



# Family and school social capitals in late childhood predict youthful drinking behaviors and problems

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## ABSTRACT

**Background:** The present study aims to investigate the connection linking late childhood's family- and school-social capitals with subsequent alcohol drinking and problems.

**Methods:** Data were obtained from the Alcohol-Related Experiences among Children survey in Taiwan. A total of 928 6th graders (age 11–12) were recruited from 17 elementary schools in an urban region in 2006 (response rate = 61.0%<sub>wr</sub>); follow-ups were conducted at 8th grade (n = 783, follow-up rate = 82.6%<sub>wr</sub>) and young adulthood (age 18–19; n = 645, follow-up rate = 68.0%<sub>wr</sub>). Information concerning family social capital, alcohol drinking, and teacher–student relationship was collected by self-administered questionnaires; school social capitals were assessed via questionnaires and official statistics. Multilevel logistic regression analyses were used to evaluate relationship estimates.

**Results:** At 8th grade, nearly one in ten reported having drunk alcohol on four or more occasions (i.e., occasional drinking) in the past year; and 14% reported past-month binge drinking in young adulthood. Effects of family social capital differed by developmental stage; parental involvement appeared prominent in reducing occasional drinking only in adolescence (adjusted Odds Ratio [aOR] = 0.54). School social capital (e.g., teacher–student ratio) was salient in shaping alcohol involvement in adolescence (occasional drinking: aOR = 0.80, 95% CI = 0.63–0.98) and young adulthood (binge drinking: aOR = 0.71, 95% CI = 0.67–0.86).

**Conclusions:** Our findings warrant future research on social capitals at family- and school- levels in late childhood, and inform preventive strategies targeting alcohol drinking and problems in young people.

## 1. Introduction

Although the prevalence of underage drinking has slowly decreased since the turn of the millennium, alcohol consumption and harmful drinking continue to be a threat to the young population in the 21st century (Pape et al., 2018). Data from the 2015 European School Survey Project on Alcohol and Other Drugs showed that nearly four in five 15–16-year-old students had drunk alcohol in their lifetimes (range: 35%–96%), and the past-month prevalence of binge drinking (i.e., having five or more drinks at one occasion) was estimated at 35% (Kraus and Nociar, 2016). In Taiwan, the past-month prevalence of alcohol drinking among students aged 13–15 years was estimated at 17% in 2016, and over one in ten community-dwelling young adults were recent binge drinkers (Health Promotion Administration Ministry

of Health and Welfare, 2018). Thus, reducing alcohol initiation and problematic drinking in the young population are high priorities in public health and public policy, particularly in high-income countries and emerging markets (Mokdad et al., 2016).

Since the end of the 20th century, a series of studies have explored the roles of social capital on individual health (Kawachi and Berkman, 2000; Kawachi et al., 2004). Social capital — a concept that addresses the importance of resources, relationships, and possible dynamics within and between social structures (or networks) — has a rather complex definition depending on schools of thought (i.e., Pierre Bourdieu, James Coleman, and Robert Putnam) (Coleman, 1988; Grootaert and Van Bastelaer, 2002). Within the topic of health behaviors (Weitzman and Chen, 2005; Weitzman and Kawachi, 2000), the measures of social capital generally cover social norms, social relationships,

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social participation, social trust, and social integration; and the assessments are ascertained from individual and structural accounts (Carpiano, 2007; Grootaert and Van Bastelaer, 2002; Kawachi and Berkman, 2000; Kawachi et al., 2004). By and large, available studies were cross-sectional and often relied solely on Putnam's perspective of social capital (i.e., social trust and participation) (Kawachi et al., 2004). To illustrate, Weitzman and colleagues found that higher social capital, as defined by the school-level mean aggregate of the time students spent in volunteerism, was associated with reduced risk of binge drinking, frequent drunkenness, and alcohol abuse for college students in the United States (Weitzman and Chen, 2005; Weitzman and Kawachi, 2000).

Although the beneficial effects of social capital on alcohol-drinking behaviors and problems were documented among community-dwelling adult residents (Carpiano, 2007; Weitzman and Kawachi, 2000), evidence for this connection in the underage population is relatively sparse. When available, the findings are somehow inconclusive (Lundborg, 2005; Morgan and Haglund, 2009), partly because (i) there are multiple mechanisms at play including social control, health-information diffusion, and increased social norms; (ii) the effects may operate differentially across outcome indicators or social milieus (Kawachi and Berkman, 2000; Parcel and Menaghan, 1994). Additionally, the measurement indicators of social capital, such as social participation, are often conceptualized on the basis of adults, who acts as an active social agent in the dynamic, reciprocal process of producing and receiving resources from a network of social relationships. Nevertheless, such a statement may not hold true for the underage population, particularly for children.

