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Student survey trends in reported alcohol use and influencing factors in Australia

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Abstract

Introduction and Aims. *There is a need to explain reported trends of reduced alcohol and drug (substance) use in school-aged children in Australia. This study used student survey data collected in the states of Victoria, Western Australia and Queensland to examine trends in substance use and associated influencing factors.* ***Design and Methods.*** *Youth self-reports were examined from 11 cross-sectional surveys completed by 41 328 adolescents (average age 13.5 years, 52.5% female) across 109 Australian communities between 1999 and 2015. Multi-level modelling was used to identify trends in adolescent reports of lifetime alcohol, tobacco and cannabis use, adjusted for age, gender, social disadvantage and minority status. Trends in influencing factors were also examined that included: individual attitudes, and family, school and community environments. Multivariate analyses estimated the main contributors to alcohol use trends.* ***Results.*** *Alcohol, tobacco and cannabis use all fell significantly from 1999 to 2015. Higher levels of use were observed in Victoria compared to Western Australia or Queensland. Multivariate analyses identified reductions in favourable parent attitudes and lower availability of substances as direct contributors to reducing alcohol use trends. Indicators of school and family adjustment did not show similar trend reductions.* ***Discussion and Conclusions.*** *Reductions in adolescent alcohol, tobacco and cannabis use from 1999 to 2015 were associated with similar reductions in parent favourable attitudes and availability of substances. It is plausible that a reduced tendency for parents and other adults to supply adolescent alcohol are implicated in the reductions in adolescent alcohol use observed across Australia.* [Toumbourou JW, Rowland B, Ghayour-Minaie M, Sherker S, Patton GC, Williams JW. Student survey trends in reported alcohol use and influencing factors in Australia. *Drug Alcohol Rev* 2018]

Key words: adolescent, alcohol, tobacco, school surveys, risk factors.

Introduction

Given that alcohol and drug (substance) use is internationally a major cause of health and social problems, it is important to monitor rates of use and to identify factors that may contribute to reductions in different nations. Since 2000, there have been steady reductions in alcohol and drug use amongst Australia's secondary school-aged youth [1]. For example, national school surveys show that for 12- to 15-year-olds, past week alcohol use fell from 29% to 11% from 2002 to 2011. Lifetime illicit drug use amongst secondary school students fell from 20% in 2005 to 16% in 2011 [2]. A number of research studies have sought explanations as to why school age substance use rates have fallen in recent decades. While previous studies have examined contributors to youth tobacco [3] and cannabis use trends [4], the current study examined factors associated with adolescent alcohol use.

An examination of data from the Australian National Drug Strategy Household Survey found that past year alcohol use dropped significantly for youth aged 14–17 from 67% in 2001 down to 50% in 2010 [5]. These reductions in adolescent alcohol use were not explained by changes in demographic or socio-economic characteristics. Reductions were consistent across sub-groups analysed by: age; gender; family income; regional location; educational participation; English language background; socio-economic status or state of residence.

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A separate examination of the National Drug Strategy Household Survey [1] confirmed that alcohol use amongst youth aged 14–17 years dropped significantly from 1998 to 2013 across measures of lifetime use and quantity and frequency. These changes were associated with reductions in sources of adolescent alcohol supply. Parent supply of alcohol to adolescents rose from 15% in 1998 to 22% in 2007 and then dropped sharply down to 12% in 2013. Friends' supply of alcohol dropped significantly from 28% in 1998 down to 20% in 2013. Underage purchase of alcohol dropped significantly from 12% in 1998 down to 1% in 2013.

The present project sought to analyse data collected in three states of Australia in recent years using the Communities That Care Youth Survey (CTC Youth Survey). The CTC Youth Survey was designed in the USA to provide a valid tool for community monitoring of factors that influence adolescent alcohol and drug use [6]. The survey includes a comprehensive range of scales that had been found in systematic reviews of longitudinal studies to be consistent risk or protective factors for youth substance abuse [7]. Scales were included based on meeting psychometric criteria including previous predictive associations with alcohol and drug use [8].

