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# Longitudinal associations between adult-supervised drinking during adolescence and alcohol misuse from ages 25–31 years: A comparison of Australia and the United States

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ABSTRACT

Prior studies suggest that adult supervised drinking in adolescence predicts greater adolescent alcohol misuse. Long-term follow up data examining how adult supervised drinking during adolescence relates to alcohol misuse in adulthood are lacking. Longitudinal data from the International Youth Development Study tested associations between adult supervised drinking during adolescence (ages 13–16; 2002–2004) and adult alcohol misuse (ages 25–31; 2014, 2018, 2020). Cross-nationally matched samples were compared in Washington State, USA (n = 961) and Victoria, Australia (n = 1,957; total N = 2,918, 55 % female, 83 % White), where adult-supervised adolescent alcohol use was more common. Multilevel analyses adjusted for state, sex, adolescent drinking, parent education, family management, family history of substance use problems, and parent alcohol-related norms. Adult supervised drinking in adolescence (at dinner or parties, on holidays) predicted more adult alcohol misuse (mean Alcohol Use Disorders Identification Test score; b[SE] 0.07[0.03]; p = 0.004) and higher rates of alcohol-impaired driving (Odds Ratio [OR] 1.501, p = 0.034) and riding with an alcohol-impaired driver (OR 1.669, p = 0.005), but not the use of strategies to moderate alcohol intake (e.g., counting drinks). Better family management (monitoring, clear rules) in adolescence predicted less adult alcohol misuse. Associations were similar in the two states. Reducing the frequency of adult supervised drinking and improving family management practices in adolescence may help to decrease alcohol misuse well into adulthood. Findings support the widespread implementation of substance use prevention and family management training programs.

## 1. Introduction

Underage alcohol use is associated with a wide range of negative consequences in adolescence and adulthood, including greater risk for alcohol misuse; alcohol-impaired driving; and a host of other negative physical and mental health, social, and economic outcomes (Booth and Feng, 2002; Marshall, 2014; Mason et al., 2011; McCambridge et al., 2011). To reduce alcohol-related problems at the population level and address underage drinking, national and regional governments take a variety of policy approaches. In Western countries, these range from zero-tolerance approaches that prohibit underage alcohol use (as in the United States of America; USA) to harm minimization approaches (as in Australia) that focus on reducing harm rather than alcohol use itself. One harm reduction strategy used in Australia until 2010–2014 (Lam, 2020; Victorian Commission for Gambling and Liquor Regulation, 1998; Victorian Commission for Gambling and Liquor Regulation, 2020) is recommending that parents teach responsible drinking in the home—for example, by supervising drinking or teaching skills such as pacing the number and timing of alcoholic drinks—so that youth can moderate their drinking when they reach any legal drinking age. Despite the

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compelling logic behind this strategy, prior studies suggest that supervised drinking in adolescence is associated with more alcohol consumption and a greater likelihood of alcohol-related harm in adolescence (Clare et al., 2019; McMorris et al., 2011; Degenhardt et al., 2015; Kaynak et al., 2014; Sharmin et al., 2017). The implications of supervised drinking in adolescence for later alcohol misuse and related harms in adulthood are unclear. This study used prospective longitudinal data from samples in Victoria, Australia and Washington State, USA to test associations between supervised drinking during adolescence and alcohol misuse, impaired driving, riding with an impaired driver, and use of alcohol intake moderation strategies in adulthood.

### 1.1. Past research on supervised drinking in adolescence

Existing studies of supervised drinking have consistently shown higher rates of alcohol use, risky drinking, and alcohol-related harms among youth who report adult supervised alcohol use (Degenhardt et al., 2015; Kaynak et al., 2014; Sharmin et al., 2017). For example, using adolescent data from the International Youth Development Study (IYDS), McMorris and colleagues (McMorris et al., 2011) found that, consistent with national and state alcohol policies at the time, supervised drinking was more commonly reported in Victoria than in Washington at age 14. In both states, more frequent supervised drinking at age 14 predicted more frequent alcohol use and a greater number of alcohol-related harms (e.g., getting into fights, blackouts, getting into trouble with police) at age 15. This association remained significant even when controlling family management practices (e.g., monitoring, clear rules), parent pro-drinking attitudes, family history of substance use problems, and respondent alcohol use frequency at age 13. The strength of association between supervised drinking and later harms was invariant across countries, despite the harm minimization approach in Victoria. This and other prior studies, however, focused on concurrent or short-term longitudinal alcohol use and misuse outcomes in adolescence, raising questions about how long links between adolescent supervised drinking and alcohol misuse endure.