For children, family has long been considered as the first socialization context wherein they develop skills, acquire knowledge, and grow values (Bengtson et al., 2002). Numerous studies have supported the notion that family resources influence an array of children's social outcomes (Bourdieu, 1986; Parcel and Dufur, 2001a, b), particularly their academic achievement. By investing social, financial, and human forms of family-based resources (so-called "family capital"), desirable academic performance of children can be achieved through pathways such as amount and quality of child care, school attendance and attitude, the nature of role models, and parent-child interaction (Coleman, 1988; Lareau, 2000). An earlier work analyzing the National Longitudinal Survey of Youth in the United States indicated that the family social capital children owned (e.g., physical environment of home and parenting style) was significantly predictive for math achievement; whereas for reading achievement, human capital (i.e., parental educational attainment) appeared more important (Parcel and Dufur, 2001b). In China, a recent study surveying primary-school-attending children found that family social capital, as measured by the parent-child relationship, was the strongest correlate for self-reported wellbeing (Lau and Li, 2011).

Besides family, school is another critical environment where children foster social relationship. Certain school-level attributes (e.g., school connectedness and student-teacher ratio) were strongly associated with academic and health outcomes in late childhood and adolescence (Gase et al., 2017; Hoffmann and Dufur, 2008; McNeely and Faldi, 2004). A study linking the California Healthy Kids Survey with school-level administrative data found that a low teacher-student ratio, a proxy measure for collective teacher-student interaction, was associated with increased alcohol drinking by 13%–20% in Asian-American students; yet such association did not exist for tobacco smoking (Kim and McCarthy, 2006). Despite its importance, to this point the concept of "capital" has not been incorporated into measures to characterize school in research.

The lack of longitudinal evidence has limited our understanding toward the nature of childhood's social capital and probable effects on health outcomes (Morgan and Haglund, 2009; Parcel and Dufur, 2001b; Weitzman and Chen, 2005; Weitzman and Kawachi, 2000), particularly drinking behaviors and problems. There are both theoretical and

practical reasons to believe the social capital built within family and schools in early life may have long-term effects on children's health and development (Swartz, 2008; Waitaha, 2014). In an attempt to fill these gaps, we turned to a prospective cohort of school-aged children to examine potential relationships linking childhood's social capital with drinking behaviors in adolescence and binge drinking in young adulthood. Specifically, with a focus on the two most important social organizations for school-aged children i.e., family and school, this work conceptualized the measures of social capital using primarily Coleman's perspective—social relationships (Grootaert and Van Bastelaer, 2002; Perna and Titus, 2005).

## 2. Methods

### 2.1. Participants and procedures

The data source for the present study was the Alcohol-Related Experiences among Children (AREC) study (Tseng et al., 2017). In brief, a total of 141 public elementary schools in Taipei were categorized into four strata based on school composition, resource, and neighboring characteristics retrieved from 2004 to 2005 administrative and commercial records. Next, 28 public elementary schools were selected from four strata, and two or three classes were randomly selected from sixth grade (age 11–12) in each selected school. A total of 2129 students in 28 public elementary schools were eligible to participate. The baseline response rate for the first semester of the calendar year (CY) 2006 (wave 1) was 61% (n = 1324) (Chen et al., 2018).

To assure the representativeness and efficiency of follow-up, we selected 17 schools with higher school-level response rates (> 70%) for further follow-up (n = 928). Four follow-up assessments were conducted during the second semester of sixth grade (wave 2, age 11–12, elementary school), the first semester of CY 2007 (wave 3, age 12–13, middle school), the first semester of CY 2008 (wave 4, age 13–14, middle school), and the CY 2011–2012 (wave 5, age 18–20, college freshman year). The follow-up rates were 99% (n = 946), 87% (n = 823), 83% (n = 783), and 68% (n = 645), respectively. Given that the outcome variables in the present study are drinking behaviors and problems in early adolescence and adulthood, we restricted our two analytic samples to (i) those with valid drinking occasions at wave 4 (n = 783), and (ii) those with valid binge drinking assessment at wave 5 (n = 645) (see Fig. 1 for sample flowchart). The attrition analyses found distributional differences only in the monthly allowance: pupils receiving lower monthly allowance at 6th grade were more likely to stay on for follow-up in young adulthood (see Supplementary Table 1). The AREC study has been approved by the Institutional Review Board of the National Health Research Institutes.

### 2.2. Measures

The AREC data for waves 1, 2, 3, and 4 were collected via self-administered paper-and-pencil questionnaires during regular class hours; most students took about 30 min to complete the assessment. In wave 5, data were collected via web-based questionnaires on college campus or in the workplace. Information in the AREC questionnaires covered individual demographics, family background, family social capital, individual alcohol drinking behaviors and problems, parental drinking, peer drinking, and teacher-student relationship. Information concerning other school social capital (i.e., school size and teacher-student ratio) was ascertained from the administrative statistics.