The CTC Youth Survey uses questions to record adolescent alcohol and drug use behaviour that are used internationally in 'Monitoring the future' [9] and 'European school survey project on alcohol and other drugs' [10] student surveys. The survey measures a range of risk and protective factors at the individual, peer, family, school and community levels (e.g. social skills, attachment to family and school, family rules, opportunities and rewards for prosocial behaviours). An Australian adaptation of the CTC Youth Survey was designed in 1998 and trialled as a state-wide student monitoring instrument in Victoria in 1999 [6]. The Australian CTC Youth Survey has been prospectively tested in matched longitudinal studies in Victoria and Washington State and found to be a valid and reliable longitudinal predictor of adolescent alcohol and drug use [11] in both states.

The objective of the present study was to identify to what extent the reduction in Australian adolescent substance use has been associated with changes in adolescent reported risk factors. To do this, student survey data collected using the CTC Youth Survey between 1999 and 2015 was submitted to trend analyses. The present study expected to identify similar trends to previous studies [1,2,5] and to extend prior efforts to identify influencing factors [1,2] by investigating a wider range of risk factors to estimate major influences.

Methods

Study design

The study sought to estimate population trends [12] in adolescent substance use. To achieve this, multi-level analysis was completed on student survey data collected using the Australian version of the CTC Youth Survey. All data used in this study were taken from cross-sectional school surveys that were designed to estimate the youth population characteristics within communities (local government areas, LGA) in Victoria, Queensland and Western Australia. Participants were enrolled in grades 5 through to 11 and the number of communities in any single survey ranged from 1 to 90. The 11 studies listed in Table 1 were included in this analysis.

Procedure

Ethics approval for data collection was obtained from the Royal Children's Hospital Human Research Ethics Committee for the surveys completed until 2012 and from the Deakin University Human

Table 1. *Survey data sources*

Reference	Year	Geographic area	Grades	Response (%)	*N*
[6]	1999	Municipalities across the State of Victoria	7, 9, 11	70	6895
[13]	2001	Western Australian Community Surveys	7, 8, 9, 11	50	2191
[14]	2002	Mornington Peninsula Shire, Victoria	7, 9, 11	75	2865
[15]	2002	Ballarat City, Victoria	5, 7, 9	85	1976
[16]	2006	Victoria, Queensland and Western Australia	6, 8	60	6981
[17]	2007	Mornington Peninsula Shire, Victoria	7, 9–12	73	1977
[18]	2009	Municipalities across the State of Victoria	7, 9, 11	77	11 357
[19]	2009	Myrtleford, Alpine Shire, Victoria	5, 7, 9	90	175
[20]	2012	Mornington Peninsula Shire, Victoria	7, 9, 11	74	3025
[21]	2013	Victoria, Queensland and Western Australia	8	61	3675
[22]	2015	Alpine Shire, Victoria	5, 6, 7, 9	86	211

Response, percentage of students surveyed from the targeted school population; N, sample included in dataset.

Research Ethics Committee for the surveys completed after 2012. Relevant education authorities and school principals provided consent. For each of the surveys, all students in the selected year levels within the participating schools were invited to take part. Six surveys were completed with signed parent consent for student participation and five with passive parent consent [14,15,17,20,22]. In all surveys, student assent was sought on the day of the survey.

All surveys were anonymous. All studies were conducted in school classrooms supervised by research staff. The survey questions and procedures were matched across years. From 1999 until 2002 responses were recorded using paper and pencil surveys that were transferred to electronic records by optic mark readers. From 2006, student responses were recorded using online survey platforms. Students completed the questionnaire in class taking between 40 to 60 min. Students were supervised by trained research staff during survey completion.