Studies examining longer term associations between supervised drinking in adolescence and adult alcohol misuse are virtually nonexistent. One study from the USA found that female high school students who were permitted to drink alcohol either at home with meals or at home with friends reported more frequent weekend and binge drinking during their first semester of college (Livingston et al., 2010). It remains unclear whether supervised drinking during adolescence continues to be related to alcohol misuse farther into adulthood or whether it may be associated with differences in long-term patterns of alcohol use behaviors, such as delayed aging-out of alcohol use.

### 1.2. Other family-related factors to consider

Supervised drinking during adolescence occurs in the context of other parenting practices, as well as family and individual alcohol use history and norms that may influence patterns of alcohol misuse in adulthood. Early-onset drinking and family history of problem substance use have been well established as risks for alcohol misuse across the life course (Merline et al., 2008; Yuen et al., 2020). Long-term longitudinal studies offer support for associations between family management and parental norms about substance use during adolescence and alcohol misuse in the mid-20s and early 30s (McMorris et al., 2011; Bailey et al., 2021; Epstein et al., 2020; Lee et al., 2014). Thus, it is important to consider these other aspects of the adolescent family environment when testing associations between supervised drinking during adolescence and alcohol misuse in adulthood (Sharmin et al., 2017).

### 1.3. The current study

This study extends the McMorris et al. (McMorris et al., 2011) paper by using long-term longitudinal follow up data from the IYDS to examine associations between frequency of supervised drinking at ages 14–16 and measures of harmful alcohol use, alcohol-impaired driving, riding with an alcohol-impaired driver, and non-use of alcohol intake moderation strategies across ages 25–31. Harmful alcohol use, alcohol-impaired driving, and riding with an alcohol-impaired driver are particularly important outcomes to examine because of high prevalence and associated public health burden (Myers et al., 2023; Oh et al., 2020). More frequent drinking with adult supervision during adolescence was expected to predict more harmful alcohol use, higher likelihood of impaired driving or riding with an alcohol-impaired driver, and less use of alcohol intake moderation strategies in adulthood. It was expected that these behaviors also would be more persistent over time for adults with a higher frequency of supervised drinking during adolescence. Based on multiple prior IYDS studies showing cross-nationally invariant associations between alcohol use and related harms (McMorris et al., 2011; Bailey et al., 2021; Epstein et al., 2020; Beyers et al., 2004; McMorris et al., 2007), the strength of association between supervised drinking during adolescence and the focal alcohol use outcomes was expected to be similar in Victoria and Washington, despite the harm minimization approach to adolescent drinking in Victoria.

## 2. Methods

### 2.1. Participants and procedures

The IYDS began in 2002, and included three cohorts of youth in fifth grade (age 11; youngest cohort), seventh grade (age 13; middle cohort), and ninth grade (age 15; oldest cohort) recruited from middle schools in Victoria and Washington (McMorris et al., 2011; McMorris et al., 2007). The study used a two-stage sampling procedure to obtain samples that were state-representative of students in Grades 5, 7, and 9: schools with students in each of the three grade levels were randomly selected with a probability-proportionate-to-size approach within state, then classrooms were randomly selected within schools. A total of 2,885 students in Washington and 2,884 students in Victoria participated (~74 % of students in selected classrooms in each state). State samples were gender balanced. Cognitive pretesting showed that race and ethnicity were conceptualized differently in the two countries. In Washington, 4 % of students identified as African American, 7 % as Asian American/Pacific Islander, 12 % as Hispanic/Latinx, 6 % as Native American/American Indian, and 65 % as White; 3 % identified with other groups. In Australia, 1 % of respondents identified as Aboriginal/Torres Strait Islander, < 1 % as African, 6 % as Asian/Pacific Islander, 88 % as Australian (read: White), and < 1 % as Spanish/Hispanic/Latinx; 2 % identified with other groups.

Due to funding constraints, only the middle cohort was followed longitudinally in Washington. All three cohorts were followed longitudinally in Victoria. The current study includes data collected at ages 13–16 (adolescence, 2002–2004) and 25–31 (adulthood, 2014, 2018, 2020) from the Washington middle cohort (n = 961) and the Victoria middle (n = 984) and oldest cohorts (n = 973); the youngest cohort in Victoria had not reached mean age 31 by 2020 and was excluded. Data were collected using in-school proctored paper surveys in adolescence and web surveys in adulthood. Retention rates were above 80 % of still-living respondents at each wave in both countries. The study was approved by the University of Washington Institutional Review Board and the ethics boards at the University of Melbourne and Deakin University. Parental consent and minor assent were obtained for adolescent data collections. Respondent consent was obtained at each adult data collection.

### 2.2. Measures

The study survey is an adapted version of the Communities that Care Youth Survey, which has been well validated and widely used in prior published studies. (Arthur et al., 2002) Measures have been modified

slightly to ensure cross-national comparability and developmental appropriateness as the sample has aged.

#### 2.2.1. Supervised drinking in adolescence

Participants self-reported how often (0 *never* to 7 *40 + times*) they had drunk alcohol a) at dinner or on a special occasion or holiday with adult supervision or b) at parties with adult supervision in the past year at ages 14 and 15 (middle cohort) or age 15 and 16 (oldest cohort). To reduce potential bias due to outliers, responses were recoded to 0 *never* to 3 *6 + times*. Supervised drinking frequency was averaged across available waves.

#### 2.2.2. Harmful alcohol use in adulthood

At each adult time point, participants completed the Alcohol Use Disorders Identification Test (AUDIT). (Saunders et al., 1993) Mean scores across all items were calculated. Higher scores indicate more harmful alcohol use.

#### 2.2.3. Alcohol-impaired driving in adulthood

At each adult time point, participants were asked a) how frequently they had driven "when probably affected by alcohol" (0 *never* to 4 *daily or more often*) and b) how frequently they had driven after drinking "above the legal limit for drivers" in the past year (0 *never* to 7 *40 + times*). Responses were dichotomized to indicate any alcohol-impaired driving in the past year at each wave.

#### 2.2.4. Riding with an alcohol-impaired driver in adulthood

Respondents reported how often they had "ridden in a car or other motor vehicle where the driver was impaired by alcohol use" in the past year at each adult time point (0 *never* to 7 *40 + times*). Responses were dichotomized to indicate any instance of riding with an impaired driver in the past year at each wave.

#### 2.2.5. Low use of alcohol intake moderation strategies in adulthood

Respondents reported whether there had been occasions in the past year when they were drinking alcohol but didn't want to exceed legal limits for blood alcohol content (1 *yes,* 2 *I never drink enough to go over the limit*, 3 *I don't care if I go over the limit*) at each adult survey. Respondents who answered 'yes' were then asked how often they used a range of alcohol intake moderation strategies, such as refusing, counting, or sipping drinks or eating a meal or snack (6 items, 0 *never* to 4 *always*; Cronbach's alpha = 0.79). Items were reversed and averaged at each wave; higher scores indicate less use of intake moderation strategies.

#### 2.2.6. Covariates

2.2.6.1. *Alcohol use at baseline* was self-reported by participants at their first survey timepoint (i.e., age 13 for the middle cohort, age 15 for the oldest cohort), and measured the frequency of past-month alcohol use (0 *never* to 7 *40 + times*). To reduce potential for bias due to outliers, responses were recoded (0 *never* to 3 *6 + times*).

2.2.6.2. *Family history of substance use problems* was assessed at ages 13, 14, and 15 (middle cohort) or 15 and 16 (older cohort) by asking respondents whether any family members had a "severe alcohol or drug problem" (1 *yes at any wave*, otherwise 0).

2.2.6.3. *Poor adolescent family management* measures were collected at ages 13, 14, and 15 (middle cohort) or 15 and 16 (older cohort). Respondents answered a series of nine questions about their parents' family management practices, including checking to see if homework was done, knowing where the respondent was and who they were with when not at home, and having clear rules (Cronbach's alpha = 0.81——0.83 across waves). Items were reversed and averaged within wave; higher scores indicate less optimal family management practices.

2.2.6.4. *Parent norms against alcohol use* were assessed at each wave in adolescence. Participants reported "how wrong" their parents would think it was if the respondent a) drank beer or wine regularly or b) drank liquor or spirits regularly (0 *not wrong at all* to 4 *very wrong)*. Correlations between the two items ranged from 0.78 to 0.84 across waves. Items were averaged within wave and then across waves. Higher scores indicate stronger parental norms against adolescent alcohol use.

2.2.6.5. *Demographics*. Student exact age (rounded to the nearest year) was calculated at each adult wave based on participant's birth date and the survey date. Although respondents were all in the same grade at baseline (middle cohort: Grade 7, oldest cohort: Grade 9), they ranged somewhat in age within grade. Thus, respondents' exact ages ranged from 24 to 29 in 2014 (M = 25.7), from 28 to 31 in 2018 (M = 29.3), and from 30 to 33 in 2020 (M = 31.3). Parent education (highest degree completed) was reported by parents at baseline. The highest education level of either parent was used. Student sex (0 *female*, 1 *male*) was based on parent report. A "state" variable indicated whether the respondent was recruited from Victoria (coded as 1) or Washington (coded as 0).

## 3. Analysis

A series of four multilevel models—one for each adult alcohol misuse outcome—was estimated using Mplus version 8.4 (Muthén and Muthén, 1998–2019.) and maximum likelihood estimation; a logit link function was used with dichotomous outcomes. Models accounted for clustering of observations within person. Full Information Maximum Likelihood was used to handle missing data; excepting parent education (3.2 %) and baseline alcohol use frequency (1.1 %), missing data on independent variables was 0.4 % or less. To model developmental change in alcohol misuse outcomes over time (age), adult outcome variables measured in 2014, 2018, and 2020 were arrayed by age; only ages 25–31 were included in analyses because of small cell sizes at ages younger than 25 and older than 31. We examined the functional form of each outcome by including both age and age squared terms in models; age squared was not significantly related to any of the outcomes examined and was dropped. Supervised drinking in adolescence, demographics, and covariates measured in adolescence were entered as time-fixed predictors (level 2) of adult alcohol misuse outcomes. Multiplicative state-by-supervised-drinking and age-by-supervised-drinking variables were created to enable tests, respectively, of whether the strength of association between adolescent supervised drinking and alcohol misuse outcomes differed in Victoria compared to Washington and whether the alcohol misuse age slope (i.e., degree of persistence in alcohol misuse) differed by frequency of adolescent supervised drinking.

## 4. Results

Analyses included 2,566 respondents who were age 25 to 31 at any of the 2014, 2018, or 2020 data collection waves (Table 1). Retained participants were more likely to be female (92 % versus 84 % of males) and have parents who attended college (46 % versus 36 %) but were no more or less likely to have initiated alcohol use at baseline and did not differ significantly from those who attritted in adolescent supervised drinking frequency. About 76 %, 81 % and 85 % of respondents scored in the "low risk" range on the AUDIT in 2014, 2018, and 2020, respectively; 12 %-20 % scored in the "risky" range and 3 %-4% in the "harmful or high risk" range at each wave. Mean AUDIT scores at each wave were 0.38 (SD 0.45), 0.32 (SD 0.42), and 0.24 (SD 0.39), respectively. Between 26 % and 32 % of respondents reported alcohol impaired driving at each wave; a similar proportion reported riding with an impaired driver.