Outcome variables. The outcomes of interest were past-year occasional drinking at eighth grade (wave 4) and binge drinking in young adulthood (wave 5) (Tseng et al., 2017). Past-year drinking occasions were measured by the question at wave 4 (age 13–14) "In the past year, on how many occasions did you drink an alcoholic beverage?" The present study defined occasional drinking by using the 3rd quartile of drinking occasions as the cut-off point, in response to the underage drinking

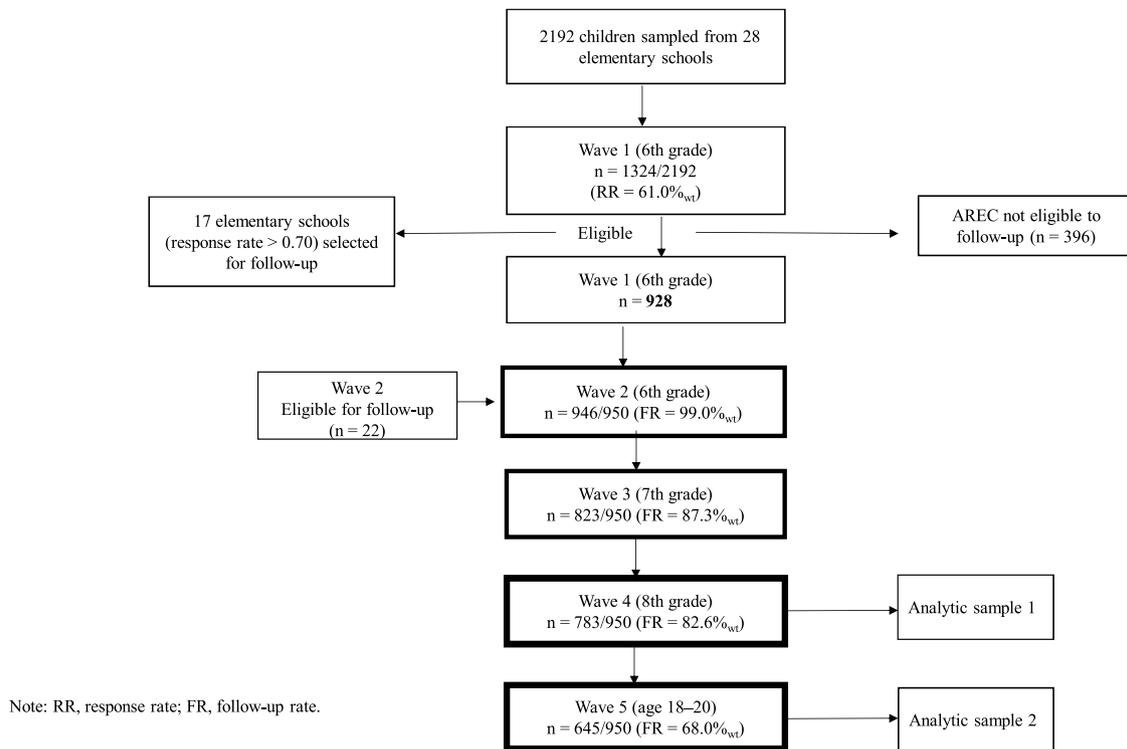


Fig. 1. Flowchart of sample selection in the AREC study.

norms in Taiwan (Chen et al., 2008). Binge drinking was assessed through the question “In the past month, on how many days have you had five or more drinks?”

Independent variables. Parental employment status was measured by two questions: “Is your father (mother) currently holding a job?” We grouped parental employment status into “both employed” and “at least one unemployed.” Family structure was divided into “living with both parents” and “living with either one only.” Parental involvement was assessed by the multi-item parenting practice instrument (Capaldi and Patterson, 2012; Chen et al., 2005), with evidenced good reliability and validity in elementary school samples. Parental involvement/reinforcement (10 items; Cronbach’s = 0.89), including the items “Will you discuss your recent plans and activities with your mom (dad)?” Based on the samples’ tertile, we grouped parental involvement into two subgroups (i.e., high and low), higher scores meant that parents were highly involved in the index child’s activities (e.g. something special that children enjoy) (Chen et al., 2005). Monthly allowance at sixth grade was classified into “0–499 New Taiwan Dollars (NTD)” (up to approximately 16 USD) and “500 NTD or above” (Hoffmann and Dufur, 2008; Parcel and Dufur, 2001a; Perna and Titus, 2005).

