BMJ Open

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Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2014-007179
Article Type:	Research
Date Submitted by the Author:	12-Nov-2014
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Primary Subject Heading:	Addiction
Secondary Subject Heading:	Public health
Keywords:	PUBLIC HEALTH, school, alcohol

Do Parents Play Different Roles in Drinking Behaviors of Male and Female Adolescents?

Running title: Adolescent Drinking Behavior and Parental Drinking Behavior/Attitudes

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Key words: gender differences, parent, attitude, adolescent, alcohol use

Word count: 3470

Abstract

Objective: This study aimed to understand the gender differences in the association between adolescent drinking behavior and parental drinking behaviors/attitudes.

Methods: Data used in this study came from the Child and Adolescent Behaviors in Long-term Evolution (CABLE) project. We used data from 2009 and 2006 when cohort 1 and cohort 2 were in grade 9, respectively. No cohort effect was found, the two cohorts were pooled and resulted in 3,972 students (1,999 males and 1,973 females) participated in the study. The major variables included drinking behaviors over the last month as well as the parental drinking behavior and parental attitudes toward underage drinking. The effects of the combination of parental drinking behaviors and attitudes on the drinking behaviors of male and female adolescents were analyzed using a logistic regression.

Results: The drinking behavior of males was correlated with the drinking behaviors attitudes of their fathers but not with those of their mothers. Fathers either did not drink and against (OR=0.27, 95% CI=0.16-0.46), did not drink but in favor of (OR=0.61, 95% CI=0.39-0.94), or drinking and against (OR=0.44, 95% CI=0.23-0.85) prevented boys from drinking, whereas mothers' influence was not significant in boys. Both fathers' drinking behavior and attitude (not drinking and against (OR=0.52, 95% CI=0.30-0.91), and not drinking but in favor of (OR=0.51, 95% CI=0.32-0.83)) prevented girls from drinking, whereas mothers did not drink and against (OR=0.23, 95% CI=0.09-0.60) had preventive effect.

Conclusions: The influence of fathers and mothers on the drinking behavior of adolescents differs by offspring gender.

Strength and limitations

Strength

■ This study considers the interaction of parental drinking behaviors and attitudes with the drinking behaviors of male and female students.

■ This study pooled two cohorts and examined the influence of parental behaviors and attitudes on the drinking behaviors of male and female students.

Weakness

■ This study only considered drinking behavior over the last month and did not consider amount or frequency of alcohol use.

■ Parental drinking behaviors and attitudes were reported by adolescents.

INTRODUCTION

Underage drinking is a social and public health issue that receives extensive attention. Drinking behavior significantly differs across gender. The developmental trajectories of different drinking behaviors among males occur earlier than those among females; in addition, the frequency and amount of alcohol consumed is also higher among males.[1] Recently, however, the drinking behaviors of females have begun to develop faster than those of males.[2] [3] Because of the modern emphasis on gender mainstreaming, paying attention to the relevant factors associated with drinking behaviors across gender is helpful to develop appropriate preventive strategies for adolescent drinking.

Multiple factors influence drinking behavior, and the family plays an important role with regard to adolescent drinking behavior. Family members are the significant thers who affect the substance use of adolescents,[4] especially the parents. Parental drinking behaviors and attitudes toward underage drinking are both associated with alcohol use among adolescents[5]. Many studies have stated that if both parents are drinkers, then their children are more likely to drink.[6-8] Various indicators of alcohol use, including age at first alcohol use, lifetime alcohol use, alcohol use over the last year, alcohol use over the last month, and excess alcohol use, are associated with the parental drinking behavior. However, the individual influences of paternal and maternal drinking behaviors on the drinking behavior of their male and female children do not show consistent results. Yu & Perrine[9] stated that paternal drinking behaviors influence sons, whereas maternal drinking behaviors influence daughters. Others studies[10-12]argued that the influence of maternal drinking behavior is greater than that of paternal behavior on those of children. In contrast, Yeh[13] showed that fathers have significant influence on the excessive drinking behavior of their children,

whereas mothers do not have any influence. However, most studies argue that parental alcohol use increases the likelihood of alcohol use in children. Nevertheless, Haugland et al. [14] found that males with alcohol-abusing mothers were less likely to use alcohol to excess. Overall, these studies consistently emphasize that the individual drinking problems of parents influence the drinking problems of their male and female children.

Kelly et al. [15] argued that parental attitudes toward underage drinking influence the drinking behaviors of their children (regardless of offspring gender). An attitude might be clearly presented during a discussion of drinking behavior or while developing rules to restrict alcohol use. Van Der Vorst, Burk, & Engels[16] stated that the discussion between adolescents and parents with regard to the drinking behaviors differs by gender: males are significant influenced, whereas females are not. Other studies indicated that parental rules regarding the restriction of adolescent alcohol use can delay the start of alcohol use among adolescents, reduce the subsequent frequency and amount of alcohol consumption,[17-20] and delay the development of drinking behaviors[21]. However, the above studies did not distinguish fathers from mothers. A study of individual paternal and maternal attitudes on the drinking behaviors of their underage children at different ages showed that paternal drinking rules significantly delay alcohol use among younger children, whereas maternal attitudes do not have the same effect.[18]

Parental drinking behavior is associated with their attitudes toward underage drinking. When parents drink, they usually have more relaxed rules with regard to underage drinking. [18-22] Previous studies of parental drinking behaviors and attitudes mostly regarded these variables as independent and introduced them into joint models or used one of them as a mediator. No study has examined the relationship between

adolescent drinking behavior and parental drinking behavior and attitudes toward underage drinking.

In summary, previous studies of parental drinking behaviors and their attitudes toward underage drinking, as well as of adolescent drinking behavior, have the following limitations. First, the previous literature discussing the influence of parents on the drinking behavior of their children did not consider the interactions of paternal/maternal drinking behaviors and attitudes with the drinking behaviors of male/female children. Moreover, previous studies focused on areas with high alcohol use prevalence within European and American countries. Recently, the underage drinking behavior in developed countries has decreased after long-term concerns of underage drinking problems. [23 24] Interestingly, the wine industry has begun to focus their marketing on Western Pacific countries with developed economies and low rates of alcohol consumption. [25] Taiwan is located in this region; therefore, the investigation of the parental factors that affect underage drinking behavior using Taiwanese data can help to establish an effective preventive mechanism for underage drinking in low alcohol consumption rate areas. Based on the above literature review, the major purpose of this study was to investigate the drinking behaviors of male and female 9th grade students in Taiwan and their relationship with parental drinking behaviors and attitudes.

METHODS

Study populations

The data used in this analysis were obtained from the Child and Adolescent Behaviors in Long-term Evolution (CABLE) project. [26] The present study included the 2,719 students in cohort 1 and the 2,499 students in cohort 2 who were in the first and fifth grades in 2002 when the study began (i.e., participants were 10-11 years old) and in

the ninth grade in 2006 and 2009 (i.e., when participants were 14-15 years old). Participants with missing data were excluded, resulting in a final sample of 1,961 students in cohort 1 (72.12%) and 2,011 students in cohort 2 (80.47%). The chi-square test was used to assess differences from baseline with regard to sex and residential area. No significant differences were found between the samples.

Because the CABLE project is school-based, the clustering effect of schools with regard to adolescent drinking behavior should be taken into account. Therefore, we used a general estimating equation with an exchangeable working correlation matrix to investigate the presence of clustering effects. The correlation coefficients of -0.002 in cohort 1 and -0.003 in cohort 2 for both models indicated that the correlation of current drinking behaviors among adolescents within each school was low. Therefore, we ignored the clustering effect and analyzed the data as an independent sample.

Measures

Drinking behavior: Students reported the frequency of their alcohol use. The item, "Have you ever used alcohol?" was rated using a 6-point scale, where 1=never used; 2=not over the last year, but have used before; 3=not over the last month, but have used before; 4=used once or twice over the last month; 5=have used many times over the last month; and 6=have used every day over the last month. Students were combined into two groups: scores of 1-3 were considered 1=non-drinking, and scores of 4-6 were considered 2=used over the last month.

