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5 2 **Developmental trajectories of adolescent risky drinking: Predictors from the Drug Education in**  
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7 3 **Victoria Schools (DEVS) study**

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9 4 **Abstract**

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12 5 With alcohol misuse one of the leading causes of disability among young Australians, determination  
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14 6 of potential predictors of risky drinking trajectories of young people is crucial. This study aimed to  
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16 7 identify risky drinking trajectories from early to mid-adolescence and to determine if membership of  
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18 8 a harm minimization intervention, alcohol knowledge, attitudes towards alcohol and prevalence of  
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20 9 alcohol harms would predict trajectory group membership. Longitudinal data from 1,746 students  
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22 10 were used to identify alcohol consumption trajectory groups for both intervention and control  
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24 11 students. Higher baseline knowledge predicted a higher, increasing, consumption trajectory for  
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26 12 controls, whereas, safer attitudes at baseline was not associated with a higher, increasing trajectory.  
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28 13 All other alcohol harms at baseline were strongly associated with higher consumption trajectories.  
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30 14 The intervention group had fewer increasing trajectories and a lower level of consumption at the  
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32 15 end of the program, suggesting the drug education program reduced the number of students who  
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34 16 substantially increased their consumption over time, while at the same time reducing their level of  
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36 17 consumption in relative terms. The consistency of better intervention student outcomes across all  
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38 18 trajectories provides evidence that the drug education program was influential with all types of  
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40 19 student drinkers and is suitable for universal delivery.

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## 1 **Introduction**

2 Risky drinking is more prevalent in late adolescence and early adulthood than in any other period in  
3 life (Kuntsche and Gmel, 2013). In the 2014 national survey of alcohol and other drug use by  
4 students in Australia, of the 14.6% of 12 to 17 year olds who had consumed alcohol in the past week,  
5 33.6% of them reported drinking five or more standard drinks on one occasion in the past week  
6 (White and Williams, 2016). This level of consumption is defined as risky drinking according to  
7 Australia's drinking guidelines (NHMRC, 2009). Frequency of risky drinking increases with age, going  
8 from 11% of 12 year old drinkers to 51% of 17 year old drinker reporting drinking at risky levels in  
9 the past week (White and Williams, 2016).

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11 Alcohol misuse is one of the leading causes of disability among young Australians (Mathews et al.,  
12 2011). Frequent heavy alcohol use and risky drinking by young people are risk factors for future  
13 alcohol dependence (Bonomo et al., 2004), and increase the likelihood of road traffic accidents and  
14 injury, violence, suicide, drunk driving, falls, unprotected sexual intercourse, substance use, property  
15 damage, and vandalism (Kuntsche and Gmel, 2013; Labhart et al., 2013). Risky drinking by young  
16 people has been linked to poor academic performance and the prevalence of other health risk  
17 behaviors such as riding with a driver who had been drinking, being a victim of dating violence and  
18 attempting suicide (Miller et al., 2007). Moreover, risky drinking patterns from adolescence persist  
19 into adulthood. An Australian prospective cohort study reported that the great majority of  
20 adolescent-onset risky drinkers (90% male; 70% female) continued to drink at unsafe levels as young  
21 adults (Degenhardt et al., 2013). In comparison 70% of males and 48% of females who were not  
22 adolescent-onset binge drinkers reported binge drinking in young adulthood (Degenhardt et al.,  
23 2013).

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3 1 Developmental trajectories of risky or binge drinking in adolescence have been previously used to  
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5 2 determine potential risk factors. Being male, having a family history of alcoholism, age at drinking  
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7 3 onset, feeling drunk during the first alcohol experience and alcohol expectancies about the positive  
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9 4 effects of alcohol are all associated with significantly greater odds of being in a problem drinking  
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11 5 trajectory group (Chassin, Pitts, and Prost, 2002; Warner, White, and Johnson, 2007; Jackson, Sher,  
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13 6 and Schulenberg, 2008). Peer drinking, drug use, delinquency, pre-drinking, drinking outside the  
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15 7 home, and parental supply of alcohol for unsupervised drinking are also associated with risky  
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17 8 drinking trajectory membership (Gilligan et al., 2012; Chassin, Pitts, and Prost, 2002; Jackson, Sher,  
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19 9 and Schulenberg, 2008; Kuntsche and Gmel, 2013). Associated personality and mental wellbeing risk  
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21 10 factors include sensation seeking, negative emotionality and high levels of emotional distress, low  
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23 11 constraint, anti-sociality, and externalizing behaviour (Jackson, Sher, and Schulenberg, 2008;  
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25 12 Chassin, Flora, and King, 2004; Colder et al., 2002; Chassin, Pitts, and Prost, 2002). In addition, early  
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27 13 onset and chronic high use of alcohol is strongly associated with smoking, and cannabis use (Jackson,  
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29 14 Sher, and Schulenberg, 2008). Outcomes associated with a developmental trajectory of risky  
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31 15 drinking, include alcohol and drug use disorders, greater internalising and externalising problems,  
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33 16 poor social functioning, and high risk for not completing secondary school or being involved in pro-  
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35 17 social activities (Gmel, Kuntsche, and Rehm, 2011; Chassin, Flora, and King, 2004; Chassin, Pitts, and  
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37 18 Prost, 2002; Hill et al., 2000).

