 30 days alcohol use (n=3724)	1.16 (0.91–1.48)	1.35 (1.09–1.65)	0.28 (0.23–0.33)
Past 30 days tobacco use (n=3699)	1.02 (0.68–1.53)	1.42 (1.01–1.98)	0.48 (0.34–0.66)
Past 30 days cannabis use (n=3724)	1.43 (0.90–2.25)	1.63 (1.18–2.25)	2.48 (1.71–3.58)
Past 30 days other illicit drug use (n=3704)	0.84 (0.52–1.35)	1.11 (0.80–1.56)	0.94 (0.69–1.29)
Past 30 days any substance use (n=3724)	1.11 (0.86–1.43)	1.31 (1.06–1.62)	0.34 (0.29–0.41)

^a Bold text indicates statistical significance at P < .05 alpha level

^b Odds ratios multivariate adjusted for age, gender, school clustering, socioeconomic status (family income and parent education).