Parental drinking behaviors and attitudes: Students reported their perceptions of the drinking behaviors of fathers and mothers and rated them using a 6-point scale via the questions "Does your father use alcohol?" and "Does your mother use alcohol", where 1=never; 2=not over the last year, but has used before; 3=not over the last

month, but has used before; 4=has used once or twice over the last month; 5=has used several times over the last month; and 6=has used every day over the last month. Scores of 1-4 were recoded as 1=used infrequently, and scores of 5-6 were recoded as 2=used frequently. Students also reported their perceptions of the attitudes of their parents toward drinking via the 5-point items "Your father's attitude toward your alcohol use" and "Your mother's attitude toward your alcohol use", where 1=very against, 2=against, 3=no opinion, 4=favorable, and 5=very favorable. Scores of 1-2 were recoded as 0=against, and scores of 3-5 were recoded as 1=favorable. Finally, paternal drinking behaviors and attitudes were combined into four types, where 1=non-drinking/against (NDA), 2=non-drinking/favorable (NDF), 3=drinking/against (DA), and 4=drinking/favorable (DF). Maternal drinking behaviors and attitudes were combined into the same types.

Background factors: Relevant background variables with regard to underage drinking based on previous studies were controlled,[6 13 27-32] including cohort factors, age at first alcohol use, residential area, parental marital status, parental education level, parenting behavior (i.e., degrees of emotional support and behavior supervision), peer alcohol use, peer pressure with regard to alcohol use, alcohol expectancies, and alcohol refusal efficacy.

Statistical analysis

We first used SAS 9.1 to perform a descriptive statistical analysis on the data across gender using the distribution of the mean, percentages, and standard deviations for both the independent and dependent variables. Next, the independent and dependent variables for males and females were compared using chi-square and analysis of variance (ANOVA) to determine differences. Finally, models of the total sample, as well as male and female student samples, were constructed, and the factors that

influence the drinking behavior of adolescents were analyzed using a logistic regression.

RESULTS

As Table 1 shows, 3,972 students (1,999 males and 1,973 females) participated in the study. Of these students, 679 reported having consumed alcohol over the last month. More males consumed alcohol over the last month than females. Adolescents with fathers and mothers who were non-drinkers and against underage drinking comprised the majority of the sample (55.74% vs 68.05%), followed by those with fathers/mothers who were non-drinkers but favored underage drinking (29.51% vs 29.68%). Paternal drinking behavior/attitude type significantly differed by gender: more females had fathers who were NDA or DA than males (57.78% vs 53.73%; 8.01% vs 7.15%). Conversely, more males had fathers who were NDF or DF than females (31.62% vs 27.37%; 7.50% vs 6.84%). In other words, paternal attitudes differed by gender, fathers were more against alcohol use by their daughters. Maternal drinking behaviors/attitudes did not significantly differ by gender.

The model in Table 2 shows the logistic regression analysis of the drinking-behavior-related factors across all participants. The analysis derived the following results with regard to the factors related to adolescent alcohol consumption over the last month: compared with adolescents whose fathers were DF, the correlation coefficients of paternal drinking behavior and attitude were NDA (OR=0.36; 95% CI=0.25-0.52), NDF (OR=0.57; 95% CI=0.41-0.78), and DA (OR=0.46; 95% CI=0.28-0.75). Compared with adolescents whose mothers were DF, those whose mothers were NDA (OR=0.33; 95% CI=0.17-0.65) or NDF (OR=0.49; 95% CI=0.25-0.94) were less likely to consume alcohol.

Table 3 shows the results of the logistic regression analysis on the

drinking-behavior-related factors across gender. The results regarding males showed that adolescents whose fathers were NDA (OR=0.27; 95% CI=0.16-0.46), NDF (OR=0.61; 95% CI=0.39-0.94), or DA (OR=0.44; 95% CI=0.23-0.85) were less likely to consume alcohol than those whose fathers were DF. Paternal drinking behaviors and attitudes influenced male adolescent drinking behavior; however, maternal drinking behaviors and attitudes did not. In addition, cohort 2 was more likely to consume alcohol than cohort 1 (OR=1.51; 95% CI=1.15-1.98). When the first alcohol use was before the age of 13 (OR=2.16; 95% CI=1.63-2.88), perceived positive alcohol expectancies were higher (OR=1.10; 95% CI=1.05-1.16), negative alcohol expectancies were lower (OR=0.92; 95% CI=0.88-0.96), alcohol refusal efficacies were lower (OR=0.96; 95% CI=0.94-0.98), more peers were perceived as using alcohol (OR=1.81; 95% CI=1.57-2.10), and peer pressure regarding alcohol use was stronger (OR=1.45; 95% CI=1.26-1.66), male adolescents were more likely to exhibit drinking behaviors over the last month.

Table 3 also shows the results from the analysis of the drinking-behavior-related factors with regard to females. Compared with females whose fathers were DF, those whose fathers were NDA (OR=0.52; 95% CI=0.30-0.91) or NDF (OR=0.51; 95% CI=0.32-0.83) were less likely to consume alcohol. Compared with females whose mothers were DF, those whose mothers were NDA (OR=0.23; 95% CI=0.09-0.60) were less likely to consume alcohol. For females, parental drinking behaviors had a greater influence on their drinking behaviors than parental attitudes. In addition, cohort 2 was more likely to consume alcohol than cohort 1 (OR=1.84; 95% CI=1.38-2.56). When the first alcohol use was before the age of 13 (OR=2.26; 95% CI=1.69-3.03), and the perceived negative alcohol expectancies (OR=0.93; 95% CI=0.89-0.97) alcohol refusal efficacies were lower (OR=0.93; 95% CI=0.90-0.95),

the perceived number of peers who used alcohol was greater (OR=1.49; 95% CI=1.27-1.76), and the peer pressure with regard to alcohol use by peers was stronger (OR=1.24; 95% CI=1.05-1.48), female students were more likely to exhibit drinking behaviors over the last month.

DISCUSSION

This study found that although the percentage of adolescent drinking behavior does not differ by gender, the influence of parental drinking behaviors and attitudes does. Only paternal drinking behaviors and attitudes influence male adolescent drinking behavior, and this influence is significant when fathers are against drinking. The paternal drinking behaviors and both maternal drinking behaviors and attitudes influence females; in particular, non-drinking fathers/mothers significantly influence adolescent drinking behaviors. Specific results are discussed below.

Gender differences with regard to adolescent drinking behaviors

Physiological, social, and environmental factors influence drinking behavior. More males than females consume alcohol. Physiologically, females have smaller body volumes and less bodily water content. Because of these factors and lower alcohol dehydrogenase activity, females are more likely to have adverse reactions to alcohol. Therefore, females are more likely to refuse alcohol.[33 34] Furthermore, society generally holds a negative opinion of female alcohol use and has more restrictions; therefore, females are less likely to drink than males.[35] Although the bivariate analysis of this study showed that males were more likely to drink than females, an additional multivariate analysis showed that the effect of gender factor was not significant after controlling for the social learning factors associated with drinking behaviors. These results suggest that gender differences in adolescent drinking behaviors over the last month are because of the influences of social and environmental variables such as

parents and peers.

The influences of parental drinking behaviors and attitudes on the drinking behaviors of their children

In general, society has different opinions concerning alcohol use; furthermore, academia has multiple suggestions regarding the relationship between drinking and health. For example, the American Heart Association indicates that although a small amount of alcohol consumption is beneficial for health, the advantages, disadvantages, and risks associated with drinking demand careful assessment, and infrequent alcohol use is recommended.[36] Society generally considers that a small amount of adult alcohol consumption is acceptable; therefore, the role of parents is complicated with regard to alcohol use.

No study has explored the effects of parental drinking behaviors and attitudes on adolescent drinking behavior. A majority of previous studies indicates that parents who drink are less likely to establish non-drinking rules for their children; nevertheless, the current study found that the anti-alcohol attitudes of parents who drink have a mitigating effect on adolescent drinking behavior. The OR value associated with this outcome is higher than that for non-drinking parents who have favorable alcohol-use attitudes with regard to their children. These results indicate that parents' drinking rules for their children have a stronger influence than their actual drinking behaviors.[5 18] Parental attitudes toward drinking might reflect their own drinking rules and communication with adolescents. Previous studies indicate that when parents have more relaxed drinking attitudes, they have fewer alcohol-related discussions;[18] furthermore, when the frequency of communication between parents and their children is high with regard to alcohol use, children are less likely to exhibit problematic drinking behaviors.[37] In addition, strict restrictions on

alcohol help to reduce its consumption by adolescents.[38] Therefore, the results of the current study regarding whether the anti-drinking attitudes of fathers who drink reduce the likelihood of adolescent alcohol use through the formulation of alcohol-use restrictions, alcohol-related discussions with their children, and enhanced supervision regarding the drinking behavior of their children are worthy of continued investigation. Overall, parents must let their children know that their negative attitudes toward underage drinking, regardless of whether they consume alcohol.

The current study found that the influences of parental drinking behaviors and attitudes differ somewhat by gender. Males are only influenced by paternal drinking behaviors and attitudes, and the influence of paternal regulation factors is larger than that of their demonstration factors. However, the influence of these factors among mothers is not obvious. Both fathers and mothers influence their daughters. However, only non-drinking parents show strong preventive effects against drinking behaviors, suggesting that females are more easily influenced by behavior demonstrations. Overall, the influences of paternal drinking behaviors and attitudes on adolescent drinking behavior were significant regardless of gender. Although the number of female drinkers has recently increased and society's attitude toward female alcohol use has become more open, drinking is usually considered a male activity, and the public more easily accepts male alcohol use.[39 40] In addition, more adult males drink than females, and they consume more alcohol; therefore, adolescents primarily learn behaviors and regulations regarding drinking from their fathers. Although previous studies have shown that mothers directly parent and nurture their children, the current study suggests that the role of fathers should not be ignored with regard to drinking behavior.

Literature regarding the accessibility of alcohol indicated that parents usually

provide children with their first drink. Adolescents often obtain alcohol from their own house or a friend's house, will accept alcohol provided by others, or purchase their own alcohol.[41] The source of alcohol differs by gender: females primarily acquire alcohol socially via parents and family members within their own house, while males primarily acquire alcohol commercially, including store purchases.[42] The current study found that against/drinking fathers significantly influence their sons. Conversely, females are significantly influenced by the non-drinking behaviors of their fathers and mothers. The reason for this gender difference might be that parents who consume alcohol several times in one month are likely to store alcohol in the house. In contrast, parents who do not consume alcohol are unlikely to store alcohol in the house and cannot encourage alcohol use among their children, thereby reducing the possibility that adolescents will acquire alcohol socially. This supposition might explain the lower rates of alcohol use among females in the current study. Study indicated that parents were more willing to discuss topics related to alcohol use with males. Therefore, fathers who are against alcohol use are more likely to encourage their sons not to consume alcohol; this disapproving attitude likely influences the probability of adolescents purchasing alcohol on their own and reduces the possibility of alcohol use.

Other drinking-behavior-related factors during adolescence

In addition to parental drinking behaviors and attitudes, this study found that variables related to cohort, alcohol expectancies, alcohol refusal efficacy, and peer alcohol use are associated with adolescent drinking behavior.

Regarding the cohort-related factors of drinking, this study showed that cohort 2 consumed more alcohol than cohort 1, perhaps because of the educational differences between the cohorts. The elementary schools in Taiwan began a new

curriculum in 2001. Cohort 1 was taught this new curriculum starting in the 1st grade, whereas cohort 2 was taught the previous curriculum. Unlike the previous curriculum, the current education emphasizes the positive development of minors, including interpersonal skills such as self-consciousness, self-efficacy, and communication skills. Whether this curriculum reduced the drinking behaviors of cohort 1 requires additional study.

The current study showed that the negative alcohol expectancies and alcohol refusal efficacies of males and females significantly predict their drinking behaviors over the last month; however, positive alcohol expectancies are not associated with female drinking behavior. Because their physiology predisposes females to adverse alcohol reactions,[33 43] females consume less alcohol than males. This fact might explain the current results, which indicate that females only have negative alcohol expectancies.

This study also showed that the drinking behaviors of peers and peer pressure associated with alcohol use continue to significantly influence underage drinking when all possible personal and environmental factors are controlled, regardless of gender. Peers who provide adverse support are the major social group in which adolescents learn and establish health-risk behaviors.[15 31]

This study has some limitations. First, it only considered drinking behavior over the last month and did not consider amount or frequency of alcohol use. Next, the parental attitudes toward adolescent alcohol use could be presented in different ways, such as alcohol-related communications or alcohol-related house rules.[18 37 38] Whether this content differs by adolescent gender is worthy of investigation. Adolescents' perceptions of parental drinking behaviors and attitudes were obtained from self-reports; therefore, actual parental drinking behaviors were not obtained. Finally,

this study did not account for the influence of diverse family structures. In addition to treating the family as a unit, future studies should also consider different family structures.

Despite the aforementioned limitations, this study nevertheless provides new knowledge regarding gender differences in adolescent drinking behavior. First, this study used a large student sample and examined the influences of parental drinking behaviors and attitudes on the drinking behaviors of adolescents. Next, this study simultaneously controlled important variables that influence adolescent drinking behaviors. Finally, this study primarily discussed the association between the general drinking behavior of parents and that of their children over the last month in an area with a low prevalence of alcohol use. Our conclusions can support the prevention of early-stage drinking behaviors in other areas.

The results of the current study suggest that preventive plans for underage drinking behaviors should consider the needs of males and females. In particular, family drinking prevention programs should emphasize the different roles of fathers and mothers in the drinking behaviors of their sons and daughters.

Acknowledgments

We would like to thank the National Health Research Institutes-funded Child and Adolescent Behaviors in Long-Term Evolution (CABLE) project for providing data for this study.

Competing interests

All authors declare that they have no conflicts of interest.

Funding sources

This study was funded by National Health Research Institute (NHRI) Grant HP-090-SC03.

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Table 1. The distribution of variables by gender

Variable	Total sample	Males	Females	
	Number of people (%)	Number of people (%)	Number of people (%)	χ^2/F
Drinking over the last month				
No	3,293 (82.91)	1,630 (81.54)	1,663 (84.29)	5.29*
Yes	679 (17.09)	369 (18.46)	310 (15.71)	
Paternal drinking/attitude				10.56*
NDA	2,214 (55.74)	1,074 (53.73)	1,140 (57.78)	
NDF	1,172 (29.51)	632 (31.62)	540 (27.37)	
DA	301 (7.58)	143 (7.15)	158 (8.01)	
DF	285 (7.18)	150 (7.50)	135 (6.84)	
Maternal drinking/attitude				0.62
NDA	2,703 (68.05)	1,354 (67.73)	2,703 (68.37)	
NDF	1,179 (29.68)	602 (30.12)	1179 (29.24)	
DA	39 (0.98)	18 (0.90)	39 (1.06)	
DF	51 (1.28)	25 (1.25)	51 (1.32)	
Cohort:				
Cohort 1	1,961 (49.37)	976 (48. 82)	985 (49.92)	0.48
Cohort 2	2,011 (50.63)	1,023 (51.18)	988 (50.08)	
Age at first alcohol use				
<13 years	917 (23.09)	443 (22.16)	474 (24.02)	1.94
>=13 years	3,055 (76.91)	1,556 (77.84)	1,499 (75.98)	

*p<0.05

Table 1. The distribution of variables by gender (continue)

Variable	Total sample	Males	Females	
	Number of people (%) or mean (standard deviation)	Number of people (%) or mean (standard deviation)	Number of people (%) or mean (standard deviation)	χ^2/F
Residential area				
Taipei	2,052 (51.66)	1,010 (50.53)	1,042 (52.81)	2.08
Hsinchu County	1,920 (48.34)	989 (49.47)	931 (47.19)	
Parental marital status				
Married, living together	3,650 (91.89)	1,847 (92.40)	1,803 (91.38)	1.37
Other	322 (8.11)	152 (7.60)	170 (8.62)	
Paternal education level				
Middle school or lower	589 (14.83)	305 (15.26)	284 (14.39)	2.84
High school	1,407 (35.42)	683 (34.17)	724 (36.70)	
College or higher	1,976 (49.75)	1,011 (50.58)	965 (48.91)	
Maternal education level				
Middle school and lower	571 (14.38)	292 (14.61)	279 (14.14)	5.94
High school	1,797 (45.24)	867 (43.37)	930 (47.14)	
College or higher	1,604 (40.38)	840 (42.02)	764 (38.12)	
Parenting behavior				
Degree of emotional support (6-24 points)	17.06 (4.81)	16.74 (4.81)	17.38 (4.78)	17.56***
Degree of behavioral supervision (4-16 points)	13.37 (2.89)	13.21 (2.96)	13.52 (2.81)	12.29**

** p<0.01; *** p<0.001

NDA= non-drinking/against; NDF= non-drinking/favorable; DA= drinking/against; DF= drinking/favorable

Table 1. The distribution of variables by gender (continue)

Variable	Total sample	Males	Females	
	Number of people (%) or mean (standard deviation)	Number of people (%) or mean (standard deviation)	Number of people (%) or mean (standard deviation)	χ^2/F
Positive alcohol expectancies (5-20 points)	9.72 (3.26)	13.04 (3.98)	14.13 (3.34)	8.16**
Negative alcohol expectancies (5-20 points)	13.58 (3.72)	20.99 (5.68)	21.50 (4.75)	88.48***
Alcohol refusal efficacy (5-25 points)	21.25 (5.24)	1.84 (0.87)	1.77 (0.82)	9.31**
Peer alcohol use(2-10 points)	1.82 (0.85)	1.84 (0.87)	1.77 (0.82)	7.38**
Alcohol use peer pressure (2-12 points)	1.23 (0.75)	9.87 (3.47)	9.57 (3.02)	6.03*

*p<0.05; ** p<0.01; *** p<0.001

Table 2. Logistic regression analysis of the drinking behavior of all participants with regard to parental drinking behaviors and attitudes as well as others factors

Variable	OR	95% CIs	P-value
Paternal drinking and attitude			
NDA vs DF	0.36	0.25 - 0.52	***
NDF vs DF	0.57	0.41 - 0.78	***
DA vs DF	0.46	0.28 - 0.75	**
Maternal drinking and attitude			
NDA vs DF	0.33	0.17 - 0.65	**
NDF vs DF	0.49	0.25 - 0.94	*
DA vs DF	0.64	0.22 - 1.84	
Cohort			
Cohort 1 vs cohort 2	1.65	1.36 - 2.00	***
Gender			
Males vs females	1.03	0.85 - 1.25	
Age at first alcohol use			
<13 years vs >=13 years	2.27	1.85 - 2.77	***
Residential area			
Hsinchu County vs Taipei	1.01	0.82 - 1.24	
Parental marital status			
Married, living together vs other	0.89	0.64 - 1.24	
Paternal education level			
Middle school or below vs college or above	1.28	0.90 - 1.82	
High school vs college or above	1.25	0.97 - 1.61	
Maternal education level			
Middle school or below vs college or above	0.84	0.58 - 1.21	
High school vs college or above	0.82	0.64 - 1.06	
Parenting behavior			
Degree of emotional support (6-24 points)	1.01	0.99 - 1.04	
Degree of behavioral supervision (4-16 points)	0.98	0.95 - 1.02	
Cognitive factors			
Positive alcohol expectancies (5-20 points)	1.07	1.04 - 1.11	***
Negative alcohol expectancies (5-20 points)	0.92	0.89 - 0.95	***
Alcohol refusal efficacy (5-25 points)	0.95	0.93 - 0.97	***
Peer factors			
Peer alcohol use (2-10 points)	1.66	1.49 - 1.85	***
Alcohol use peer pressure (2-12 points)	1.36	1.22 - 1.51	***

*p<0.05; ** p<0.01; *** p<0.001

NDA= non-drinking/against; NDF= non-drinking/favorable; DA= drinking/against; DF= drinking/favorable

Table 3. Logistic regression analysis of adolescent drinking behavior across gender with regard to parental drinking behaviors and attitudes as well as others factors

Variable	Males			Females		
	OR	95% CIs	P-value	OR	95% CIs	P-value
Paternal drinking behavior and attitude						
NDA vs DF	0.27	0.16 - 0.46	***	0.52	0.30 - 0.91	*
NDF vs DF	0.61	0.39 - 0.94	*	0.51	0.32 - 0.83	**
DA vs DF	0.44	0.23 - 0.85	*	0.47	0.22 - 1.01	
Maternal drinking behavior and attitude						
NDA vs DF	0.43	0.16 - 1.17		0.23	0.09 - 0.60	**
NDF vs DF	0.47	0.18 - 1.25		0.49	0.20 - 1.25	
DA vs DF	0.72	0.15 - 3.41		0.58	0.13 - 2.50	
Cohort						
Cohort 2 vs cohort 1	1.51	1.15 - 1.98	**	1.84	1.38 - 2.56	***
Age at first alcohol use						
<13 years vs >=13 years	2.16	1.63 - 2.88	***	2.26	1.69 - 3.03	***
Residential area						
Hsinchu County vs Taipei	1.01	0.76 - 1.35		1.07	0.80 - 1.44	
Parental marital status						
Married, living together vs other	1.19	0.72 - 1.98		0.66	0.43 - 1.03	

*p<0.05; ** p<0.01; *** p<0.001

NDA= non-drinking/against; NDF= non-drinking/favorable; DA= drinking/against; DF= drinking/favorable

Table 3. Logistic regression analysis of adolescent drinking behavior across gender with regard to parental drinking behaviors and attitudes as well as others factors (continue)

Variable	Males			Females		
	OR	95% CIs	P-value	OR	95% CIs	P-value
Paternal education level						
Middle school or below vs college or above	1.28	0.79 - 2.08		1.40	0.83 - 2.36	
High school vs college or above	1.30	0.91 - 1.85		1.27	0.87 - 1.84	
Maternal education level						
Middle school or below vs college or above	0.95	0.58 - 1.58		0.72	0.41 - 1.25	
High school vs college or above	0.91	0.64 - 1.29		0.71	0.49 - 1.03	
Parenting behavior						
Degree of emotional support (6-24 points)	1.01	0.97 - 1.04		1.02	0.99 - 1.06	
Degree of behavioral supervision (4-16 points)	1.01	0.96 - 1.07		0.96	0.91 - 1.01	
Cognitive factors						
Positive alcohol expectancies (5-20 points)	1.10	1.05 - 1.16	***	1.02	0.97 - 1.08	
Negative alcohol expectancies (5-20 points)	0.92	0.88 - 0.96	***	0.93	0.89 - 0.97	***
Alcohol refusal efficacy (5-25 points)	0.96	0.94 - 0.98	***	0.93	0.90 - 0.95	***
Peer factors						
Peer alcohol use(2-10 points)	1.81	1.57 - 2.10	***	1.49	1.27 - 1.76	***
Alcohol use peer pressure(2-12 points)	1.45	1.26 - 1.66	***	1.24	1.05 - 1.48	*

*p<0.05; *** p<0.001

BMJ Open

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Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2014-007179.R1
Article Type:	Research
Date Submitted by the Author:	11-Mar-2015
Complete List of Authors:	Hung, Chao-Chia; Yuanpei University of Medical Technology, Department of Nursing Chang, Hsing-Yi; National Health Research Institutes, Institute of Population Health Sciences Luh, Dih-Ling; Chung Shan Medical University, Department of Public Health Wu, Chi-Chen; Institute of Population Health Sciences, National Health Research Institutes, Yen, Lee-Lan; National Taiwan University,
Primary Subject Heading:	Addiction
Secondary Subject Heading:	Public health
Keywords:	PUBLIC HEALTH, school, alcohol

Do Parents Play Different Roles in Drinking Behaviors of Male and Female Adolescents? A longitudinal Follow-up Study

Running title: Adolescent Drinking Behavior and Parental Drinking Behaviors/Attitudes

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Keywords: gender differences, parent, attitude, adolescent, alcohol use

Word count:3533

Abstract

Objective: Gender differences in the associations between adolescent drinking behavior and perceived parental drinking behaviors and attitudes toward underage drinking were investigated.

Methods: Data were drawn from two cohorts in the Child and Adolescent Behaviors in Long-term Evolution project. We used data from 2009 and 2006, when cohorts 1 and 2, respectively, were in grade 9. No cohort effect was found, so the two cohorts were pooled; 3,972 students (1,999 boys and 1,973 girls) participated in the study. The major variables included adolescent drinking behaviors over the last month and perceived parental drinking behaviors and parental attitudes toward underage drinking. The effects of the combination of parental drinking behaviors and attitudes on the drinking behaviors of male and female adolescents were analyzed by logistic regression.

Results: The drinking behavior of boys was correlated with the drinking behaviors and attitudes of their fathers but not with those of their mothers. Among boys, having a nondrinking father who was against underage drinking (OR = 0.27, 95% CI = 0.16–0.46), a nondrinking father who was favorable toward underage drinking (OR = 0.61, 95% CI = 0.39–0.94), or a drinking father who was against underage drinking (OR = 0.44, 95% CI = 0.23–0.85) significantly decreased the likelihood of alcohol consumption, whereas maternal behavior and attitude were not significant influences. Among girls, having a nondrinking father who was against underage drinking (OR = 0.52, 95% CI = 0.30–0.91) or a nondrinking father who was favorable toward underage drinking (OR = 0.51, 95% CI = 0.32–0.83) significantly decreased the likelihood of alcohol consumption, as did having a nondrinking mother who was against underage drinking (OR = 0.23, 95% CI = 0.09–0.60).

Conclusions: The influences of fathers and mothers on the drinking behavior of their adolescent children differed by offspring gender.

Strength and limitations of this study

■ This study considered the effects of the combination of parental drinking behaviors and attitudes on the drinking behaviors of male and female students.

■ This study pooled two cohorts and examined the influence of parental behaviors and attitudes on the drinking behaviors of male and female students.

■ This study considered only drinking behavior over the last month and did not consider amount or frequency of alcohol use.

■ Parental drinking behaviors and attitudes were reported by adolescents rather than by parents.

INTRODUCTION

Underage drinking is a social and public health issue that receives much attention. Drinking behavior differs significantly across gender. The stages in the developmental trajectories of various drinking behaviors occur earlier among males than among females, and drinking frequency and amount of alcohol consumed are higher among males.[1] Recently, however, gender convergence in the drinking behaviors of adolescents has been reported.[2, 3] Because of the modern emphasis on gender mainstreaming, paying attention to the relevant factors associated with drinking behaviors across gender can be expected to facilitate the development of appropriate strategies for preventing adolescent drinking.

Multiple factors influence drinking behavior, and the family plays an important role with regard to adolescent drinking behavior. Family members, especially parents, affect the substance use of adolescents.[4] Both the drinking behaviors of parents and their attitudes toward underage drinking are associated with alcohol use among adolescents.[5] Many studies have shown that children are more likely to drink if both parents are drinkers than if only one or neither drinks.[6-8] Various indicators of adolescent alcohol use, including age at first alcohol use, lifetime alcohol use, alcohol use over the last year, alcohol use over the last month, and excess alcohol use, are associated with parental drinking behavior. Child-reported levels of parental drinking have been reported to be significantly associated with alcohol drinking in children.[9] However, studies of the individual influences of paternal and maternal drinking behaviors on the drinking behaviors of their male and female children have not shown consistent results. For example, Yu and Perrine [10] reported that paternal drinking behaviors influence the drinking behaviors of sons, whereas maternal drinking behaviors influence those of their daughters. Other investigators have argued that the

influence of maternal drinking behaviors on children's drinking behaviors is greater than that of paternal drinking behaviors,[11-13] and Yeh[14] reported that fathers significantly influence the excessive drinking behaviors of their children, whereas mothers have no influence. However, most studies argue that parental alcohol use increases the likelihood of alcohol use in children, although Haugland et al.[15] found that male adolescents with alcohol-abusing mothers were less likely to use alcohol to excess than were male adolescents whose mothers did not abuse alcohol. Overall, these studies consistently emphasize that the individual drinking problems of parents influence the drinking problems of their male and female children.

Kelly et al.[16] argued that parental attitudes toward underage drinking influence the drinking behaviors of their children (regardless of offspring gender), whether the attitudes were clearly articulated during a discussion of drinking behavior or during the development of rules to restrict alcohol use. Van der Vorst et al.[17] reported that the outcomes of discussions between adolescents and their parents about drinking behaviors differ by gender: males are significantly influenced, whereas females are not. Other studies have indicated that parental restrictions on adolescent alcohol use can delay the start of alcohol use among adolescents, can decrease the frequency and amount of alcohol consumption,[18–21] and can delay the development of harmful drinking behaviors.[21] However, the above-mentioned studies did not distinguish fathers from mothers. A study that did distinguish between the effects of paternal and maternal attitudes about underage drinking on the drinking behaviors of their underage children at different ages showed that paternal drinking rules significantly delay alcohol use among younger children, whereas maternal attitudes do not have the same effect.[19]

The drinking behaviors of parents are associated with their attitudes toward

underage drinking. Compared to parents who do not drink, parents who drink usually have more-relaxed rules with regard to underage drinking.[19–23] Most of the previous studies of parental drinking behaviors and attitudes regarded these variables as independent and introduced them into joint models or used one of them as a mediator. No previous study has examined the relationship between adolescent drinking behaviors and parental drinking behaviors and attitudes toward underage drinking.

In summary, previous studies of the effects of parental drinking behaviors and attitudes toward underage drinking on adolescent drinking behaviors have the following limitations. First, previous studies have not adequately considered the various same-gender and cross-gender interactions of paternal and maternal drinking behaviors and attitudes with the drinking behaviors of male and female children. Moreover, previous studies focused on geographical areas with a high prevalence of alcohol use in Europe and the Americas. In developed countries, underage drinking behavior, which has long been a concern, has recently begun to decrease.[24, 25] Interestingly, the wine industry has begun to focus its marketing efforts on Western Pacific countries with developed economies and low rates of alcohol consumption.[26] Taiwan is in this region; therefore, investigation of Taiwanese data on the parental factors that affect underage drinking behavior can help to establish an effective mechanism for preventing underage drinking in areas with low rates of alcohol consumption. On the basis of a review of the above-described literature, the major purpose of this study was to investigate the drinking behaviors of male and female ninth-grade students in Taiwan and the association of these behaviors with parental drinking behaviors and attitudes simultaneously.

METHODS

Study population

The data used in this study were obtained from the Child and Adolescent Behaviors in Long-term Evolution (CABLE) project. [27] The original project was reviewed and approved by the Human Subject Review Board of the National Health Research Institutes (no. EC9009003). Informed written consent was obtained from participants and their parents. The present study included two cohorts: cohort 1 consisted of 2,719 students who were in the first grade in 2002 (when the study began) and were in the ninth grade (14–15 years old) in 2009; and cohort 2 consisted of 2,499 students who were in the fifth grade (10–11 years old) in 2002 and were in the ninth grade (14–15 years old) in 2006. Participants with missing data were excluded, resulting in a final sample of 1,961 students in cohort 1 (72.12%) and 2,011 students in cohort 2 (80.47%). The chi-square test was used to assess differences from baseline with regard to sex and residential area. No significant differences were found between the samples.