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41 19 The Drug Education in Victorian Schools (DEVS) 'Get Ready' intervention was designed to provide  
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43 20 junior secondary school students with the critical disposition, practical knowledge and  
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45 21 communication and decision making skills to predict and manage risk and use strategies to minimise  
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47 22 the harms most likely to be encountered in relation to drug and alcohol use, whether their own or  
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49 23 that of others. Findings in relation to alcohol prevention from the DEVS program have been  
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51 24 reported in previous papers and show by the end of the year following a two year classroom  
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53 25 education program, there were fewer risky drinkers in the intervention group, intervention students

1 who did drink in a risky manner reduced their consumption, and alcohol harms decreased for  
2 intervention group risky drinkers (Midford et al., 2015; Midford et al., 2014; Midford et al., 2016).  
3 Conversely, the proportion of risky drinkers in the control group increased (Midford et al., 2016).

4 As far as the authors are aware, there are no studies to date which look at knowledge, attitudes and  
5 alcohol harm predictors of risky drinking developmental trajectories of young people involved in a  
6 harm minimisation intervention. In this study we aim to identify developmental trajectories of risky  
7 drinking from early to mid-adolescence and to determine if intervention or control group  
8 membership, alcohol knowledge, attitudes towards alcohol and prevalence of alcohol harms would  
9 predict trajectory group membership. The specific hypotheses are:

- 10 1. The risky drinking developmental trajectories of intervention students will be lower than  
11 those of control students; and
- 12 2. Knowledge and attitudes towards alcohol will more likely be predictors of risky drinking  
13 membership in the control group than the intervention group.

#### 14 **Methods**

15 The research methodology for this study has been previously described in the study protocol and the  
16 paper reporting findings from the first year (Midford et al., 2014; Midford et al., 2012a). The study  
17 was approved by Edith Cowan University's and the University of Melbourne's human research ethics  
18 committees. It was also approved by the Research Branch, Education Policy and Research Division of  
19 the Victorian Department of Education and Early Childhood Development (DEECD).

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21 This research is part of a three year, cluster-randomized, controlled study that followed a cohort of  
22 students from the start of Grade eight (average age 13) to the end of Grade ten (average age 16).

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3 1 The intervention students received 10 lessons of the 18 lesson research-derived education program  
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5 2 in the first year, followed by eight lessons in the second year. No lessons from the DEVS *Get Ready*  
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7 3 program were provided in the third year (Cahill, Pose, and Beadle, 2013b, 2013a). The control  
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9 4 students received drug education lessons usually provided by their school. These varied considerably  
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11 5 from school to school, as no standard curriculum was specified.  
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15 7 At the commencement of the project, 21 Victorian government secondary schools were recruited to  
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17 8 the study on a voluntary basis, and allocated to greater metro/rural location and high/low  
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19 9 socioeconomic (SES) strata to approximate the proportion of Victorian secondary schools in each  
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21 10 category. Schools within each strata were then randomly allocated to either the intervention or  
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23 11 control condition on a two to one proportion to allow more precise statements about the effects of  
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25 12 the intervention (Hendricks Brown, 2006). Subsequently, schools were further partitioned into high,  
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27 13 medium and low socioeconomic strata so as to better align with the school SES categories derived  
28  
29 14 from DEECD's Student Family Occupation Index. One intervention school, with 44 participating  
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31 15 students at Post1, withdrew from the second year of the study because they did not have the  
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33 16 resources to implement the program. The statistical power of the study was not affected by this  
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35 17 withdrawal.  
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40 19 Written active assent was sought from the 2700 Grade 8 students in the 21 original participating  
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42 20 schools and their parents. Of this total population 1752 (64.9%) agreed to participate in the  
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44 21 research. The self-report survey instrument used to measure change was trialed in the pilot  
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46 22 research that preceded this study (Midford, Cahill, Ramsden, et al., 2012). Of relevance to this  
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48 23 study, the survey gathers information on knowledge, and attitudes related to alcohol and drugs, plus  
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50 24 patterns and context of use with implications for harm. At Baseline, 1161 usable surveys were  
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1 returned by intervention students and 585 by control students. At Post3 54% of intervention (n=621)  
2 students and 60% of control students (n=345) returned surveys.

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#### 4 **Measures**

5 Knowledge: The knowledge index represented the number of correct answers to 38 knowledge  
6 questions on alcohol, smoking and other drugs ( $\alpha=.86$ ,  $p<0.001$ ) (Midford, Cahill, Foxcroft, et al.,  
7 2012).