Measures Student self-report data was collected using the CTC Youth Survey that has been shown to provide reliable and valid estimation and prediction of population rates of adolescent substance use [11]. A variable representing the survey year was developed, each unit represented the increment of 1 year (e.g. 1 = 1999; 3 = 2001; 4 = 2002; 17 = 2015). Substance use was examined as any lifetime use. Given high rates of lifetime alcohol use, trends in past month alcohol use were also examined. The questions were as follows: *Lifetime Alcohol Use:* 'In your lifetime on how many occasions (if any) have you: Had alcoholic beverages (like beer, wine or liquor/spirits) to drink—more than just a few sips?' *Past Month Alcohol Use*: '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)?' *Lifetime Tobacco Use*: 'Have you ever smoked cigarettes?' and *Lifetime Cannabis Use*: 'In your lifetime on how many occasions (if any) have you … used marijuana (pot, weed, grass)?'. The response options for these variables ranged from Never (1) to 10 or more times (5) and were recoded for categorical outcome analyses as Never (0)/One or more times (1). *Past Year Antisocial Behaviour*: 'How many times in the past year (12 months) have you: carried a weapon? Sold illegal drugs? Stolen or tried to steal a motor vehicle such as a car or motorcycle? Attacked someone with the idea of seriously hurting them? Been drunk or high at school?' Cronbach's alpha (a) = 0.62. Coded as none (0), one or more (1).

The CTC Youth Survey risk factors measured in the current study were as follows. *Favourable Attitudes to Substance Use*: 4-items measuring low perceived risks: 'How much do you think people risk harming themselves (physically or in other ways) if they: …smoke one or more packs of cigarettes a day? Take one or two drinks of an alcoholic beverage (like beer, wine, or liquor/spirits) nearly every day? Try marijuana … once or twice? Use marijuana … regularly?' Response options—Great risk (1) to No risk (4) (a = 0.85) [were dichotomised for Table 2 trend analyses using cut-off points at 2.00/2.01 (see analyses section below)]. *Parent Favourable Attitudes to Substance Use*: 4-items (How wrong do your parents feel it would be for you to: Smoke cigarettes? Drink beer or wine regularly …? Drink liquor/spirits regularly …? Use marijuana …?)—Very wrong (1) to Not wrong at all (4) (a = 0.81) (Table 2 cut-off points 1.75/1.76).

Poor family management 9-items (My parents ask if I've gotten my homework done? … Parents know if you did not come home on time? The rules in my family are clear? When I am not at home, one of my parents knows where I am and who I am with? My parents want me to call if I am going to be late getting home? My family has clear rules about alcohol and drug use?; … Would you be caught by your parents… if you: drank some alcohol …? …carried a weapon …? …skipped school …?)—NO! (4) to YES! (1) (a = 0.83) (cut-off points 2.12/2.13). *Family Conflict.* 3-items (… In my family … We argue about the same things … over and over? People … have serious arguments? … often insult or yell at each other?)—NO! (1) to YES! (4) (a = 0.80) (cut-off points 2.70/2.71).

Low commitment to school 7-items [During the last 4 weeks … how many whole days have you missed because you skipped or 'cut/wagged' (reverse coded, R)? How often do you feel that the schoolwork you are assigned is meaningful and important? How interesting are most of your school subjects to you? …the things you are learning in school are going to be (important) for your later life?; … over the past year … how often did you... Enjoy being in school? Hate being in school (R)? Try to do your best work in school?]—Never (5) to Almost Always (1) (a = 0.80) (cut-off points 2.72/2.73). *Academic Failure*: 2-items (… what were your grades/marks like last year?)—Very poor (4) to Very good (1). (Are your school grades better than the grades/marks of most students in your class?)—NO! (4) to YES! (1) (a = 0.68) (cut-off points 2.40/2.41).

Community substance availability 4-items (e.g. How easy would it be for you … if you wanted to get some …cigarettes? alcohol …? marijuana …? a drug like cocaine, heroin …?)—Very hard (1) to Very easy

Table 2. *Changes in substance use and risk factors from 1999 to 2015 and annual change trend*

Variable	1999 Prevalence		2015 Prevalence		Annual change		Significant effects
	prop.	95% CI	prop.	95% CI	prop.	95% CI	
Behavioural measures							
Lifetime alcohol use	0.69	0.67, 0.70	0.45	0.43, 0.47	0.93	0.93, 0.94	V; G; M; S; C; I; L
Past month alcohol use	0.45	0.42, 0.47	0.25	0.23, 0.26	0.94	0.93, 0.94	V; G; M; S; C; I; L
Lifetime tobacco use	0.45	0.42, 0.47	0.10	0.09, 0.11	0.87	0.86, 0.87	V; G; C; I; L
Lifetime cannabis use	0.15	0.13, 0.17	0.04	0.03, 0.04	0.90	0.89, 0.91	V; G; M; S; C; I; L
Antisocial behaviour (past year)	0.24	0.23, 0.26	0.16	0.14, 0.17	0.97	0.96, 0.97	V; G; M; S; C; I; L
Risk factors							
Favourable attitudes to substance use	0.38	0.36, 0.41	0.11	0.10, 0.12	0.90	0.89, 0.90	V; G; M; I; L
Parent favourable attitudes to substance use	0.24	0.22, 0.26	0.23	0.21, 0.25	1.00	0.99, 1.00	G; M; C; I; L
Poor family management	0.28	0.27, 0.30	0.19	0.18, 0.21	0.97	0.96, 0.97	V; G; M; C; I; L
Family conflict	0.22	0.21, 0.23	0.25	0.24, 0.27	1.01	1.01, 1.02	V; Q; G; F; C; I
Low commitment to school	0.25	0.23, 0.27	0.20	0.19, 0.22	0.98	0.98, 0.99	V; G; M; C; I; L
School academic failure	0.20	0.18, 0.21	0.23	0.22, 0.25	1.02	1.01, 1.02	G; M; C; I
Community substance availability	0.30	0.28, 0.31	0.15	0.14, 0.16	0.94	0.93, 0.94	V; G; M; C; I; L
Community disorganisation	0.09	0.08, 0.10	0.13	0.12, 0.14	1.03	1.02, 1.04	LG; F; Q; W; NC; L
Community transitions and mobility	0.17	0.16, 0.18	0.22	0.20, 0.24	1.02	1.01, 1.03	LG; F; Q; W; NC; I; L

Significant effects (higher risk groups): C, Australian birth; CI, confidence interval; F, females; G, higher grade; I, Indigenous (Aboriginal or Torres Strait Islander); L, local government area variation above 3%; LG, lower grades; M, males; NC, non-Australian birth; OR, odds ratio; prop., proportion; Q, Queensland; S, low socio-economic status; V, Victoria; W, Western Australia.

(4) (a = 0.87) (cut-off points 2.70/2.71). *Community Disorganisation*: 5-items [How much do each of the following statements describe your neighbourhood: crime and/or drug selling? lots of empty or abandoned buildings? lots of graffiti? Fights? I feel safe in my neighbourhood? (R)]—NO! (1) to YES! (4) (a = 0.79) (cut-off points 3.42/3.43). *Community Transitions & Mobility*: 4-items (In the past year: Have you changed homes? Have you changed schools …?)—No/Yes. (How many times have you changed schools… since kindergarten? How many times have you changed homes since kindergarten?)—Never to seven or more times (scored 1 to 5) (a = 0.61) (cut-off points 2.25/ 2.26).

Demographic details were recorded based on student reports of: gender; age; school grade; country of birth and Indigenous status. State and community location were coded based on the student school location. Community disadvantage was coded based on 2011 census data (Index of Relative Socio-economic Disadvantage [24]).

Analyses

All analyses were done with STATA, version 14. Trends were examined based on youth surveys completed by 41 328 adolescents across 109 local government areas between 1999 and 2015. Multi-level modelling was conducted using STATA (version 14) procedure 'mixed' for continuous outcomes and 'melogit' for categorical. To provide a comparable metric for annual trends, continuous risk-factor scores were converted to categorical variables and reported in Table 2 using the margins procedure. Categorisation was achieved by dichotomising scores at the 75th percentile of risk or, depending on the distribution of scores, at the nearest practical point above this threshold. The measures section above specifies the cut-off points used for each scale and Table 2 lists the prevalence above this cut-off point in 1999 and 2015. The findings for analyses based on categorical and continuous risk factor outcomes were compared for consistency. Linear trends were estimated and compared (Table 2) based on the odds ratio for the effect of survey year on substance use and risk factors adjusting for gender, school grade, community disadvantage, child country of birth and Indigenous status. Estimates also controlled for the clustering of students within communities. Adjusted prevalence estimates were also provided in Table 2 for the 16-year interval between 1999 and 2015.