Because the CABLE project is school-based, clustering effects on adolescent drinking behavior had to be taken into account. Therefore, we used a general estimating equation with an exchangeable working correlation matrix to investigate the presence of clustering effects. The obtained correlation coefficients of –0.002 for cohort 1 and –0.003 for cohort 2 for both models indicated that the correlation of current drinking behaviors among adolescents within each school was low. Therefore, we ignored clustering effects and analyzed the data as an independent sample.

Measures

Student drinking behavior

Students reported the frequency of their alcohol use by answering the question "Have you ever used alcohol?" using a 6-point scale: 1 = never used; 2 = not over the last year, but have used before; 3 = not over the last month, but have used before; 4 = used once or twice over the last month; 5 = have used many times over the last month; and 6 = have used every day over the last month. On the basis of their responses, the students were combined into two groups as follows: scores of 1–3 were recoded as 1 = nondrinking, and scores of 4–6 were recoded as 2 = used over the last month.

Student-reported paternal and maternal drinking behaviors and attitudes

Students reported their perceptions of the drinking frequencies of their fathers and mothers by using a 6-point scale in response to the questions "Does your father use alcohol?" and "Does your mother use alcohol": 1 = never; 2 = not over the last year, but has used before; 3 = not over the last month, but has used before; 4 = has used once or twice over the last month; 5 = has used several times over the last month; and 6 = has used every day over the last month. Scores of 1–4 were recoded as 1 = used infrequently, and scores of 5–6 were recoded as 2 = used frequently.

Students also reported their perceptions of the attitudes of their parents toward underage drinking on a 5-point scale in response to the prompts "Your father's attitude toward your alcohol use" and "Your mother's attitude toward your alcohol use": 1 = very against, 2 = against, 3 = no opinion, 4 = favorable, and 5 = very favorable. Scores of 1–2 were recoded as 0 = against, and scores of 3–5 were recoded as 1 = favorable.

Finally, perceived paternal drinking frequencies and attitudes were combined into four categories and recoded as follows: (1) NDA, nondrinking and against underage drinking; (2) NDF, nondrinking but favorable toward underage drinking; (3)

DA, drinking frequently but against underage drinking; (4) DF, drinking frequently and favorable toward underage drinking. Maternal drinking behaviors and attitudes were categorized and coded in the same way.

Background variables

Relevant background variables with regard to underage drinking based on previous studies were controlled,[6, 14, 28–33] including cohort factors, age at first alcohol use, residential area, parental marital status, parental education level, parenting behavior (i.e., degrees of emotional support and behavior supervision), peer alcohol use, peer pressure with regard to alcohol use, alcohol expectancies, and alcohol refusal efficacy.

Statistical analysis

We first used SAS 9.1 to perform a descriptive statistical analysis on the data across gender using the distribution of the mean, percentages, and standard deviations for both the independent and the dependent variables. Next, we compared the independent and dependent variables for males and females using chi-squared and analysis of variance to determine differences. Finally, we constructed models of the total sample, as well as male and female student samples, and we analyzed the factors that influenced the drinking behavior of the adolescents by using logistic regression.

RESULTS

The study population comprised 3,972 students (1,999 males and 1,973 females; Table 1). Of these students, 679 reported having consumed alcohol over the last month. More males than females consumed alcohol over the last month. Adolescents with fathers who were nondrinkers and against underage drinking comprised the majority

of the sample (55.74%), followed by adolescents with fathers who were nondrinkers but favored underage drinking (29.51%); the corresponding percentages for the mothers were 68.05% and 29.68%, respectively. Paternal drinking behavior and attitude differed significantly by gender: more females than males had fathers who were NDA (57.78% vs 53.73%) or DA (8.01% vs 7.15%). Conversely, more males than females had fathers who were NDF (31.62% vs 27.37%) or DF (7.50% vs 6.84%). In other words, fathers were more against alcohol use by their daughters than by their sons. The effects of maternal drinking behavior and attitude did not significantly differ by offspring gender.

Table 1. Distribution of variables by adolescent gender

Variable	Total sample	Males	Females	
	Number of people (%)	Number of people (%)	Number of people (%)	χ^2/F
Drinking over the last month				
No	3,293 (82.91)	1,630 (81.54)	1,663 (84.29)	5.29*
Yes	679 (17.09)	369 (18.46)	310 (15.71)	
Perceived Paternal drinking behavior/attitude				10.56*
NDA	2,214 (55.74)	1,074 (53.73)	1,140 (57.78)	
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DF	285 (7.18)	150 (7.50)	135 (6.84)	
Perceived Maternal drinking behavior/attitude				0.62
NDA	2,703 (68.05)	1,354 (67.73)	2,703 (68.37)	
NDF	1,179 (29.68)	602 (30.12)	1179 (29.24)	
DA	39 (0.98)	18 (0.90)	39 (1.06)	
DF	51 (1.28)	25 (1.25)	51 (1.32)	
Cohort				
Cohort 1	1,961 (49.37)	976 (48. 82)	985 (49.92)	0.48
Cohort 2	2,011 (50.63)	1,023 (51.18)	988 (50.08)	
Age at first alcohol use				
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≥13 years	3,055 (76.91)	1,556 (77.84)	1,499 (75.98)	

Table 1. Distribution of variables by gender (continued)

Variable	Total sample	Males	Females	χ^2/F
	Number of people (%) or mean (SD)	Number of people (%) or mean (SD)	Number of people (%) or mean (SD)	
Residential area				
Taipei	2,052 (51.66)	1,010 (50.53)	1,042 (52.81)	2.08
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Other	322 (8.11)	152 (7.60)	170 (8.62)	
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College or higher	1,976 (49.75)	1,011 (50.58)	965 (48.91)	
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High school	1,797 (45.24)	867 (43.37)	930 (47.14)	
College or higher	1,604 (40.38)	840 (42.02)	764 (38.12)	
Parenting behavior				
Degree of emotional support (6–24 points)	17.06 (4.81)	16.74 (4.81)	17.38 (4.78)	17.56***
Degree of behavioral supervision (4–16 points)	13.37 (2.89)	13.21 (2.96)	13.52 (2.81)	12.29**

Table 1. Distribution of variables by gender (continued)

Variable	Total sample	Males	Females	
	Number of people (%) or mean (SD)	Number of people (%) or mean (SD)	Number of people (%) or mean (SD)	χ^2/F
Positive alcohol expectancies (5–20 points)	9.72 (3.26)	13.04 (3.98)	14.13 (3.34)	8.16**
Negative alcohol expectancies (5–20 points)	13.58 (3.72)	20.99 (5.68)	21.50 (4.75)	88.48***
Alcohol refusal efficacy (5–25 points)	21.25 (5.24)	1.84 (0.87)	1.77 (0.82)	9.31**
Peer alcohol use (2–10 points)	1.82 (0.85)	1.84 (0.87)	1.77 (0.82)	7.38**
Alcohol use peer pressure (2–12 points)	1.23 (0.75)	9.87 (3.47)	9.57 (3.02)	6.03*

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Abbreviations: NDA = nondrinking/against; NDF = nondrinking/favorable; DA = drinking/against; DF = drinking/favorable; SD, standard deviation.

We conducted logistic regression analysis of the drinking-behavior-related factors across all participants and observed the following results with regard to the factors related to adolescent alcohol consumption over the last month (Table 2). Comparison between adolescents whose fathers were DF and adolescents whose fathers were NDA, NDF, and DA resulted in odds ratios (ORs) and 95% confidence intervals (CIs) of 0.36 (0.25–0.52), 0.57 (0.41–0.78), and 0.46 (0.28–0.75), respectively. Compared with adolescents whose mothers were DF, those whose mothers were NDA (OR = 0.33; 95% CI = 0.17–0.65) or NDF (OR = 0.49; 95% CI = 0.25–0.94) were significantly less likely to consume alcohol.