8 Attitudes: The alcohol attitude scale was a sum of five individual attitude variables (alcohol harm,  
9 alcohol education, safe use of alcohol, getting drunk on purpose and talking with parents about  
10 alcohol) measured on a five-point Likert scale, with higher scores representing safer alcohol-related  
11 attitudes ( $\alpha=.39$ ,  $p<0.001$ ) (Midford, Cahill, Foxcroft, et al., 2012).

12 Alcohol consumption: Those students who indicated they had consumed a full drink of alcohol were  
13 asked, in the past 12 months how many standard drinks (containing 10g of alcohol) they usually  
14 drank in one session. Responses ranged from non-drinker, 1-2 standard drinks, 3-4 standard drinks,  
15 5-6 standard drinks, 7-10 standard drinks, 11-20 standard drinks, to more than 20 standard drinks.

16 Risk factors: Binary alcohol consumption patterns included whether in the past 12 months the  
17 student drank alcohol alone, drank alcohol with family, drank at parties with adults present, drank at  
18 parties without adults present, planned to drink to get drunk, and drank more than planned.

#### 19 **Statistical Analysis**

20 A previous paper has reported (using CONSORT criteria) intention-to-treat analyses of the primary  
21 and secondary outcomes at final follow-up (Midford et al., 2017). Cronbach's Alpha was used as a

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3 1 measure of the lower bound of scale reliability, with  $\alpha > 0.7$  reflecting acceptable reliability. One  
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5 2 session alcohol consumption trajectories were modelled within MPlus with the censored normal  
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7 3 distribution used to account for the censoring at the lower bounds of the alcohol consumption scale.  
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9 4 A polynomial relationship was used to link consumption with time. All four time-points from  
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11 5 longitudinal data collected at baseline, Post 1, Post 2 and Post 3 were used in the calculation of  
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13 6 trajectories. Missing data at each time point were handled through Full Information Maximum  
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15 7 Likelihood (FIML) estimation enabling the use of all students with at least one valid score in the  
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17 8 analyses. FIML assumes missing at random and produces unbiased parameter estimates and  
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19 9 standard errors of the data (Wothke, 1998). Developmental trajectories of alcohol consumption  
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21 10 were identified using the semi-parametric group-based trajectory approach (Nagin, 2005). To  
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23 11 determine the best fitting models, models were compared through an examination of fit statistics as  
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25 12 well as theoretical justification and interpretability. Fit statistics examined included the Bayesian  
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27 13 Information Criterion (BIC; a smaller BIC value represents a better fit), and the Lo-Mendell-Rubin  
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29 14 Likelihood Ratio Test (LMR; comparing the current model against the model with one less class  
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31 15 should give a LMR and BLRT  $p$ -value less than 0.05) (Jung and Wickrama, 2008; Nylund, Asparouhov,  
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33 16 and Muthén, 2007). To ensure optimal solutions were obtained from the analysis, rather than local  
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35 17 maxima, 500 random sets of starting values were used in the model. Using both intervention and  
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37 18 control students, application of the minimum BIC for developmental trajectory model selection did  
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39 19 not result in the determination of a clear best model, with BIC improving with the addition of  
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41 20 classes. The LMR-BLRT test of model fit indicated that increasing the model from four classes to five  
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43 21 classes was not significant ( $p=0.6278$ ). Given this non-significant result and the small proportion of  
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45 22 students in the fifth class, the four-class model was chosen as optimal. Students were assigned to a  
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47 23 trajectory class based on their individual probability scores. The distributions indicated that  
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49 24 trajectory classes differed significantly on the proportion of intervention and control students. Due  
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51 25 to these significant differences and previous analyses which has shown differences in the control  
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1 and intervention groups, with respect to knowledge, consumption and harms over time [19],  
2 trajectory analyses were conducted separately on the intervention and control samples to  
3 determine the difference in the trajectories and the number of classes for each group.  
4 The BIC and LMR-LRT values for two-, three-, four-, and five-class models were compared. The LMR-  
5 LRT test of model fit indicating the three-class solution was a better fit than the four-class solution  
6 for intervention students ( $p=0.072$ ), while examination of BIC showed a four-class solution was the  
7 best fit for intervention students ( $p=0.489$ ).

8 Separate multi-level multinomial logistic regression models (using robust standard error estimation  
9 to account for school level clustering in the data) were fitted in Stata v12 (STATA Corp., College  
10 Station, Texas) for intervention and control students and were used to determine whether the  
11 knowledge, attitudes and harm predictors at baseline could individually be used to predict the  
12 identified one session alcohol consumption trajectory groups. Due to baseline differences, all  
13 models took into account school location (metropolitan/regional), SES and gender.

## 15 **Results**

16 Overall, the majority of students were females (54%), were from schools within the greater  
17 metropolitan area (78%), and classified as medium SES (54%) (Table 1). Controls schools have a  
18 significantly higher proportion of females (64% compared to 49%) ( $X^2=32.919$ ,  $p<0.001$ ), and a  
19 significantly higher proportion of students from regional areas (27% compared to 20%) ( $X^2=7.964$ ,  
20  $p=0.005$ ) than intervention schools. Intervention schools have a higher proportion of low SES (22%  
21 compared to 14%) and medium SES (59% compared to 45%), and a lower proportion of high SES  
22 (19% compared to 41%) students than control schools ( $X^2=100.263$ ,  $p<0.001$ ).