In addition to examining annual trends in individual risk factors, multivariate regression modelling was undertaken predicting Lifetime Alcohol Use (Table 3). This was done using the STATA regress command, with robust clustering at the LGA level (e.g. vce(cluster LGA)). First, only the survey year was entered into

the model. This was done to see if adding other variables in the model changed the coefficient between the survey year and risk of consumption. Next, demographic variables were entered into the model. Finally, risk factors were entered into the model; non-significant variables were removed from the model. Missing data was imputed (with 30 imputations), using the mi command in STATA. The final regression model with missing data was compared to the model with imputed data. To aid interpretation, the coefficients for the first model with only the survey year, and the final model were also presented as odds ratios. This was done using the eform(exp(Coef.) option in STATA.

A semi-elasticity (ey/dx) analysis was undertaken to assess the percentage change in each risk factor (ey) for a one unit change (i.e. 1 year) in the survey year (dx), while controlling for all the other risk factors and demographic variables in the model [25]. Semi-elasticities for each risk factor were then plotted.

Results

Survey responses were analysed for a maximum total sample of 41 328 adolescents. There was missing data for all the variables. For the demographic variables the proportion of missing data ranged between 1% (age) and 11% (State); for risk factors the proportion of missing data ranged from 2% (low commitment to school) to 10% (transitions and mobility). Approximately, 7% of lifetime alcohol data was missing and approximately, 4% of lifetime smoking was missing. Average respondent characteristics were: 13.5 years of age; grade 8.2; 52.5% female; 82.8% from Victoria, 7.1% Queensland and 10.1% Western Australia.

Table 2 presents details of the behavioural and risk factor estimates based on the multi-level models. Table 2 revealed rates of adolescent alcohol and other drug use reduced significantly from the baseline year (1999) over the course of the study.

Socio-demographic adjusted estimates from the multi-level models revealed that the prevalence of lifetime alcohol use in 1999 was 69% reducing to 45% in 2015 [annual change trend adjusted odds ratio (OR) = 0.93, 95% confidence interval (CI) 0.93–0.94, n = 39 469]. This translates to an average 7% per annum reduction in risk of lifetime alcohol consumption, per each survey year. Higher levels of alcohol use were observed for students: in Victoria (multivariate adjusted OR 0.73 for Queensland compared to Victoria); in higher grades (OR 1.66); males (female OR 0.73); from Australian born (non-Australian born OR 0.68); and Indigenous backgrounds (OR 1.21). Responses varied significantly across communities (variation 7.8%, 95% CI 5.2–11.7%).

Changes were also observed in risk factors. The largest reductions in risk factors were evident for Student Favourable Attitudes to Substance Use (38% 1999, 11% 2015, OR 0.90, 95% CI 0.89–0.90, n = 38 093) and Community Substance Availability (30% 1999, 15% 2015, OR 0.94, 95% CI 0.93–0.94, n = 37 896). Risk factor annual change increases were observed for: Family Conflict; Academic Failure (1.01); Community Disorganisation (1.03) and Community Transitions & Mobility (1.02). The models for the continuous and categorical risk factor outcomes were compared and all models were similar with respect to the direction and strength of predictors, with the exception of Parent Favourable Attitudes to Substance Use. This risk factor showed significant decreasing effects for annual change with the continuous measure but effects were non-significant with the categorical measure.

The results of the regression analysis are presented in Table 3. To assist with the semi-elasticity modelling interpretation, the continuous variable of lifetime alcohol consumption and the continuous versions of the risk factors were used. Model 0 (not shown in Table 3) with only the survey year indicated that for every year, the risk of alcohol consumption decreased by 5% (OR 0.95; 95% CI 0.93–0.95). Model 1 incorporating year of the survey and demographic variables identified that all these variables were significant predictors. Adding all the risk factors into the multivariate regression analysis (Model 2) identified that all risk factors made significant independent contributions to the prediction of Lifetime Alcohol Use. The demographic variable identifying whether a person was Indigenous (Aboriginal and Torres Strait Islander) was no longer significant and was removed from the model.

The imputed data model presented in Table 3 produced coefficients similar to the model without imputed data. Standard errors were similar to two decimal places; subsequently P-values were similar. The odds ratios indicated that adjusting for demographic variables and risk factors, there was a 3% reduction in risk of lifetime alcohol use, per year. This indicated that the association between the survey year and the risk of alcohol use was diminished after including all the risk factors into the model (OR 0.97; 95% CI 0.96–0.98). All the risk factors were significant predictors of Lifetime Alcohol Use. Parent Favourable Attitudes to Substance Use (OR 1.65), Poor Family Management (OR 1.36) and Community Substance Availability (OR 1.64) were the risk factors associated with the greatest risk of lifetime alcohol use.

Given the coefficients for the imputed and non-imputed model were similar, semi-elasticities were

Table 3. *Regression models for ever used alcohol*

	Model 1: Demographics only			Model 2: with risk factors			Imputed model			
	β	95 CI	*P*	*β*	95 CI	*P*	*β*	95 CI	*P*	OR
Survey year[a]	−0.06	−0.07, −0.05	0.000	−0.02	−0.03,-0.01	0.000	−0.03	−0.04,-0.02	0.000	0.97
Age	0.41	0.39, 0.44	0.000	0.16	0.14, 0.18	0.000	0.16	0.14, 0.18	0.000	1.17
Female	−0.16	−0.20, −0.12	0.000	−0.04	−0.08, −0.00	0.047	−0.05	−0.08, −0.02	0.004	0.95
COB	−0.39	−0.50, −0.29	0.000	−0.23	−0.33, −0.13	0.000	−0.24	−0.32, −0.16	0.000	0.79
ATSI	0.21	0.03, 0.39	0.022	N/A	N/A	N/A		N/A	N/A	N/A
State										
Victoria	Referent			Referent			Referent			Referent
Queensland	0.08	−0.01, 0.17	0.095	0.08	0.00, 0.16	0.040	0.03	−0.03, 0.08	0.629	1.02
Western Australia	0.17	0.06, 0.27	0.003	0.13	0.07, 0.19	0.000	0.09	0.03, 0.18	0.020	1.10
Favourable attitudes[b]				0.04	−0.00, 0.09	0.053	0.05	0.02, 0.08	0.000	1.05
Low commitment to school				0.14	0.11, 0.16	0.000	0.15	0.12, 0.16	0.000	1.16
School academic failure				0.10	0.07, 0.13	0.000	0.10	0.07, 0.12	0.000	1.10
Family conflict				0.04	0.02, 0.06	0.000	0.04	0.03, 0.06	0.000	1.04
Parent favourable attitude[b]				0.53	0.49, 0.57	0.000	0.50	0.48, 0.53	0.000	1.65
Poor family management				0.32	0.28, 0.35	0.000	0.31	0.28, 0.34	0.000	1.36
Community substance availability				0.50	0.47, 0.54	0.000	0.49	0.47, 0.52	0.000	1.64
Community transitions and mobility				0.06	0.03, 0.09	0.000	0.06	0.03, 0.08	0.000	1.06
Community disorganisation				0.07	0.02, 0.12	0.006	0.08	0.03, 0.13	0.002	1.09
Constant	1.58	1.46, 1.5	0.000	−1.21	−1.39, −1.04	0.000	−1.11	−1.30, −0.93	0.000	0.33
-LL	72 059			45 931						
AIC	134 231			91 894						
BIC	134 299			92 027						
df	8			16						
N	38 147			28 664				40 074		
LGA (*N*)	109			109				109		

[a]Linear trend for annual change associated with year survey was completed. [b]Favourable attitudes to substance use. AIC, Aikake information criteria; ATSI, Indigenous: Aboriginal or Torres Strait Islander; BIC, Bayesian information criteria; CI, confidence interval; COB, non-Australian country of birth; LGA, local government areas; LL, log likelihood; OR, odds ratio.