The results of logistic regression analysis of the drinking-behavior-related factors across gender showed that male adolescents whose fathers were NDA (OR = 0.27; 95% CI = 0.16–0.46), NDF (OR = 0.61; 95% CI = 0.39–0.94), or DA (OR = 0.44; 95% CI = 0.23–0.85) were significantly less likely to consume alcohol than those whose fathers were DF. Paternal drinking behavior and attitude influenced male adolescent drinking behavior, whereas maternal drinking behavior and attitude did not. In addition, cohort 2 was more likely to consume alcohol than cohort 1 (OR = 1.51; 95% CI = 1.15–1.98). Male adolescents were more likely to have used alcohol over the last month when the first alcohol use occurred before age 13 (OR = 2.16; 95% CI = 1.63–2.88), when perceived positive alcohol expectancies increased 1 point (OR = 1.10; 95% CI = 1.05–1.16), when negative alcohol expectancies decreased 1 point (OR = 0.92; 95% CI = 0.88–0.96), when alcohol refusal efficacies decreased 1 point (OR = 0.96; 95% CI = 0.94–0.98), when more peers were perceived as using alcohol (OR = 1.81; 95% CI = 1.57–2.10), and when peer pressure regarding alcohol use was stronger (OR = 1.45; 95% CI = 1.26–1.66).

Table 2. Logistic regression analysis of drinking behavior of all participants with regard to parental drinking behaviors and attitudes as well as others factors

Variable	OR	95% CI	*P*-value
Perceived Paternal drinking behavior/attitude			
NDA vs DF	0.36	0.25–0.52	***
NDF vs DF	0.57	0.41–0.78	***
DA vs DF	0.46	0.28–0.75	**
Maternal drinking behavior/attitude			
NDA vs DF	0.33	0.17 - 0.65	**
NDF vs DF	0.49	0.25 - 0.94	*
DA vs DF	0.64	0.22 - 1.84	
Cohort			
Cohort 1 vs cohort 2	1.65	1.36 - 2.00	***
Gender			
Male vs female	1.03	0.85 - 1.25	
Age at first alcohol use			
<13 years vs ≥13 years	2.27	1.85 - 2.77	***
Residential area			
Hsinchu County vs Taipei	1.01	0.82 - 1.24	
Parental marital status			
Married, living together vs other	0.89	0.64 - 1.24	
Paternal education level			
Middle school or below vs college or above	1.28	0.90 - 1.82	
High school vs college or above	1.25	0.97 - 1.61	
Maternal education level			
Middle school or below vs college or above	0.84	0.58 - 1.21	
High school vs college or above	0.82	0.64 - 1.06	
Parenting behavior			
Degree of emotional support (6–24 points)	1.01	0.99 - 1.04	
Degree of behavioral supervision (4–16 points)	0.98	0.95 - 1.02	
Cognitive factors			
Positive alcohol expectancies (5–20 points)	1.07	1.04 - 1.11	***
Negative alcohol expectancies (5–20 points)	0.92	0.89 - 0.95	***
Alcohol refusal efficacy (5–25 points)	0.95	0.93 - 0.97	***
Peer factors			
Peer alcohol use (2–10 points)	1.66	1.49 - 1.85	***
Alcohol use peer pressure (2–12 points)	1.36	1.22 - 1.51	***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Abbreviations: NDA = nondrinking/against; NDF = nondrinking/favorable; DA = drinking/against; DF = drinking/favorable

Table 3 also shows the results from the analysis of the drinking-behavior-related factors with regard to female adolescents. Compared with females whose fathers were DF, those whose fathers were NDA (OR = 0.52; 95% CI = 0.30–0.91) or NDF (OR = 0.51; 95% CI = 0.32–0.83) were less likely to consume alcohol. Compared with females whose mothers were DF, those whose mothers were NDA (OR = 0.23; 95% CI = 0.09–0.60) were less likely to consume alcohol. For females, parental drinking behaviors had a greater influence on drinking behaviors than did parental attitudes. In addition, cohort 2 was more likely to consume alcohol than cohort 1 (OR = 1.84; 95% CI = 1.38–2.56). Female students were more likely to have consumed alcohol over the last month when their first alcohol use occurred before age 13 (OR = 2.26; 95% CI = 1.69–3.03), when perceived negative alcohol expectancies increased 1 point (OR = 0.93; 95% CI = 0.89–0.97), when alcohol refusal efficacies were 1 point lower (OR = 0.93; 95% CI = 0.90–0.95), when the perceived number of peers who used alcohol was greater (OR = 1.49; 95% CI = 1.27–1.76), and peer pressure with regard to alcohol use by peers was stronger (OR = 1.24; 95% CI = 1.05–1.48).

DISCUSSION

In this study, we found that although the percentage of students who had used alcohol in the last month did not differ by gender, the influence of parental drinking behaviors and attitudes on adolescent drinking behavior depended on both patent and adolescent gender. Paternal, but not maternal, drinking behavior and attitude influenced male adolescent drinking behavior, and this influence was significant when fathers were against drinking. Paternal drinking behavior and both maternal drinking behavior and maternal attitude influenced female adolescents' drinking behavior; in particular, having a nondrinking father or a nondrinking mother significantly influenced the likelihood of adolescent drinking. Specific results are discussed below.

Gender differences with regard to adolescent drinking behavior

Compared to males, females have smaller body volumes, less body water content, and lower alcohol dehydrogenase activity and therefore are more likely to have adverse reactions to alcohol and consequently more likely to refuse alcohol.[34, 35] Furthermore, people in Asian societies generally hold negative opinions of female alcohol use, which is more restricted in Asia than in Western countries; as a result, Asian females are less likely to drink than Asian males.[35] Although the bivariate analysis conducted in this study showed that males were more likely to drink than females, the effect of gender disappeared after social learning factors associated with drinking behaviors were controlled for. These results suggest that gender differences in adolescent drinking behaviors operate through the influences of social and environmental variables such as the behaviors and attitudes of parents and peers.

Table 3. Logistic regression analysis of adolescent drinking behavior across gender with regard to parental drinking behaviors and attitudes as well as others factors

Variable	Males			Females		
	OR	95% CI		OR	95% CI	
Perceived Paternal drinking behavior/attitude						
NDA vs DF	0.27	0.16–0.46	***	0.52	0.30–0.91	*
NDF vs DF	0.61	0.39–0.94	*	0.51	0.32–0.83	**
DA vs DF	0.44	0.23–0.85	*	0.47	0.22–1.01	
Perceived Maternal drinking behavior/attitude						
NDA vs DF	0.43	0.16 - 1.17		0.23	0.09 - 0.60	**
NDF vs DF	0.47	0.18 - 1.25		0.49	0.20 - 1.25	
DA vs DF	0.72	0.15 - 3.41		0.58	0.13 - 2.50	
Cohort						
Cohort 2 vs cohort 1	1.51	1.15 - 1.98	**	1.84	1.38 - 2.56	***
Age at first alcohol use						
<13 years vs ≥13 years	2.16	1.63 - 2.88	***	2.26	1.69 - 3.03	***
Residential area						
Hsinchu County vs Taipei	1.01	0.76 - 1.35		1.07	0.80 - 1.44	
Parental marital status						
Married, living together vs other	1.19	0.72 - 1.98		0.66	0.43 - 1.03	

Table 3. Logistic regression analysis of adolescent drinking behavior across gender with regard to parental drinking behaviors and attitudes as well as others factors (continued)

Variable	Males			Females		
	OR	95% CI	*P*-value	OR	95% CI	*P*-value
Paternal education level						
Middle school or below vs college or above	1.28	0.79 - 2.08		1.40	0.83 - 2.36	
High school vs college or above	1.30	0.91 - 1.85		1.27	0.87 - 1.84	
Maternal education level						
Middle school or below vs college or above	0.95	0.58 - 1.58		0.72	0.41 - 1.25	
High school vs college or above	0.91	0.64 - 1.29		0.71	0.49 - 1.03	
Parenting behavior						
Degree of emotional support (6–24 points)	1.01	0.97 - 1.04		1.02	0.99 - 1.06	
Degree of behavioral supervision (4–16 points)	1.01	0.96 - 1.07		0.96	0.91 - 1.01	
Cognitive factors						
Positive alcohol expectancies (5–20 points)	1.10	1.05 - 1.16	***	1.02	0.97 - 1.08	
Negative alcohol expectancies (5–20 points)	0.92	0.88 - 0.96	***	0.93	0.89 - 0.97	***
Alcohol refusal efficacy (5–25 points)	0.96	0.94 - 0.98	***	0.93	0.90 - 0.95	***
Peer factors						
Peer alcohol use (2–10 points)	1.81	1.57 - 2.10	***	1.49	1.27 - 1.76	***
Alcohol use peer pressure (2–12 points)	1.45	1.26 - 1.66	***	1.24	1.05 - 1.48	*

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Abbreviations: NDA = nondrinking/against; NDF = nondrinking/favorable; DA = drinking/against; DF = drinking/favorable

Influences of parental drinking behaviors and attitudes on the drinking behaviors of children

Research on the relationship between drinking and health has generated conflicting results. The American Heart Association indicates that although consumption of a small amount of alcohol may be beneficial for health, the advantages, disadvantages, and risks associated with drinking demand careful assessment, and infrequent alcohol use is recommended. [36] Adult consumption of a small amount of alcohol is generally considered acceptable. The role of parents is complicated with regard to alcohol use among children.

To the best of our knowledge, no previous study has explored the simultaneous effects of parental drinking behaviors and attitudes on adolescent drinking behavior. Most previous studies have indicated that parents who drink are less likely to establish rules against drinking for their children. In the current study, we found that drinking parents' negative attitudes toward underage drinking had a mitigating effect on adolescent drinking behavior. These results indicate that parents' rules for their children's drinking have a stronger influence than their actual drinking behaviors.[5, 19] Perceived parental attitudes toward adolescent drinking might reflect drinking rules parents set for themselves and the degree to which they communicate with adolescents about drinking. Previous studies have shown that parents who have more-relaxed attitudes toward drinking have fewer alcohol-related discussions than do parents who have strict attitudes toward drinking.[18] When the frequency of communication between parents and their children about alcohol use is high, children are less likely to exhibit problematic drinking behaviors.[37] In addition, strict restrictions on alcohol help to reduce its consumption by adolescents.[38] Therefore,

the results of the current study regarding whether the antidrinking attitudes of drinking fathers reduce the likelihood of adolescent alcohol use through the formulation of alcohol-use restrictions, through alcohol-related discussions with their children, or through enhanced supervision regarding the drinking behavior of their children are worthy of continued investigation. Regardless of whether parents consume alcohol, they must communicate their negative attitudes toward underage drinking to their children.

We found that the influences of parental drinking behaviors and attitudes differed somewhat by gender. Male adolescents were influenced only by paternal drinking behaviors and attitudes, and the influence of paternal regulation factors was larger than that of their demonstration factors. However, the influence of these factors among mothers was not obvious. Both fathers and mothers influenced their daughters, but only having nondrinking parents showed strong preventive effects against drinking behaviors, suggesting that females were more easily influenced by behavior demonstrations. Overall, the influences of paternal drinking behaviors and attitudes on adolescent drinking behavior were significant regardless of gender.

Although the number of female drinkers has recently increased in Taiwan, and societal attitudes toward female alcohol use have become more open, drinking is still considered a male activity, and male drinking is more acceptable to the public than female drinking.[39, 40] In Asian societies, more adult males drink than do adult females, and adult males consume more alcohol. Although mothers directly parent and nurture their children, the current study suggests that the role of fathers should not be ignored with regard to drinking behavior in our society.

Other factors affecting adolescent drinking behavior

In addition to parental drinking behaviors and attitudes, alcohol expectancies, alcohol refusal efficacy, and peer alcohol use were found to be associated with adolescent drinking behavior in this study. In addition, a cohort effect was also observed: cohort 2 consumed more alcohol than cohort 1. This result was likely due to differences between the educational materials provided to the two cohorts. In 2001, a new curriculum was introduced in elementary schools in Taiwan. Unlike the previous curriculum, the new one emphasizes positive development, including self-awareness, self-efficacy, and communication skills. Cohort 1 was taught the new curriculum starting in the first grade, whereas cohort 2 was taught the previous curriculum. Whether the new curriculum reduced the drinking behaviors of cohort 1 requires additional study.

The current study showed that the negative alcohol expectancies and alcohol refusal efficacies of male and female adolescents significantly predicted their drinking behaviors. However, positive alcohol expectancies were not associated with female drinking behavior. Because their physiology predisposes females to adverse alcohol reactions,[33, 41] females consume less alcohol than males. This fact might explain the current results.

This study also showed that the drinking behaviors of peers and peer pressure associated with alcohol significantly influenced underage drinking, regardless of gender, when all possible personal and environmental factors were controlled for. Peers who provide adverse support are the major social group from which adolescents learn and establish health-risk behaviors.[15, 31]

This study has some limitations. First, it considered drinking behavior only over the last month and did not consider the amount or frequency of alcohol use during that time. Second, we considered adolescents' perceptions of parental drinking behaviors

and attitudes rather than parent-reported parental drinking behaviors and attitudes. Nevertheless, the behaviors and attitudes as perceived by adolescents might better reflect the behaviors of adolescents. Finally, this study did not account for the influence of diverse family structures, such as single-parent families.

Despite the aforementioned limitations, this study nevertheless provides new knowledge regarding gender differences in adolescent drinking behavior. In addition, the study has several strengths. First, the study used a large sample of students and examined the influences of both parental drinking behaviors and parental attitudes about underage drinking on adolescent drinking behaviors. Second, the study simultaneously controlled for important variables that influence adolescent drinking behaviors. Third, the study discussed the association between the drinking behaviors of parents and that of their children in an area with a low prevalence of alcohol use. Our conclusions can support the prevention of early-age drinking behaviors in other areas.

The results of the current study suggest that strategies for preventing underage drinking should be gender specific. In particular, family-based drinking prevention programs should emphasize the different roles of fathers and mothers in the drinking behaviors of their sons and daughters.

Ethics Approval: Ethics approval was given in 2001 by the Human Ethics Committee of the National Health Research Institutes, Miaoli, Taiwan. Informed consent was provided by the parents of participating students.

Role of Funding Sources: Funding for this study was provided by a grant from the National Health Research Institutes (NHRI, HP-090-SC03). The NHRI had no role in

the study design; the collection, analysis or interpretation of the data; the writing of the manuscript; or the decision to submit the paper for publication.

Contributors: All authors participated in the study and read and approved the final manuscript. CCH designed the study, completed data analysis, and drafted the manuscript; HYC and DLL contributed to data interpretation, provided data analysis advice, and revised the manuscript; CCW was responsible for data collection, cleaning, and coding; and LLY initiated the CABLE project and provided critical comments on the manuscript**.**

Conflict of Interest: All authors declare that they have no conflicts of interest.

Acknowledgements: We thank the Child and Adolescent Behaviors in Long-term Evolution project, funded by the NHRI, for providing data for this study. Language-editing services were provided by Boldface Editors, Inc.

Data sharing: CABLE data is open for application. Please visit http://cable.nhri.org.tw for more information.

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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract ✓
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found ✓
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported ✓
Objectives	3	State specific objectives, including any prespecified hypotheses ✓
Methods		
Study design	4	Present key elements of study design early in the paper ✓
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection ✓
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up ✓ *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable ✓
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group ✓
Bias	9	Describe any efforts to address potential sources of bias ✓
Study size	10	Explain how the study size was arrived at ✓
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why ✓
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding ✓
		(*b*) Describe any methods used to examine subgroups and interactions ✓
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	✓
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	✓
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	✓
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	✓
		(*b*) Report category boundaries when continuous variables were categorized	✓
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	✓
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	✓
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	✓
Generalisability	21	Discuss the generalisability (external validity) of the study results	✓
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	✓

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.