23 ----- Table 1 here -----



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3 1 At Baseline and Post 1 intervention and control students had similar distributions of alcohol  
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5 2 consumption in one session (both  $p < 0.05$ ) (Table 2). At Post 2 ( $\chi^2 = 14.90$ ,  $p = 0.011$ ) and Post 3  
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7 3 ( $\chi^2 = 12.441$ ,  $p = 0.029$ ), a significantly greater proportion of control students consumed larger  
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9 4 amounts of alcohol in one session than intervention students.

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15 6 There were no significant differences between intervention and control students with respect to  
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17 7 knowledge, attitudes and drinking behaviours (all  $p > 0.05$ ) at baseline (Table 3).

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20 8 ---- Table 3 here ----

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23 9 *Trajectories of alcohol consumption in one session*

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25 10 Using both intervention and control students, 40% of students were allocated to a *low stable*  
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27 11 trajectory, 48% to a *low decreasing* trajectory, 9% to a *medium increasing* trajectory and 3% to a  
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29 12 *high decreasing* trajectory. The distributions indicated that trajectory classes differed significantly on  
30  
31 13 the proportion of intervention and control students ( $\chi^2 = 36.946$ ,  $p < 0.001$ ). Distributions within the  
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33 14 *low stable* class were higher for intervention (45%) than for control (30%) students, and higher for  
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35 15 control students (56%) within the *low increasing* class than for intervention students (44%). There  
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37 16 were no significant differences in trajectories with respect to gender ( $\chi^2 = 0.641$ ,  $p = 0.887$ ).

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42 18 As described above, intervention and control distributions were significantly different. For the  
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44 19 intervention students (see Figure 1), the three alcohol consumption trajectories consisted of: *low*  
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46 20 *stable overall* (88%), *medium increasing overall* (9%) and *high with post program decrease* (3%). The  
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48 21 *low stable overall* trajectory corresponds to alcohol consumption of 1-2 standard drinks in one  
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50 22 session, but decreasing within that range. The *medium increasing overall* trajectory corresponds to  
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52 23 students starting at 1-2 standard drinks in one session and increasing to 5-6 standard drinks in one  
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54 24 session. The *high with post program decrease* trajectory corresponds to students starting at 1-2

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3 1 standard drinks in one session and increasing to 7-10 standard drinks in one session before  
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5 2 decreasing to 5-6 standard drinks in one session.  
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7 3 ---- Figure 1 here ----  
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10 4 For control students the four alcohol consumption trajectory classes consisted of: *low stable overall*  
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12 5 (30%); *low with post program increase* (56%); *medium increase overall* (10%) and *high increasing*  
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14 6 *overall* (4%). The *low stable overall* trajectory corresponds to alcohol consumption of 1-2 standard  
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16 7 drinks in one session. The *low with post program increase* trajectory corresponds to students  
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18 8 starting at 2-3 standard drinks in one session, decreasing during the course of the program to 1-2  
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20 9 standard and then increasing post program, but remaining in range of 1-2 standard drinks. The  
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22 10 *medium increase overall* trajectory corresponds to students starting at 1-2 standard drinks in one  
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24 11 session and increasing to 5-6 standard drinks in one session. The *high increasing overall* trajectory  
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26 12 corresponds to students starting at 1-2 standard drinks in one session and increasing to 6-8 standard  
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28 13 drinks in one session.

#### 14 **Are knowledge, attitudes, alcohol harms predictive of trajectories?**

15 Knowledge, attitudes and all alcohol harms are predictive of all increasing trajectories for both  
16 intervention and control students. Decreasing trajectories for intervention and control students  
17 differ with attitudes and most alcohol harms predictive for intervention students, and knowledge  
18 and one alcohol harm predictive for control students.

19 *Intervention medium increasing overall*: Students at baseline who reported greater knowledge  
20 ( $p=0.004$ ), had consumed alcohol (alone  $p<0.001$ ; at parties with adults  $p<0.001$ ; at parties without  
21 adults  $p<0.001$ ) who planned to get drunk ( $p<0.001$ ), and who consumed more alcohol than they  
22 planned ( $p<0.001$ ), had increased odds of being in the *medium increasing overall trajectory* group  
23 than in the *low stable overall* trajectory group. Students at baseline who reported greater positive  
24 attitudes ( $p<0.001$ ), and who had consumed alcohol with their families ( $p<0.001$ ) had diminished  
25 odds of being in the *medium increasing overall* trajectory group than in the *low stable overall*  
26 trajectory group.