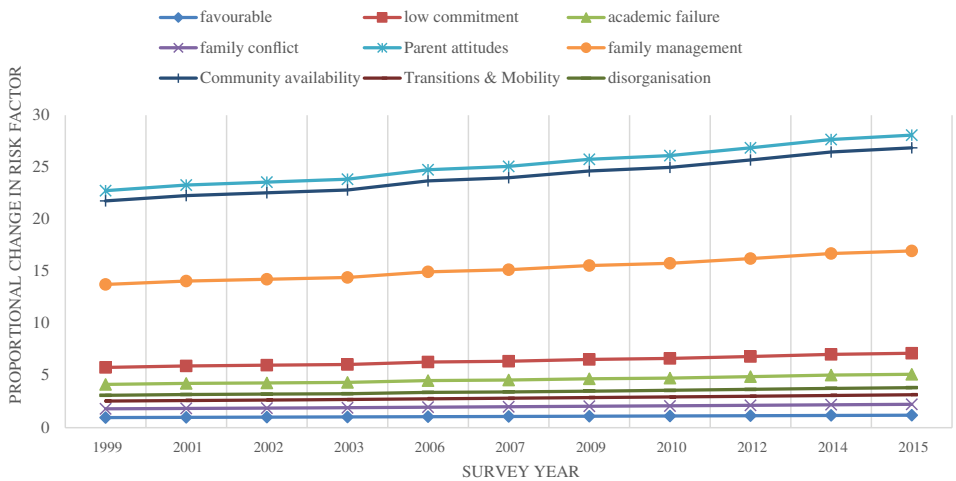

Figure 1. *Percentage change in risk of alcohol consumption, for every one unit change in risk factors at survey time points. Note: favourable, favourable attitudes to substance use; low commitment, low commitment to school; academic failure, school academic failure; parent atttitudes, parent favourable attitudes to substance use; family management, poor family management; community availability, community substance availability; transitions & mobility, community transitions and mobility; disorganisation, community disorganisaton.*

produced with the non-imputed data. Comparisons between multivariate adjusted estimates of proportional change in risk of lifetime alcohol consumption with a one unit change in the risk factors at the different survey time points are presented in Figure 1.

The proportional change (*y*-axis) represents the absolute percentage change in the risk of alcohol consumption, for every one unit change in the plotted risk factor, for each year of the survey (*x*-axis). Consistent with risk factors with the highest odds ratios in the multivariate model, risk factors associated with the greatest proportional change for risk of lifetime alcohol consumption, for every one unit change in risk factor were: Parent Favourable Attitudes (1999: 23%; 2015: 28%); Community Substance Availability (1999: 22%; 2015: 27%) and Poor Family Management (1999: 14%; 2015: 17%). The gradient of the remaining risk factors was relatively flat. This suggested that the proportional change for these risk factors were not clearly associated with risk of lifetime alcohol use over the course of the study.

Discussion

This study presented youth survey trend data from large community surveys conducted in Australia from 1999 to 2015. Adolescent self-reports showed reductions in alcohol, tobacco and cannabis use over the period examined.

The current study examined trends across a range of risk factors to identify changes that may be plausibly associated with the observed reductions in adolescent alcohol and drug use. Although Parent Favourable Attitudes to Substance Use showed little change as a categorical measure (Table 2), the continuous measure was emphasised in multivariate models (Table 3) as a risk factor that showed some of the largest associations with reductions in risk of Lifetime Alcohol use across the study period. Figure 1 also identified from the multivariate model that reductions in Parent Favourable Attitudes to Substance Use may have independently contributed to the observed reduction in adolescent alcohol use. That the effect was evident only in the continuous measure suggests that trends were due to normative shifts in parent attitudes, while high risk families showed less change. These finding of normative reductions in favourable parent attitudes are consistent with the observation that parents were generally less likely to supply alcohol to adolescents from 2007 [1]. The findings are not compatible with the view that reduced substance use was due to overall improvements in family environments. Figure 1 revealed that, after multivariate adjustment, changes in Family Conflict made relatively little contribution to the observed changes in alcohol consumption.