Building upon Coleman’s perspective on social capitals, we ascertained three indicators from self-administered questionnaires (i.e., teacher–student conflict at 6th grade) and administrative statistics (school size and teacher–student ratio) (Dufur et al., 2013b; Gase et al., 2017; Hoffmann and Dufur, 2008) to reflect children’s social relationship in schools. Teacher–student conflict was assessed through the prevalence of pupils’ self-reported experience of not getting along with teachers at 6th grade (wave 1). Using the 3rd quartile as the cut-off points, schools with prevalence rates lower than 10 percent were coded as having “low” teacher–student conflict at elementary school. School size was coded as “large” if the elementary school had 85 or more classes; the cutoff point was chosen on the basis of the 3rd quartile of the sampled schools.

Other covariates. Parental educational attainment, assessed by two questions: “What is the highest level of education completed by your father (mother)?” Those were categorized into “at least one college education”

and “both high school or below.” Observing parental drinking — assessed by two questions: “Have you ever see your father (mother) drinking?” — was categorized into “none,” “only one,” and “both.” As to best friend’s drinking behaviors, the participants were first asked to nominate at most five best friends at wave 3 (seventh grade). For each of the nominated friend, participants were asked “Have you ever observed your friend drink alcohol?” to measure the best friend’s drinking behaviors. Peer drinking was defined as positive if the respondents reported having observed at least one of their best friends’ drinking. Childhood alcohol initiation was assessed at wave 1 “Not including a sip of alcohol or alcoholic beverages added in meals, have you ever drunk alcohol in your lifetime?”

### 2.3. Data analysis

Since the AREC adopted multistage probability sampling, we turned to complex survey analyses to take into account sampling weight, sampling strata, and primary sampling unit. Distribution of selective individual socio-demographics, family social capital and school social capital, peers drinking, and problem drinking in adolescence and young adulthood were first summarized. Next, to test the potential effects of school social capital on subsequent drinking behaviors and problems, we turned to multilevel logistic regression analysis (Hox et al., 2017). The school-level intra-class correlation coefficient (ICC) was 0.04 for occasional drinking at 8th grade, and 0.02 for binge drinking in young adulthood. In model 1, we adjusted for individual characteristics and family social capital. Next, school social capital was added to the model with individual characteristics and family social capital (model 2). Finally, we replaced alcohol initiation at 6th grade with past-year drinking on four or more occasions at 8th grade in the final model, and simultaneously took individual characteristics, family social capital, and school social capital into account (model 3). Odds ratio (OR) with a 95% confidence interval was used to present the association estimates. All the data were computed through SAS version 9.4.

**Table 1**  
Selected individual characteristics, family social capital, and school social capital for children in the AREC Study.

Characteristics <sup>a</sup>	8th graders (n = 783)	% <sub>wt</sub> <sup>b</sup>	Young adults (n = 645)	% <sub>wt</sub> <sup>b</sup>
<b>Individual characteristics</b>				
Gender				
Male	396	51.0	332	51.0
Female	387	49.0	313	49.0
Parental education attainment (8th grade)				
At least one college or above	454	59.3	334	53.3
Both are high school or below	312	38.6	197	30.2
NA <sup>c</sup>	17	2.1	114	16.5
Observing parental drinking (6th grade)				
Only one	264	34.6	222	34.8
Both	349	44.0	291	44.8
None	170	21.4	132	20.4
Observing peers' drinking (7th grade)				
No	648	83.7	552	85.7
Yes	135	16.3	93	14.3
Alcohol initiation (6th grade)				
No	453	57.9	361	56.0
Yes	330	42.1	284	44.0
<b>Family social capital</b>				
Parental employment status (6th grade)				
Both employed	542	69.8	452	70.4
At least one unemployed	217	27.0	183	27.8
Living with parents (6th grade)				
Both	670	85.4	569	88.0
One or none	91	11.5	67	10.0
Parental involvement/reinforcement (6th grade)				
Low (< 26)	517	65.9	426	66.2
High (≥ 26)	266	34.1	219	33.8
Monthly allowance (NTD <sup>d</sup> ) (6th grade)				
0–499	607	76.9	520	80.5
500 or above	132	17.2	96	14.8
<b>School social capital (n = 17) (6th grade)</b>				
Teacher–student conflict (6th grade)				
Low (< 10)	13	74.8		
High (≥ 10)	4	25.2		
School size				
Small (< 85)	13	72.2		
Large (≥ 85)	4	27.8		
Teacher–student ratio				
Mean (SE <sup>e</sup> )/ Minimum/ Maximum	0.07 (0.004)/0.05/0.20			
Drinking in the past year (8th grade)				
No	469	60.0	332	52.4
Yes	312	39.7	205	31.8
NA <sup>c</sup>	–	–	108	15.8
Number of drinking occasions in the past year (8th grade)				
Mean (SE <sup>e</sup> )/ Minimum/ Maximum	3.26 (0.28)/1/50		3.13 (0.32)/1/20	
Binge drinking in the past month (college freshman year, age 19)				
No	474	59.4	561	85.9
Yes	70	9.3	84	14.1
NA <sup>c</sup>	239	31.2	–	–

Note. