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Girls**

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**The relationship between parent drinking and adolescent drinking: differences for mothers and fathers and boys and girls**

**Short title:** Parent drinking and adolescent drinking

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**ABSTRACT** (250 words)

**Background:** Gender differences in the relationship between parent drinking and adolescent drinking are poorly understood. As parental alcohol use is a primary early exposure to alcohol for adolescents, it is important to understand how consequences may differ for adolescent males and females.

**Objectives:** The aim of this paper was to examine gender differences in the relationship between mother's and father's heavy episodic drinking, and its combination, and adolescent drinking.

**Methods:** The sample included 2,800 14-15 year olds (48.9% female) living in two-parent households from the Longitudinal Study of Australian Children. The adolescent outcome measure was having had an alcoholic drink in the past year. Mothers and fathers self-reported their frequency of heavy episodic drinking. Covariates included parents' education, smoking, non-English-speaking background, and symptoms of psychological distress. Logistic regression was used to examine the hypotheses.

**Results:** After adjustment for covariates, both mothers' and fathers' heavy episodic drinking significantly increased the likelihood of adolescent drinking. Moreover, fathers' heavy drinking was more strongly related to adolescent drinking for girls. However, there were no gender differences in the relationship between mothers' drinking and adolescent drinking, and the combination of mothers' and fathers' drinking was not more risky than heavy drinking in either parent alone.

**Conclusions:** Parent heavy episodic drinking is a risk factor for adolescent drinking, after controlling for potential confounding variables. Results suggest that girls may be especially vulnerable to parent heavy drinking in early adolescence. This variation should be considered in the design and evaluation of family-based interventions to prevent adolescent drinking.

**KEYWORDS**

Parent drinking, heavy episodic drinking, adolescent alcohol use, adolescents, gender, family risk factors

## **The relationship between parent heavy episodic drinking and adolescent drinking: Differences for mothers and fathers and boys and girls**

Several longitudinal investigations show a positive association between parent drinking and drinking during early adolescence (Rossow, Keating, Felix, & McCambridge, 2016). In general, adolescents with parents who drink more heavily tend to start drinking younger (Donovan, 2004; Hung, Yen, & Wu, 2009) and to drink greater amounts throughout adolescence (Alati et al., 2014). However, several important questions about the gendered nature of the association between parent drinking and adolescent drinking remain. First, the literature is unclear about whether effects of parent drinking are stronger for adolescent males or females. Second, there is insufficient evidence for whether, in two-parent households, mothers' drinking, fathers' drinking, or the combination of both parents' drinking, is most strongly associated with adolescent drinking. These questions are important because parental alcohol use is a primary early exposure to alcohol for children and adolescents.

Understanding gender differences in the nature and consequences of this exposure is essential information for researchers and practitioners who design, implement and evaluate treatment programs and provide public health advice to parents. Finally, many past studies have used small, cross-sectional samples. To understand the nature of the association between parent and adolescent drinking, it will be beneficial to utilise longitudinal data from cohort studies.

The dominant explanation for the association between parent and adolescent drinking is parental modelling, both of drinking itself, and of alcohol-related cognitions and expectations (Campbell & Oei, 2010). Drawing on social learning theory, some authors have proposed the presence of same-sex modelling, such that the drinking of adolescent boys would be more strongly related to their father's drinking, and the drinking of adolescent girls more strongly related to their mother's drinking (Wickrama, Conger, Wallace, & Elder Jr,

1999; Yu & Perrine, 1997). Alternatively, gender intensification theory suggests that girls might be more sensitive to parental drinking. According to the theory, socialisation processes during early adolescence lead boys to become more independent and autonomous, while girls become more communal, or concerned for the welfare of close others. Thus, girls will be more reactive to adverse family environments than boys because they are more emotionally enmeshed in family relationships (Skeer et al., 2011).

However, empirical support based on longitudinal studies for differential effects of parental drinking for adolescent males and females is inconsistent. A few studies have found stronger or more consistent associations between parent drinking and adolescent drinking for girls (Green, Macintyre, West, & Ecob, 1991; Haugland, Holmen, Krokstad, Sund, & Bratberg, 2015). For instance, Coffelt and colleagues (2006) found that fathers' alcohol problems were associated with higher rates of alcohol use for adolescent girls only. Similarly, Burk and colleagues (2011) found that more frequent drinking (averaged across parents) was more strongly associated with greater quantities of alcohol use for adolescent girls than boys. Other studies have found no gender differences (Alati et al., 2014; McGue, Malone, Keyes, & Iacono, 2014; Poelen, Scholte, Willemsen, Boomsma, & Engels, 2007), and at least one study demonstrated stronger effects of parental drinking for boys (Cleveland & Wiebe, 2003).

The evidence is also quite unclear about the relative importance of mothers' and fathers' drinking for adolescent drinking. Many longitudinal studies lack information about father's drinking, or average reports across parents for analysis (Donovan & Molina, 2014; Duncan, Gau, Duncan, & Strycker, 2011; Latendresse et al., 2008). Amongst studies that do examine the role of both mother's and father's drinking, some show that only mother's drinking is significantly associated with adolescent drinking after controlling for father's drinking (Chassin, Pillow, Curran, Molina, & Barrera Jr, 1993; Macleod et al., 2008; Poelen et al., 2007). Others report statistically significant coefficients for both parents (Alati et al.,

2014; Chassin, Curran, Hussong, & Colder, 1996; Haugland et al., 2015; Kelly et al., 2016; McGue et al., 2014; van der Zwaluw et al., 2008), but do not explicitly test whether the mother's or the father's drinking has stronger associations with adolescent drinking.

Moreover, very few investigations have considered whether the effects of mothers' and fathers' drinking for adolescent drinking are additive or interactive. Given that a large body of research on child and adolescent problem behaviour shows that the likelihood of adverse outcomes increases as risks accumulate (Evans, Li, & Whipple, 2013), this is a surprising gap in the literature. The few studies examining combinations of mothers' and fathers' drinking provide limited evidence that the risk of adolescent drinking is higher when both parents drink (Green et al., 1991; Hung et al., 2009), although not all studies find this (Coffelt et al., 2006). It is also possible that the cumulative risk of mother's and father's drinking differs by adolescent gender. A study of Dutch adolescents (Vermeulen-Smit et al., 2012) found that heavy drinking by both mothers and fathers was more strongly associated with drinking in early adolescent boys, but girls were more likely than boys to use alcohol in families where only the father drank heavily.

Overall, the evidence for gender moderation in the relationship between parent drinking and adolescent drinking is quite inconsistent. This inconsistency may arise from a number of methodological weaknesses in past longitudinal research, including a lack of information about fathers' drinking; lack of testing for gender differences; reliance on high-risk samples; and use of sample sizes too small to examine gender interactions for both parents and adolescents (Rossow et al., 2016).

An additional problem is how parent drinking should be measured. Many past studies have taken a categorical approach and focused on parent alcoholism or alcohol problems. However, in community samples the relatively smaller proportion of high risk drinkers may mean that such categorisation runs the risk of reducing statistical power to detect interaction

effects due to small cell sizes. It also places limits on the range of drinking behaviour that can be analysed. With these issues in mind, in the present study the frequency of parental heavy episodic drinking was examined. Defined as consuming a large volume of alcohol on a single occasion, the prevalence of heavy episodic drinking is widely reported in population health surveys in developed nations (Australian Institute of Health and Welfare, 2017).

Internationally, the most widely-used definition of heavy episodic drinking is five or more standard drinks on a single occasion, but this varies, with some European countries adopting a cut-off of six or more drinks (Bloomfield, Hope, & Kraus, 2013). While this may limit cross-country comparisons, the use of this measure permits the association between heavy episodic drinking and adolescent drinking to be compared with other harms arising from heavy drinking.

#### *The present study*

The aim of the present longitudinal study was to examine gender differences in the additive and interactive relationships between parent heavy episodic drinking and the drinking of their 14-15 year old children. Some limitations of past research were addressed through the use of a large, nationally representative longitudinal sample and the availability of self-reported drinking from both parents.

We addressed three research questions. First, we asked how mother's and father's heavy episodic drinking when adolescents were aged 12-13 was associated with adolescent drinking at ages 14-15. We expected more frequent episodic drinking for both mother and father to be uniquely associated with an increased likelihood of adolescent drinking. This is consistent with several past studies that have shown both mothers' and fathers' drinking to be significantly related to adolescent drinking (Alati et al., 2014; Kelly et al., 2016). Second, we asked whether the combination of mother's and father's heavy episodic drinking would increase the risk of adolescent drinking. On the basis of literature highlighting accumulation

of risk factors (Evans et al., 2013), we expected that adolescent drinking would be most likely when heavy episodic drinking was frequent in both parents. Third, we asked whether the relationship between parent drinking and adolescent drinking would differ according to adolescent gender. Although the evidence for adolescent gender differences is inconsistent, there is some evidence that girls may be at increased risk of externalising problems in the presence of family stressors (Davies & Lindsay, 2004; Hill & Lynch, 1983; Skeer et al., 2011). Thus, we expected that mother's and father's heavy episodic drinking, and its combination, would be more strongly associated with drinking for female adolescents. Given the lack of evidence for same- or opposite-sex effects in the relationship between parent and adolescent drinking, we did not specify whether girls will be at increased risk from mother or father drinking. Finally, we controlled for key covariates that have been shown to be associated with both parent and adolescent drinking, and that may confound the relationship between the two.

## **Methods**

### **Participants**

The Longitudinal Study of Australian Children (LSAC) is a nationally representative study of 10,090 children and their families that commenced in 2004 (Soloff, Lawrence, & Johnstone, 2005). The present study used the older cohort of 4,983 children born between March 1999 and February 2000, aged 4-5 years old in the first wave of the study. Subsequent waves of data were collected at ages 6-7, 8-9, 10-11, 12-13 and 14-15 years.

### **Sample**

The sample for the present study included 2,800 children (49% female) in two-parent households with non-missing data for adolescent drinking at 14-15 years old (wave 6). Because of our interest in parent gender, we excluded 10 families in which both parents were female, and one family in which both parents were male. We also excluded two families in



which one of the child's main carers was their sibling. The sample for analysis included 2,547 (91%) households with both biological or adoptive parents, and 253 (9%) blended households. Of these blended households five had a complex structure, for example, where the study child was living with their biological father and his sister, the child's aunt. In these cases the female caregiver was considered the female parent and for simplicity, we refer to the female parent as the child's mother.

### **Procedures**

At each wave, data were collected during home visits. Information from the adolescent and his or her primary caregiver (usually the child's mother) was collected during face-to-face interviews or via computer-assisted self-interview for sensitive topics such as drinking and depressive symptoms. Information from the other parent (usually the child's father) was collected via pencil- and paper questionnaire. This study received ethics approval from the Australian Institute of Family Studies Human Research Ethics Committee. Informed consent was obtained from the children's primary caregiver.

### **Measures**

#### **Dependent variable: Whether the adolescent has had an alcoholic drink in the last 12 months**

At ages 14-15 years old, adolescents were first asked 'Have you ever had even part of an alcoholic drink?' with response options: no (1), yes, just a few sips (2), yes, I have had fewer than 10 alcoholic drinks in my life (3), yes, I have had 10 or more alcoholic drinks in my life (4). Those who responded that they had had more than just a few sips were asked: 'Have you had an alcoholic drink in the last 12 months?' with response options 'yes' or 'no.' Methodological investigations show that children and adolescents can reliably report their alcohol use and that these reports are valid (Donovan et al, 2004).

#### **Parents' heavy episodic drinking**

Parents' drinking was measured in wave 5, when participants were 12-13 years old. Both parents were first asked 'How often do you have a drink containing alcohol?' with response options: never (0) not in the last year (1) monthly or less (2), 2-3 times/month (3), once a week (4), 2-3 times/week (5), 4-6 times/week (6), everyday (7). Heavy episodic drinking was assessed with the question 'How often do you have 5 or more standard drinks on one occasion?' with response options: not in the last year (1), monthly or less (2), 2-3 times/month (3), once a week (4), 2-3 times/week (5), 4-6 times/week (6), every day (7). This item is consistent with Australian drinking guidelines, which recommend not drinking more than four standard drinks on a single occasion (National Health and Medical Research Council, 2009). Current abstainers were identified from a 'never' response to the first question: 'How often do you have a drink containing alcohol?' For this analysis, heavy episodic drinking was coded from 0 (current abstainer) to 7 (every day) and was treated as a continuous variable.

### **Covariates**

We included measures of socio-economic status because rates of adolescent drinking have been shown to be higher in lower-SES families (Vermeulen-Smit et al., 2012) and economically-disadvantaged neighbourhoods (Jackson, Denny, & Ameratunga, 2014), and adult heavy drinking is more prevalent amongst lower-SES groups (Huckle, You, & Casswell, 2010). Measures of socio-economic status included *parents' highest education* (year 11 or less, year 12, Certificate, Advanced Diploma, Bachelor and above), an indicator of *material disadvantage* (parental income less than 50% of the median and/or experiencing three or more indicators of financial hardship), quartiles of *community level advantage and disadvantage* (Australian Bureau of Statistics, 2011), and an indicator for whether the participant *resided in a major city or not*. An indicator for *blended family* was included as rates of alcohol use may be higher in such households (Donovan & Molina, 2014). An

indicator for *language spoken at home* for both mother and father (not English; English) was included as alcohol use is less prevalent in families who speak a language other than English (Livingston, 2014). As religiosity is a protective factor for adolescent alcohol use (Kelly et al., 2016) an indicator for *family religiosity* (whether the adolescent had attended a religious service with a family member in the past month) was included. *Parental psychological distress* was included because it is associated with heavy drinking in adults (Boden & Fergusson, 2011) and externalising behaviour in adolescent offspring (Kane & Garber, 2009). Psychological distress for both mother and father was measured with the Kessler 6 (Kessler et al., 2002) and items were averaged for each parent. To account for a general tendency to model risky health behaviours, *mother's and father's smoking* was included. This was represented as never smoked, past smoker, and current smoker.

### **Missing data**

The largest source of missing data was the father questionnaire, with 25% of data missing for father drinking, current smoking, and symptoms of psychological distress. Variables associated with missingness included maternal age less than 40, being a blended family, and parental education less than an advanced diploma. Multiple imputation with chained equations was used to include cases with missing data in the analysis, assuming data were missing at random. Twenty datasets were imputed. The imputation models included all the dependent and independent variables in the analytic model, as well as household unemployment, mother and father (if in household) born outside Australia/New Zealand, and mother and father Aboriginal status. Coefficients were combined using Rubin's Rules (Sterne et al., 2009).

### **Data analysis**

To examine the research questions, we estimated three logistic regression models predicting adolescent drinking, adding covariates and interaction terms in stages. To examine

the unique associations between mother heavy drinking and father heavy drinking and adolescent drinking (research question 1), we estimated two models. The first model included only mother drinking, father drinking, and adolescent gender. The second model adjusted for covariates: parents' education, material disadvantage, non-English-speaking background, blended family, religiosity, parental psychological distress and parental smoking. The third model included interactions between mother and father drinking and adolescent gender and addressed the second and third research questions. To examine whether the combination of mother's and father's heavy episodic drinking increased the risk of adolescent drinking (research question 2), a two-way interaction between mother drinking and father drinking was included. To examine adolescent gender differences in the association between parent drinking and adolescent drinking (research question 3), two-way interactions between mother drinking and adolescent gender, and father drinking and adolescent gender were included. These tested whether parent drinking was more strongly associated with drinking for adolescent girls. A three-way interaction between mother drinking, father drinking, and adolescent gender tested whether the combination of mother and father drinking was more strongly associated with adolescent drinking for females compared to males. A significant coefficient for the three-way interaction would indicate that the effect of the combination of mother's and father's drinking on adolescent drinking varied between males and females (West, Aiken & Krull, 1996). Parent drinking variables were mean-centred prior to analysis.

We report estimates for parent drinking and adolescent gender, with estimates for covariates in Supplementary Material Table S1. Because LSAC uses a probability sample design, all analyses were weighted to take account of the survey design and attrition to wave 6 (Norton & Monahan, 2015), and were carried out using Stata version 13.

## **Results**

### **Description of parent and adolescent drinking**

Overall, 12.7% of adolescents (95% CI 11.3, 14.2) reported having had a drink in the past 12 months. This proportion was similar for females (13.9%; 95% CI 11.8, 16.0) and males (11.6%; 95% CI 9.6, 13.7) and the difference was not statistically significant ( $\chi^2(1, 269) = 2.18, p = 0.141$ ).

Table 1 describes mother and father heavy episodic drinking. Two-thirds of fathers (65%) reported at least some heavy episodic drinking in the past year, compared with 37% of mothers. One-fifth of fathers reported heavy drinking at least once a week, compared with 6.5% of mothers. The Pearson correlation between mother and father drinking ranged from 0.39 to 0.42 across imputed datasets (all  $p < 0.001$ ).

### **Analyses examining the research questions**

#### **Research question 1: How are mother's and father's heavy episodic drinking associated with adolescent drinking?**

Table 2 shows the results of the logistic regression models examining the association between mother's and father's heavy drinking and adolescents' drinking. The results of Model 1 and Model 2 show that more frequent heavy episodic drinking by both mothers and fathers were significantly associated with increased likelihoods of adolescent drinking. Coefficients for parents' drinking were slightly attenuated after the addition of covariates but remained statistically significant.

#### **Research question 2: Does the combination of mother's and father's heavy episodic drinking increase the risk of adolescent drinking?**

Model 3 (Table 2) examined interactions between mother drinking, father drinking, and adolescent gender. The two-way interaction between mother's drinking and father's drinking was not significant.

#### **Research question 3: Does the relationship between parent drinking and adolescent drinking differ according to adolescent gender?**

As shown in the results for Model 3 (Table 2), the two-way interaction between father's heavy episodic drinking and adolescent gender was statistically significant. Figure 1 shows that the predicted probability of female adolescents having had a drink in the past year became higher as father's heavy episodic drinking frequency increased, but a similar increase was not seen for males. Simple slopes analysis showed that father's heavy episodic drinking significantly increased the likelihood of drinking for females (odds ratio = 1.02, 95% CI 1.01, 1.04) but not males (odds ratio = 1.00, 95% CI 0.98, 1.02). The male-female difference in the predicted probability of drinking was statistically significant when fathers reported drinking heavily 2-3 times per month and more frequently. The interaction between mother's drinking and adolescent gender was not statistically significant, and the three-way interaction between mother's and father's drinking and adolescent gender was not significant.

### **Complete-data analysis**

We compared the reported estimates with those obtained with complete, non-imputed data (Table S2 in Supplementary Material). All the coefficients for parent drinking were very similar in magnitude to those reported above using imputed data. The confidence intervals were wider, indicating the loss of precision in complete-data estimates due to the reduced sample size.

## **Discussion**

This study aimed to examine the relationship between parent heavy episodic drinking and adolescent drinking in two-parent families, with a focus on how this association varied by both parent and adolescent gender. Specifically, we asked, first, whether mother's and father's heavy episodic drinking would be independently associated with adolescent drinking. Results supported our hypothesis that more frequent heavy episodic drinking for both mother and father would be uniquely associated with an increased likelihood of adolescent drinking. Second, we asked whether the combination of mother's and father's heavy episodic drinking

would increase the risk of adolescent drinking above and beyond influences from either parent. We expected the combination of both parents' drinking to be associated with an increased likelihood of adolescent drinking, but this was not supported. Finally, we asked whether the relationship between parent drinking and adolescent drinking differed according to adolescent gender. We expected that mother's and father's drinking, and its combination, would be more strongly associated with drinking for female adolescents. The results showed that father's drinking was indeed more strongly associated with drinking for female adolescents, but adolescent gender differences in the association between mother's drinking and the combination of both parents' drinking were not significant.

This study adds to a very limited pool of research examining the influence of both mother's and father's drinking for drinking during early adolescence, using a large, representative sample. Our finding that both mother's and father's drinking increased the likelihood of adolescent drinking is consistent with several past studies that have found both parents' drinking to increase the risk of adolescent alcohol use (Alati et al., 2014; Kelly et al., 2016; McGue et al., 2014; van der Zwaluw et al., 2008). Although father's drinking is often not included in longitudinal studies, the present findings reaffirm the importance of considering the role of fathers' behaviours in adolescent development.

Contrary to expectations, higher levels of both mother and father drinking did not increase the risk of adolescent drinking beyond the influence from each parent separately. Only a few prior studies have examined how the combination of mother and father drinking is related to adolescent drinking, and findings have been mixed (Coffelt et al., 2006; Green et al., 1991; Hung et al., 2009). One possible explanation for our failure to find a significant effect for combined mother and father drinking is that patterns of drinking in couples may be complex and non-linear. For example, Vermeulen-Smit et al. (2012) used latent class analysis to form distinct subgroups of couples based on a number of drinking measures, and showed

that only those characterised by father heavy episodic drinking, with or without mother heavy drinking, increased the risk of adolescent drinking. Future research should carefully examine different profiles of parent drinking based on multiple assessments of alcohol use.

Our initial finding highlighting the importance of both mother's and father's heavy episodic drinking is tempered by the results examining our third research question, showing that father's heavy episodic drinking was most strongly related to drinking for adolescent girls. Some past studies have demonstrated an increased risk of parental drinking for girls (Burk et al., 2011; Green et al., 1991; Haugland et al., 2015), but only a few have examined interactions between the drinking behaviour of both parents and adolescent gender. The stronger relationship between father's heavy drinking and adolescent drinking for girls is consistent with two of these studies. Coffelt and colleagues (2006) showed that fathers' alcohol problems were related to drinking for girls only, and Vermeulen-Smit et al (2012) found that early adolescent girls were more strongly affected than boys by their fathers' heavy drinking.

The reasons for gender differences in the relationship between parent and adolescent drinking are not well theorised. A broader literature shows that girls' adjustment can be poorer than boys' in relation to family discord and stress (Skeer et al., 2011). The gender intensification hypothesis contends that this occurs because interpersonal relationships become increasingly salient for girls during adolescence, and therefore disruptions in these relationships are more stressful for girls than they are for boys (Davies & Lindsay, 2004). Our findings are somewhat consistent with this hypothesis, but without examining family conflict and stress as mediators between parent drinking and adolescent drinking, this interpretation cannot be certain.

Furthermore, the gender intensification hypothesis does not account for why girls experienced increased risk from fathers' heavy episodic drinking, but not mothers' heavy



episodic drinking. There is evidence that poor quality relationships with fathers are associated with earlier puberty in girls (Moffitt, Caspi, Belsky, & Silva, 1992), which is subsequently associated with deviant peer associations and problem behaviour (Westling, Andrews, Hampson, & Peterson, 2008). Relationships with fathers may also be important as girls develop perceptions about relationships with males (Werner & Silbereisen, 2003), and girls with heavy drinking fathers may therefore be more tolerant of heavy drinking in male friends. Future research should investigate these speculations by integrating information about parenting, pubertal status and peer networks.

Strengths of the present study include the availability of self-reported drinking data from mothers and fathers, and the use of a representative sample large enough to permit examination of parent and adolescent gender differences. However, several limitations should be noted. First, we restricted our analysis to two-parent households. Although this is quite common in the literature, it means the role of parent drinking in one-parent households is not well understood. As many studies show that adolescents in one-parent households are more likely to drink than those in two-parent households (Donovan, 2004; Kelly et al., 2016), future research should incorporate all family types. Second, survey measures of alcohol use are known to underestimate alcohol use in Australian adults (Livingston & Callinan, 2015). Therefore, it is possible that our study underestimates the effect of parental heavy episodic drinking on adolescent outcomes. Unfortunately assessments of alcohol problems or dependence such as the AUDIT were not available in LSAC. Thus, our results cannot be directly compared to past studies that have assessed parental alcohol problems or alcoholism. Finally, in the present study we chose to focus on a close examination of the association between parent and adolescent drinking, modified by gender. However, this was at the cost of examining mechanisms underlying the association. Further research should investigate the interplay between parent drinking and parent monitoring, parent rule-setting around alcohol

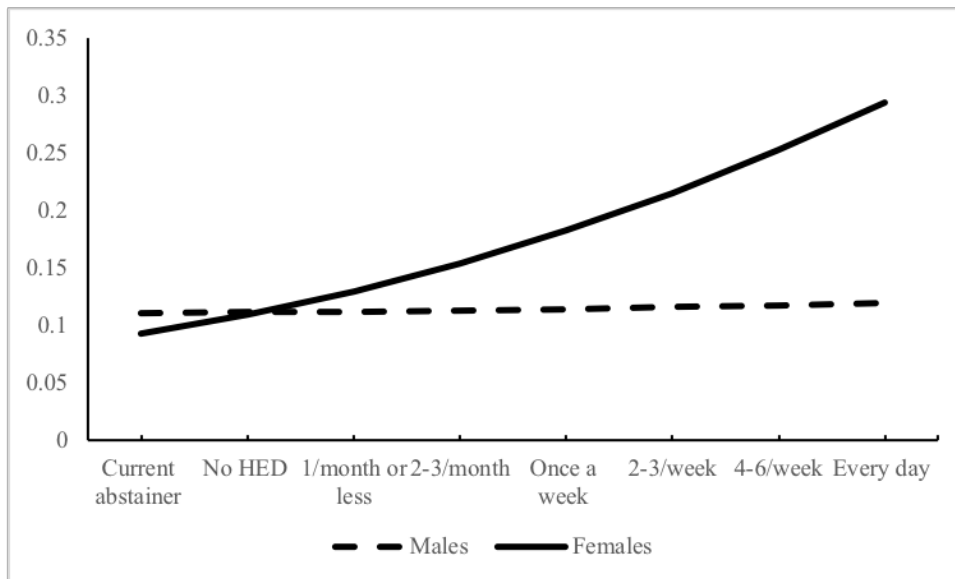
use, parent mental health, family adversity, and peer-group drinking, with a focus on possible gender differences in these relationships.

## **Conclusions**

The results of this contemporary, nationally representative study showed that (1) the drinking of both mothers and fathers in two-parent households increased the risk of adolescent drinking, (2) the combination of mother and father drinking did not increase the risk of adolescent drinking beyond the influence from each parent separately, and (3) father's heavy episodic drinking was more strongly related to drinking for adolescent girls.

These findings reaffirm the importance of parental drinking as a risk factor for adolescent drinking. This is important information for programs aimed at preventing adolescent drinking. For example, interventions aimed at parenting behaviours should emphasise that either parent's heavy drinking can increase the risk of offspring drinking. The finding that the relationship between father heavy drinking and adolescent drinking may be stronger for girls is also an important consideration for the design and evaluation of family- and parent-oriented programs because they show that interventions may need to be different for parents of boys compared to girls.

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**Figure 1:** Predicted probability of male and female drinking across levels of father's heavy episodic drinking

**Table 1:** Mother and father heavy episodic drinking

|                                | Mother           | Father           |
|--------------------------------|------------------|------------------|
| Heavy episodic drinking        | Est. (95% CI)    | Est. (95% CI)    |
| Current abstainer (%)          | 19.8 (17.7, 1.1) | 11.2 (9.4, 0.9)  |
| No HED (%)                     | 42.9 (40.9, 1.0) | 23.1 (21.0, 1.0) |
| Once a month or less often (%) | 26.2 (24.4, 0.9) | 35.3 (32.7, 1.3) |
| Two to three times a month (%) | 4.2 (3.3, 0.4)   | 7.9 (6.5, 0.7)   |
| Once a week (%)                | 4.6 (3.7, 0.4)   | 11.9 (10.3, 0.8) |
| Two to three times a week (%)  | 1.4 (0.9, 0.3)   | 7.1 (5.8, 0.7)   |
| Four to six times a week (%)   | 0.4 (0.1, 0.1)   | 2.1 (1.3, 0.4)   |
| Every day (%)                  | 0.4 (0.1, 0.1)   | 1.5 (0.8, 0.4)   |
| Total                          | 100.0            | 100.0            |
| Average                        | 1.4 (1.3, 1.5)   | 2.2 (2.2, 2.3)   |

**Table 2:** Odds ratios from logistic regression models examining the association between parent heavy episodic drinking and adolescent drinking

|  | Model 1: Unadjusted |          | Model 2 <sup>2</sup> : Adjusted for covariates |          | Model 3 <sup>2</sup> : Interactions between parent drinking and adolescent gender |          |
|--|---------------------|----------|--|----------|---|----------|
|  | Odds ratio (95% CI) | <i>p</i> | Odds ratio (95% CI)                            | <i>p</i> | Odds ratio (95% CI)   | <i>p</i> |
| Mother's HED <sup>1</sup>              | 1.26 (1.14, 1.40)   | <0.001   | 1.21 (1.09, 1.34)                              | <0.001   | 1.23 (1.01, 1.50)   | 0.035    |
| Father's HED                           | 1.17 (1.07, 1.29)   | 0.001    | 1.12 (1.02, 1.24)                              | 0.024    | 1.24 (1.10, 1.41)   | 0.001    |
| Adolescent male                        | 0.81 (0.61, 1.07)   | 0.132    | 0.80 (0.61, 1.06)                              | 0.117    | 0.80 (0.59, 1.07)   | 0.140    |
| Mother HED*                            | -                   | -        | -  | -        | 0.95 (0.87, 1.04)   | 0.242    |
| Father HED                             |                     |          |  |          |   |          |
| Mother HED* adolescent male            | -                   | -        | -  | -        | 0.98 (0.74, 1.30)   | 0.883    |
| Father HED* adolescent male            | -                   | -        | -  | -        | 0.80 (0.65, 0.99)   | 0.046    |
| Mother HED*Father HED* adolescent male | -                   | -        | -  | -        | 1.10 (0.97, 1.23)   | 0.146    |

Note: <sup>1</sup> HED = heavy episodic drinking. <sup>2</sup> Model controls for parents' education, household material disadvantage, family structure, mother and father non-English-speaking background, family religiosity, community disadvantage, residence outside a major city, and mother and father symptoms of psychological distress, and mother and father smoking status.

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