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3 1 *Intervention high with post program decrease*: Students at baseline who had consumed alcohol  
4 2 (alone  $p<0.001$ ); at parties with adults  $p<0.001$ ); at parties without adults  $p<0.001$ ), who planned to  
5 3 get drunk ( $p<0.001$ ) and who consumed more alcohol than they planned ( $p<0.001$ ), had increased  
6 4 odds of being in the *high with post program decrease* trajectory group than in the *low stable overall*  
7 5 trajectory group. Students at baseline who reported greater positive attitudes ( $p<0.001$ ), had  
8 6 diminished odds of being in the *intervention high with post program decrease* trajectory group than  
9 7 in the *low stable overall* trajectory group.

10 8 *Control with post program increase*: Students at baseline who reported greater knowledge ( $p=0.002$ )  
11 9 and who consumed more alcohol than they planned ( $p=0.026$ ) had increased odds of being in the  
12 10 *low with post program increase* trajectory group than in the *low stable overall* trajectory group.

13 11 *Control medium and high increasing overall*: Students at baseline who reported greater knowledge  
14 12 (medium  $p=0.014$ ; high  $p=0.008$ ), had consumed alcohol (alone medium and high  $p<0.001$ , with  
15 13 family medium and high  $p<0.001$ , at parties with or without adults medium and high  $p<0.001$ ), who  
16 14 planned to get drunk (medium  $p<0.001$ ; high  $p<0.001$ ), and who consumed more alcohol than they  
17 15 planned (medium  $p<0.001$ ; high  $p<0.001$ ), had increased odds of being in the *medium and high*  
18 16 *increasing overall* trajectory group than in the *low stable overall* trajectory group. Students at  
19 17 baseline who reported greater positive attitudes had diminished odds of being in the *medium*  
20 18 ( $p=0.027$ ) and *high* ( $p=0.015$ ) *increasing overall* trajectory groups than in the *low stable overall*  
21 19 trajectory group.

22 20 ---- Table 4 here ----

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## 1 Discussion

2 This longitudinal study followed the trajectory of alcohol consumption in one session by students  
3 from 21 schools involved in the DEVS *Get Ready* harm minimisation drug education program. The  
4 period covered was the start of Grade 8 to the end of Grade 10. Knowledge, attitudes and drinking  
5 behaviours at the beginning of Grade 8 were used to predict risky drinking trajectory class  
6 membership for intervention and control students.

7 Prior studies using trajectory analyses to model adolescent risky drinking behaviour, have identified  
8 between three and five trajectory groups distinguished by factors such as gender, ethnicity, family  
9 structure, emotional distress, risk taking, age at drinking onset, family history of alcoholism, feeling  
10 drunk during first alcohol experience, and parental and peer approval of drinking (Colder et al.,  
11 2002; Warner, White, and Johnson, 2007; Tucker, Orlando, and Ellickson, 2003). Those in high risky  
12 drinking trajectory groups showed elevated levels of alcohol-related problems, with those in early  
13 high risky drinking trajectory groups at highest risk for alcohol dependence in adulthood (Colder et  
14 al., 2002; Chassin, Flora, and King, 2004; Chassin, Pitts, and Prost, 2002). This study aimed to  
15 determine if there were differences in the number, type and predictors of risky drinking trajectory  
16 groups for students involved in a harm minimisation intervention compared to students not involved  
17 in an intervention.

18 The control students have a greater number of consumption trajectories than the intervention  
19 students: four as compared to three. The nature of each group's set of trajectories and the  
20 percentage of students in each trajectory is also different. Both groups have a small percentage of  
21 students with consumption trajectories that increased substantially over the course of the study (3%  
22 of interventions and 4% of controls). The control group also had a higher level of consumption at the  
23 end of the program. This suggests that the drug education program reduced the number of  
24 students, who substantially increased their consumption over time, while at the same time reducing  
25 their level of consumption in relative terms. Both groups had a percentage of students whose

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3 1 drinking increased moderately over the course of the study (9% of interventions and 10% of  
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5 2 controls), with the control group ending with a higher level of consumption. As with the high  
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7 3 increasing trajectory there was a greater percentage of control students in the medium increasing  
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9 4 trajectory, and they ended with higher consumption. Again, this suggests that the drug education  
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11 5 program had a beneficial effect in terms of reducing numbers in the trajectory category and reducing  
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13 6 the consumption in relative terms.

16 7 Comparing the two groups' low consumption trajectories is more difficult because the intervention  
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18 8 students only exhibited a low stable trajectory. This identified the drinking pattern of the majority  
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20 9 (88%) of intervention students. In comparison the control students exhibited low stable (30%) and  
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22 10 low with post program increase (56%) consumption trajectories. This is the greatest difference  
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24 11 between the two study groups suggesting intervention students were more able to maintain low  
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26 12 levels of alcohol consumption than their control peers. A much smaller percentage of control  
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28 13 students had a trajectory of consistently low consumption, with a substantial number having initially  
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30 14 low consumption that increased post program.

34 15 When comparing the overall differences in intervention and control student consumption  
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36 16 trajectories, the intervention group have lower proportions in the higher consumption trajectories  
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38 17 and lower levels of consumption at the end of the program. This consistency of better intervention  
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40 18 student outcomes across all consumption trajectories provides strong evidence that the drug  
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42 19 education program was influential with all types of student drinkers, from low to high consumers. In  
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44 20 turn this means it is suitable for universal delivery.