A greater frequency of supervised drinking in adolescence, living in Victoria compared to Washington, being male, reporting a higher frequency of baseline alcohol use, experiencing poorer family management during adolescence, and having a family history of substance use problems predicted higher AUDIT scores across ages 25–31 (Table 2). AUDIT scores decreased linearly with increasing age. Other covariates, including the state- and age-by-supervised-drinking interaction terms, were unrelated to AUDIT mean scores in adulthood.

Greater frequency of supervised drinking in adolescence, being male,

**Table 1**
Demographics of the analytic sample by state.

| Characteristic | Victoria | | Washington | |
|---|---|---|---|---|
| | N (%) | M (SD) | N (%) | M (SD) |
| Sex | | | | |
| Female | 1,008 (51.5) | – | 489 (50.9) | – |
| Male | 949 (48.5) | – | 472 (49.1) | – |
| Age in 2014 (in years) | – | 25.8 (1.1) | – | 25.2 (0.5) |
| Parent education | | | | |
| >= Grade 11 | 265 (14.2) | – | 77 (9.1) | – |
| GED | 285 (15.3) | – | 20 (2.1 | – |
| High school | 249 (13.3) | – | 160 (17.1) | – |
| Some trade/business school | 346 (18.5) | – | 53 (5.7) | – |
| AA degree | 66 (3.5) | – | 91 (9.7) | – |
| Some college | 271 (14.5) | – | 249 (26.7) | – |
| College graduate | 141 (7.6) | – | 162 (17.3) | – |
| Postgraduate degree | 157 (8.4) | – | 110 (11.8) | – |
| Other | 87 (4.7) | – | 3 (0.3) | – |
| Race and ethnicity (Australia) | | | | |
| African | 14 (0.7) | – | – | – |
| Aboriginal/Torres Strait Islander | 18 (0.9) | – | – | – |
| Spanish/Hispanic | 15 (0.8) | – | – | – |
| Asian | 107 (5.5) | – | – | – |
| Pacific Islander | 12 (0.6) | – | – | – |
| White | 1,754 (89.6) | – | – | – |
| Other race or ethnicity | 27 (1.4 %) | – | – | – |
| Race and ethnicity (United States) | | | | |
| Hispanic/Latino(a) | – | – | 172 (18.5) | – |
| African American/Black | – | – | 45 (4.7) | – |
| Native American | – | – | 78 (8.1) | – |
| Asian | – | – | 55 (5.7) | – |
| Native Hawaiian or Pacific Islander | – | – | 24 (2.5) | – |
| White | – | – | 698 (72.6) | – |

Note: Race and ethnicity percentages may not sum to 100% due to rounding and non-mutually exclusive classification. Race and ethnicity are conceptualized differently in the two countries, which necessitated different response options.

higher baseline alcohol use frequency, higher level of parent education, and poorer family management during adolescence predicted a higher probability of alcohol-impaired driving in adulthood (Table 3). Increasing age predicted a lower probability of alcohol-impaired driving. Neither state, the state- or age-by-supervised-drinking interaction terms, nor remaining covariates were significantly related to the probability of alcohol-impaired driving in adulthood.

A greater frequency of supervised drinking in adolescence, being male, reporting a higher frequency of baseline alcohol use, poorer adolescent family management, and having a family history of substance use problems all predicted a higher probability of riding with an alcohol-impaired driver in adulthood (Table 4). The probability of riding with an impaired driver decreased linearly with age. State, state- and age-by-supervised-drinking interaction terms, and remaining covariates were unrelated to the probability of riding with an alcohol-impaired driver.

Supervised drinking in adolescence was unrelated to the frequency of use of alcohol intake moderation strategies in adulthood (Table 5). Being male and experiencing poorer family management during adolescence predicted less use of these strategies (i.e., more "low use"); having parents with more education and who held less positive norms toward alcohol use predicted greater use of these strategies (i.e., less "low use"). None of the other included variables, including state and the state- and age-by-supervised-drinking interaction terms, was related to the frequency of use of alcohol intake moderation strategies in adulthood.

**Table 2**
Results of fixed-effects mixed model predicting AUDIT mean score across ages 25–31 years (n = 2,566).

| Predictor | b(SE) | Std. estimate (β) | *p* value |
|---|---|---|---|
| Within-person (time-varying) | | | |
| Age | **−0.014 (0.005)** | **−0.112** | **0.005** |
| Age * supervised drinking interaction | 0.002 (0.003) | 0.028 | 0.473 |
| Between-person (time-fixed) | | | |
| Supervised drinking in adolescence | **0.066 (0.023)** | **0.172** | **0.004** |
| State (1 = Victoria) | **0.146 (0.043)** | **0.428** | **0.001** |
| State * supervised drinking interaction | −0.034 (0.025) | −0.126 | 0.174 |
| Male (1 = yes) | **0.169 (0.016)** | **0.493** | **<0.001** |
| Baseline alcohol use frequency | **0.039 (0.012)** | **0.094** | **0.001** |
| Parent education | 0.004 (0.003) | 0.027 | 0.234 |
| Poor family management | **0.103 (0.020)** | **0.135** | **<0.001** |
| Family history of substance use problems | **0.041 (0.017)** | **0.121** | **0.016** |
| Parent norms against alcohol use | 0.013 (0.014) | 0.029 | 0.351 |

Note: AUDIT = Alcohol Use Disorder Identification Test. Std. = standardized. Standardized estimates for categorical predictors are standardized with respect to the outcome variable (STDY) and show the expected change in AUDIT mean score in standard deviation units for each 1-unit change in the predictor. Standardized estimates for continuous predictors are standardized with respect to both the predictor and the outcome (STDYX) and show the expected change in AUDIT mean score in standard deviation units for each standard deviation change in the predictor. Statistically significant predictors at p <.05 are bolded. Dichotomous variables (state, male, family history of substance use problems) had to be excluded from the FIML model as they caused problems with model identification. These variables had very few missing cases (n = 3).

**Table 3**
Results of fixed-effects mixed model predicting driving under the influence of alcohol (yes/no) across ages 25–31 years (n = 2,566).

| Predictor | b(SE) | Odds ratio | *p* value |
|---|---|---|---|
| Within-person (time-varying) | | | |
| Age | **−0.177 (0.052)** | **0.837** | **0.001** |
| Age * supervised drinking interaction | 0.055 (0.029) | 1.056 | 0.059 |
| Between-person (time-fixed) | | | |
| Supervised drinking in adolescence | **0.443 (0.188)** | **1.5557** | **0.019** |
| State (1 = Victoria) | −0.042 (0.371) | 0.959 | 0.907 |
| State * supervised drinking interaction | −0.325 (0.208) | 0.723 | 0.119 |
| Male (1 = yes) | **1.184 (0.142)** | **3.267** | **<0.001** |
| Baseline alcohol use frequency | **0.204 (0.101)** | **1.223** | **0.043** |
| Parent education | **0.057 (0.027)** | **1.059** | **0.031** |
| Poor family management | **0.662 (0.169)** | **1.939** | **<0.001** |
| Family history of substance use problems | 0.043 (0.148) | 1.044 | 0.772 |
| Parent norms against alcohol use | 0.101 (0.121) | 1.106 | 0.404 |

Note: Statistically significant predictors at $p < .05$ are bolded. Dichotomous variables (state, male, family history of substance use problems) had to be excluded from the FIML model as they caused problems with model identification. These variables had very few missing cases (n = 3).

## 5. Discussion

This study tested long-term longitudinal associations between frequency of supervised drinking in adolescence and measures of harmful alcohol use, alcohol-impaired driving, riding with an alcohol-impaired driver, and non-use of alcohol intake moderation strategies in adulthood. Findings showed that more frequent supervised drinking during adolescence was linked to higher levels or greater prevalence of three

**Table 4**
Results of a fixed-effects mixed model predicting riding with an alcohol-impaired driver (yes/no) across ages 25–31 years (n = 2,566).

| Predictor | b(SE) | Odds ratio | p value |
|---|---|---|---|
| Within-person (time-varying) | | | |
| Age | **−0.251 (0.053)** | **0.778** | **<0.001** |
| Age * supervised drinking interaction | 0.039 | 1.040 | 0.176 |
| Between-person (time-fixed) | | | |
| Supervised drinking in adolescence | **0.485 (0.180)** | **1.624** | **0.007** |
| State (1 = Victoria) | −0.557 (0.350) | 0.573 | 0.112 |
| State * supervised drinking interaction | −0.357 (0.200) | 0.700 | 0.073 |
| Male (1 = yes) | **0.562 (0.132)** | **1.754** | **<0.001** |
| Baseline alcohol use frequency | **0.317 (0.098)** | **1.373** | **0.001** |
| Parent education | 0.038 (0.026) | 1.039 | 0.138 |
| Poor family management | **0.447 (0.165)** | **1.564** | **0.004** |
| Family history of substance use problems | **0.372 (0.141)** | **1.451** | **0.008** |
| Parent norms against alcohol use | −0.001 (0.121) | 0.999 | 0.992 |

Note: Statistically significant predictors at $p < .05$ are bolded. Dichotomous variables (state, male, family history of substance use problems) had to be excluded from the FIML model as they caused problems with model identification. These variables had very few missing cases (n = 3).

**Table 5**
Results of a fixed-effects mixed model predicting low use of strategies to moderate alcohol use across ages 25–31 years (n = 2,566).

| Predictor | b(SE) | Std. estimate (β) | p value |
|---|---|---|---|
| Within-person (time-varying) | | | |
| Age | −0.033 (0.022) | −0.110 | 0.125 |
| Age * supervised drinking interaction | 0.001 (0.011) | 0.005 | 0.943 |
| Between-person (time-fixed) | | | |
| Supervised drinking in adolescence | 0.053 (0.071) | 0.047 | 0.456 |
| State (1 = Victoria) | −0.002 (0.129) | −0.002 | 0.991 |
| State * supervised drinking interaction | −0.115 (0.076) | −0.228 | 0.130 |
| Male (1 = yes) | **0.322 (0.043)** | **0.501** | **<0.001** |
| Baseline alcohol use frequency | −0.071 (0.048) | 0.027 | 0.141 |
| Parent education | **−0.029 (0.009)** | **−0.117** | **0.001** |
| Poor family management | **0.190 (0.057)** | **0.133** | **0.001** |
| Family history of substance use problems | −0.071 (0.048) | −0.111 | 0.141 |
| Parent norms against alcohol use | **−0.093 (0.040)** | **−0.108** | **0.020** |

Note: Std. = standardized. Standardized estimates for categorical predictors are standardized with respect to the outcome variable (STDY) and show the expected change in low use of strategies to moderate alcohol intake in standard deviation units for each 1-unit change in the predictor. Standardized estimates for continuous predictors are standardized with respect to both the predictor and the outcome (STDYX) and show the expected change in low use of alcohol intake moderation strategies in standard deviation units for each standard deviation change in the predictor. Statistically significant predictors at $p < .05$ are bolded. Dichotomous variables (state, male, family history of substance use problems) had to be excluded from the FIML model as they caused problems with model identification. These variables had very few missing cases (n = 3).

out of the four adult alcohol misuse outcomes examined. In fact, supervised drinking in adolescence was linked to the most concerning outcomes, including AUDIT mean score, which measures both consumption and experience of alcohol-related harms, (Saunders et al., 1993) as well as alcohol impaired driving and riding with an alcohol-impaired driver, both of which carry significant risk for severe health and financial consequences. Although supervised drinking was linked to higher levels of these outcomes overall (main effects), it did not predict greater persistence in alcohol misuse over time (i.e., no age-by-supervised-drinking interactions).