Table 2 revealed that lifetime tobacco use showed the steepest annual reduction of all factors examined. The gateway hypothesis [26] argued that preventing adolescent involvement in one form of substance use could lead to reduced involvement in other forms of substance use. Based on this theory it is plausible that successful public health efforts to encourage lower tobacco use [27] may have contributed to adolescent's being less likely to engage in other forms of substance use through the period examined.

Students reported relatively large reductions in the risk of Community Substance Availability across the

period studied (0.94) and multivariate analyses associated these changes with reduced alcohol use (Figure 1). What might have explained the reduction of Community Substance Availability over the study period? It is plausible that a contribution to these reductions may have been made by successful efforts to control underage sales of tobacco in the period examined. In some cases, underage tobacco sales checks would have occurred in outlets that also sell alcohol, potentially leading outlets to be more vigilant in enforcing underage alcohol sales regulations. These findings also corroborate observations of reduced supply of alcohol by parents, peers and alcohol sales outlets over this time [1]. Less tolerant Australian norms toward adolescent alcohol supply may have been influenced by policy changes including: 2009 national health guidelines recommending adolescents abstain from alcohol; and state laws to restrict adolescent supply [5].

The findings did not reveal consistent trends in school environments. Only small reductions were observed in Low Commitment to School (0.98) and Academic Failure increased slightly (1.01). The multivariate adjusted risk factor effects summarised in Figure 1 suggested that changes in school risk factors contributed little to the observed reduction in adolescent alcohol use.

Important strengths of the current study included the large student samples surveyed using a common instrument across a 16-year period. Further strengths were the assessment of a wide range of previously identified risk factors and the use of multi-level modelling to adjust estimates for socio-demographic confounders and multivariate semi-elasticity analyses to identify specific risk factor contributions. Important limitations of the study were that the surveys were cross-sectional with different communities surveyed in different years. Further limits were that the analysis was restricted to school-aged adolescents. The CTC Youth Survey guided the completion of interventions in four communities; this may have led to a slightly elevated estimate of trend reductions. However, adolescent rates of alcohol use were similar to those reported in Australian national school surveys [2]. For example, past month alcohol use for 12 to 15 year olds in 2011 was 29% in the national school survey and 29% in the current study 95% CI 27–31%). A further limitation of the present study was that data were based exclusively on self-reports of volunteering students. Despite this limitation, estimates of adolescent demographic factors were similar to those reported using alternative survey methods. Specifically the sample 95% confidence interval estimates on indicators such as community disadvantage (mean Index of Relative Socio-economic Disadvantage 1010, 95% CI 998–1022), non-Australian birth (11.2%, 95% CI 8.8–13.7%) and Indigenous identification (2.9%, 95% CI 2.1–3.8%) equated population data from the 2011 Australian Census for community disadvantage (mean Index of Relative Socio-economic Disadvantage 1000) and for youth aged 10–19 non-Australian birth 13.3%, and Indigenous identification 2.2%.

Implications

The current study firstly highlights that substantial reductions in alcohol and drug use are possible across large youth populations [28]. The present findings contribute to efforts to explain the reductions in adolescent substance use observed across Australia in recent years by revealing firstly that tobacco use showed the largest reduction of any of the factors examined. This finding suggests that successful public health efforts to reduce tobacco use may have contributed to the observed reductions in adolescent alcohol and cannabis use.

Multivariate analyses (Figure 1) suggested that favourable parent attitudes, community availability and family management were three risk factors that made independent contributions to reducing adolescent alcohol use across the period observed. These findings have implications for future interventions to maintain the decline in adolescent alcohol use. Interventions are recommended to reduce: favourable student attitudes using strategies such as school drug education [27]; youth alcohol supply through restrictive underage purchase laws and market regulation [21] and favourable parent attitudes through parent education [29].

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