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3 1 The trajectory analysis was also useful in identifying the association of initial student characteristics  
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5 2 and behaviours with their pattern of drinking over time. In of terms of the influence of prior alcohol  
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7 3 and drug (AOD) knowledge, a pattern of greater knowledge at baseline increased the odds for both  
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9 4 intervention and control students being in low and medium increasing consumption trajectory  
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11 5 groups. This suggests a greater prior interest in or experience with drinking was in turn predictive of  
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13 6 a greater increase in consumption over the course of the study. It does seem, however, that  
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15 7 exposure to the program's drug education weakened this relationship for those intervention  
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17 8 students who had a trajectory of high increasing consumption. Here, having greater prior knowledge  
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19 9 did not increase the odds of having a high increasing consumption trajectory, compared to controls.  
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22 10 It would seem that the program's drug education had its strongest effect on students with the  
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24 11 highest consumption trajectory, while also maintaining a low drinking trajectory for most drinkers  
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26 12 and not encouraging non-drinkers to start using. This finding supports suggestions from previous  
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28 13 research that teaching harm minimisation strategies, which aim to meet students at their individual  
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30 14 level of experience and knowledge in relation to alcohol and drug use, does not increase  
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32 15 consumption or uptake (McBride et al., 2004; Marlatt and Witkiewitz, 2010; Hamilton et al., 2007).  
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36 16 Initial attitudes towards alcohol use were predictive in terms of consumption trajectories. A pattern  
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38 17 of more responsible attitudes at baseline increased the odds for both intervention and control  
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40 18 students being in lower consumption trajectory groups. This relationship was clear and strong for  
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42 19 both groups and suggests that the attitudes students brought to their involvement in the study were  
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44 20 potent in terms of consumption trajectory, independent of exposure to the drug education program.  
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47 21 Pre-drinking before going out, drinking with peers, and parental supply of alcohol for unsupervised  
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49 22 drinking has previously been associated with facilitating risky drinking among adolescents (Gilligan et  
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51 23 al., 2012; Kuntsche and Gmel, 2013; Jackson et al., 2002; Jackson, Sher, and Schulenberg, 2008). In  
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53 24 this study, risk factors at baseline, such as drinking alone, drinking with family, drinking at parties  
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3 1 with adults, drinking at parties without adults, drinking to get drunk, and drinking more than  
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5 2 planned, all were strongly associated with higher consumption trajectories. The practice of drinking  
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7 3 alone, when measured at baseline, was strongly predictive of higher consumption trajectories for  
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9 4 intervention students, and even more strongly predictive of higher consumption trajectories for  
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11 5 control students. This suggests that drinking alone predisposed all students to engaging in  
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13 6 progressively heavier drinking, but exposure to the drug education program ameliorated this trend.  
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16 7 The practice of drinking with family, when measured at baseline was differentially predictive in the  
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18 8 case of intervention and control students. It was weakly predictive of a lower consumption  
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20 9 trajectory in the case of intervention students, and strongly predictive of higher consumption  
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22 10 trajectories in the case of control students. This suggests that exposure to the drug education  
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24 11 program interacted with established practice of drinking in a family context to protect against higher  
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26 12 consumption over time.  
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29 13 The consumption trajectory patterns for both intervention and control students, who drank at  
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31 14 parties, were very similar, whether this involved the presence of adults or not. In the case of both  
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33 15 groups and both levels of adult involvement, party drinking at baseline was strongly predictive of  
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35 16 higher consumption trajectories. In the context where party drinking had been established neither  
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37 17 an adult presence, nor exposure to the drug education program lessened progression to higher  
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39 18 levels of consumption. This suggests that drinking with peers in party contexts is a significant  
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41 19 influence on patterns of consumption.  
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45 20 Students from both intervention and control groups, who, at baseline, planned to get drunk prior to  
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47 21 drinking, or who drank more than they planned, were much more likely to have high consumption  
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49 22 trajectories. The extremely high odds ratios for being in the highest consumption trajectory  
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51 23 compared to being in lowest were particularly notable. These patterns of baseline drinking  
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53 24 behaviour seem to identify students at greatest risk of substantially increasing consumption over  
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3 1 time. The intervention students in the case of both the planning to get drunk and drinking more than  
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5 2 planned categories had less extreme highest to lowest consumption trajectory odds ratios,  
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7 3 compared to controls, which suggests some effect of the drug education program. However,  
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9 4 whether the effect was sufficient to provide meaningful benefit has to be questioned given the odds  
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11 5 ratios were still very high. This may indicate the need to commence provision of drug education  
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13 6 earlier and before onset of drinking practices.

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16 7 There are a number of limitations of this study. One-third of eligible students were not included in  
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18 8 this study due to the requirement to obtain active consent from both student and parents. This was  
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20 9 not a consequence of particular students or their parents being actively opposed to participation,  
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22 10 but rather a function of school follow up on the return of consent forms. The study also suffered  
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24 11 from 40% attrition from Baseline to Post3. Although high, this level of attrition over two years is  
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26 12 similar to a previous comparable study, and can be largely explained in terms of family mobility  
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28 13 (McBride et al., 2004). Such loss of participants at different points in the study should be expected  
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30 14 in this type of research, but it still has implications for the generalizability of findings. An addition  
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32 15 consideration is that the reliability of the attitude towards alcohol scale was low, but still significant.

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36 16 The impact of risky drinking on adolescents makes understanding the predictors of those within risky  
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38 17 alcohol consumption trajectory classes an important priority, due to their vulnerability and the  
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40 18 association of alcohol use with other health risk factors. The findings from this study indicate that  
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42 19 the DEVS *Get Ready* drug and alcohol program can be universally delivered to change risky alcohol  
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44 20 consumption trajectory development and reduce alcohol consumption, with the program having  
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46 21 greatest impact on students within highest consumption trajectories.

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**Table 1 Numbers in study at all time points**

|          | Intervention | Control   | Total     |
|----------|--------------|-----------|-----------|
| Baseline |              |           |           |
| Male     | 587(50.6)    | 211(36.0) | 798(45.7) |
| Female   | 574(49.4)    | 374(64.0) | 948(54.3) |
| Total    | 1161(66.5)   | 585(33.5) | 1746(100) |
| Post 1   |              |           |           |
| Male     | 456(50.1)    | 183(36.5) | 639(45.2) |
| Female   | 455(49.9)    | 319(63.5) | 774(54.8) |
| Total    | 911(64.5)    | 502(35.5) | 1413(100) |
| Post 2   |              |           |           |
| Male     | 350(49.4)    | 139(32.7) | 489(43.2) |
| Female   | 358(50.6)    | 286(67.3) | 644(56.8) |
| Total    | 708(62.5)    | 425(37.5) | 1133(100) |
| Post 3   |              |           |           |
| Male     | 310(49.9)    | 117(33.9) | 427(44.2) |
| Female   | 311(50.1)    | 228(66.1) | 539(55.8) |
| Total    | 621(62.5)    | 345(37.5) | 966(100)  |

**Table 2 Number of standard drinks in one session by intervention and control students over time**

| %                            | Baseline | Post 1 | Post 2 | Post 3 |
|------------------------------|----------|--------|--------|--------|
| <b>Intervention</b>          | n=1160   | n=954  | n=708  | n=621  |
| None                         | 76.6     | 72.0   | 62.9   | 48.3   |
| 1-2 standard drinks          | 13.4     | 16.9   | 16.7   | 15.3   |
| 3-4 standard drinks          | 5.7      | 6.2    | 11.0   | 16.3   |
| 5-6 standard drinks          | 2.5      | 3.2    | 4.4    | 10.0   |
| 7-10 standard drinks         | 1.3      | 1.3    | 3.8    | 7.9    |
| 11-20 standard drinks        | .5       | .4     | 1.1    | 1.4    |
| More than 20 standard drinks | .1       | 0.0    | .1     | .8     |
| <b>Control</b>               | n=584    | n=502  | n=424  | n=345  |
| None                         | 77.1     | 62.9   | 57.3   | 44.3   |
| 1-2 standard drinks          | 13.7     | 16.7   | 18.2   | 12.5   |
| 3-4 standard drinks          | 5.0      | 11.0   | 8.3    | 14.8   |
| 5-6 standard drinks          | 2.7      | 4.4    | 7.5    | 16.8   |
| 7-10 standard drinks         | 1.2      | 3.8    | 5.7    | 7.8    |
| 11-20 standard drinks        | .2       | 1.1    | 1.9    | 3.5    |
| More than 20 standard drinks | .2       | .1     | 1.2    | .3     |

**Table 3 Descriptive statistics of knowledge, attitudes and drinking behaviours at baseline by group**

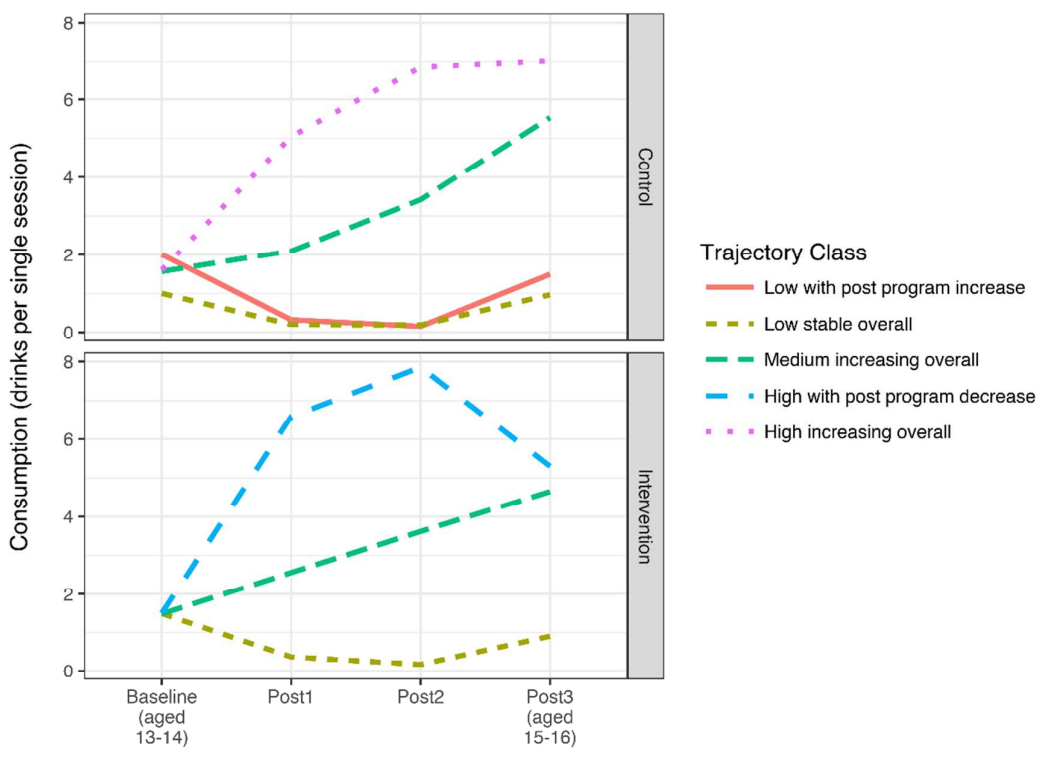
|                                    | Intervention | Control   |
|------------------------------------|--------------|-----------|
|                                    | Mean (Sd)    | Mean (Sd) |
| Knowledge index                    | 20.8(5.4)    | 21.0(5.3) |
| Attitude scale                     | 18.6(3.7)    | 18.6(3.7) |
|                                    | %            | %         |
| Drinking alone                     | 9.4          | 9.6       |
| Drinking with family               | 16.5         | 17.6      |
| Drinking at parties with adults    | 15.9         | 16.1      |
| Drinking at parties without adults | 16.3         | 14.7      |
| Drink to get drunk                 | 12.6         | 11.1      |
| Drinking more than planned         | 12.2         | 12.8      |

**Table 4 Multinomial regressions of baseline knowledge, attitudes and other risks on alcohol consumption trajectories**

| OR(95% CI)                      | Knowledge         | Attitudes         | Drink alone           | Drink with family   | Drink at parties with adults | Drink at parties without adults | Plan to get drunk       | Drink more than planned |
|---------------------------------|-------------------|-------------------|-----------------------|---------------------|------------------------------|---------------------------------|-------------------------|-------------------------|
| <b>Intervention</b>             |                   |                   |                       |                     |                              |                                 |                         |                         |
| Medium increasing overall       | 1.06(1.02,1.10)** | 0.89(0.85,0.95)** | 6.60(4.05,10.78)**    | 0.14(0.09,0.21)**   | 11.19(7.26,17.26)**          | 11.68(7.58,18.00)**             | 10.00(6.40, 15.64)**    | 10.73(6.84, 16.85)**    |
| High with post program decrease | 1.01(0.94,1.09)   | 0.78(0.70,0.87)** | 24.85(11.12,55.52)**  | 1.84(0.78,4.35)     | 34.20(13.50,86.66)**         | 53.77(18.29,158.09)**           | 37.95(15.56 ,92.54)**   | 50.91(19.92,130.12)**   |
| <b>Control</b>                  |                   |                   |                       |                     |                              |                                 |                         |                         |
| Low with post program increase  | 1.16(1.06,1.28)*  | 1.00(0.88,1.14)   | 1.47(0.41,5.29)       | 1.82(0.61,5.41)     | 1.25(0.41,3.77)              | 1.43(0.42,4.86)                 | 1.76(0.49,6.38)         | 4.54(1.20,17.16)*       |
| Medium increasing overall       | 1.14(1.03,1.27)** | 0.89(0.80,0.99)*  | 12.08(4.41,33.04)**   | 12.46(5.10,30.39)** | 9.25(3.78,22.64)**           | 12.46(4.84,32.10)**             | 14.38(5.35, 38.67)*     | 42.64(14.22,127.87)**   |
| High increasing overall         | 1.17(1.04,1.31)** | 0.85(0.75,0.97)*  | 34.34(10.25,115.08)** | 20.86(6.75,64.52)** | 22.78(7.29,71.17)**          | 182.76(33.34,1001.85)**         | 113.34(28.5 0,450.77)** | 167.06(40.26,693.25)**  |

\* $p < 0.05$ , \*\* $p < 0.001$ . Reference class is 'Low stable overall'. Odds ratio is a measure of the likelihood of class membership; knowledge, attitudes and behaviours measured at baseline. All models control for school location, gender, and SES.

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**Figure 1 Trajectories of alcohol consumption for intervention and control students**