This study extended work by McMorris and colleagues using the current sample (McMorris et al., 2011) and a large body of other cross-sectional and longitudinal studies that found positive associations between adult supervised drinking and greater alcohol use, misuse, and related harm in adolescence (Degenhardt et al., 2015; Kaynak et al., 2014; Sharmin et al., 2017). The current findings suggest that these associations may persist well into adulthood and that reducing the prevalence of supervised drinking in adolescence may help to reduce problematic alcohol use and impaired driving among adults. Reflecting the weight of scientific evidence, changes to state and national policy in Australia in 2010–2014 softened recommendations that parents teach responsible drinking at home (Lam, 2020; Kelly et al., 2016) and were accompanied by dramatic reductions in the prevalence of supervised drinking and parental provision of alcohol and adolescent alcohol use (Kelly et al., 2016). As of 2020, the Australian national government recommends that children under the legal purchase age not be given alcohol (Lam, 2020). It will be interesting to see whether these changes are accompanied by reductions in adult alcohol misuse and impaired driving in the coming years.

Despite differences in policy approaches to adolescent alcohol use (harm minimization versus zero-tolerance), multiple prior studies from the IYDS have shown remarkable cross-national similarity in etiologic processes related to alcohol use and misuse, as well as the degree to which alcohol misuse is associated with harms in adolescence and early adulthood (McMorris et al., 2011; Bailey et al., 2021; Epstein et al., 2020; Beyers et al., 2004). This study extends prior work by showing that supervised drinking during adolescence appears to operate as a risk factor for poor alcohol use outcomes well into adulthood and to the same degree in different policy contexts. Findings are not consistent with the principal of harm minimization that adolescent alcohol consumption, even when supervised, can be effectively separated from later alcohol-related harm.

Two other notable findings emerged. First, poor family management in adolescence was linked to all of the adult alcohol misuse measures examined here, even after adjusting for multiple potential confounds. Consistent with the limited literature on long-term longitudinal associations between adolescent family management and adult alcohol outcomes (e.g., Lee et al., 2014) this finding suggests that family management practices during adolescence may have long-lasting impacts on alcohol use that stretch into the 30s. Second, baseline alcohol use frequency was uniquely related to adult AUDIT scores and alcohol-impaired driving outcomes many years later. This finding further underlines the importance of preventing adolescent alcohol use in order to reduce adult alcohol misuse (Marshall, 2014; Mason et al., 2011; Hingson et al., 2006) and is consistent with the emerging notion of alcohol use disorder as an adolescent onset disease. (McCrory and Mayes, 2015).

## 6. Limitations

The 2020 data collection (U.S. middle cohort, mean age 31) occurred during the first 9 months of the COVID-19 pandemic, which may have affected reports of adult alcohol outcomes in the Washington subsample. However, visual inspection of mean AUDIT scores and rates of impaired driving or riding with an impaired driver by age (available on request) showed that scores in the Washington subsample continued a typical, age-graded pattern of decline (Myers et al., 2023) from ages 25 (pre-pandemic) to 31 (mid-pandemic); US national rates of impaired driving also did not deviate from historical trends in 2020. (Myers et al., 2023) Both driving under the influence of alcohol and riding with an alcohol-impaired driver were measured with one or two items and may be subject to social desirability bias. Adolescents may not be optimal reporters of family history of substance use problems. Adult supervised use of alcohol at “dinners/holidays” and “parties” were combined here;

quantity of supervised use and baseline use were not assessed. These limitations are balanced by important strengths, including the use of prospective longitudinal data, extensive pretesting of surveys, and identical procedures across states to maximize cross-state comparability (McMorris et al., 2007).

## 7. Conclusions

Reducing the frequency of adult supervised drinking in adolescence may help to decrease alcohol misuse and involvement in alcohol impaired driving well into adulthood. Findings also support the widespread implementation of tested effective substance use prevention and family management training programs as ways to reduce alcohol misuse and risky driving in adulthood.

## CRediT authorship contribution statement

**Jennifer A. Bailey:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing. **Vi T. Le:** Conceptualization, Writing – review & editing. **Barbara J. McMorris:** Conceptualization, Writing – review & editing. **Gabriel J. Merrin:** Conceptualization, Writing – review & editing. **Jessica A. Heerde:** Conceptualization, Writing – review & editing. **Ebru A. Batmaz:** Conceptualization, Writing – review & editing. **John W. Toumbourou:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Project administration, Writing – review & editing.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.

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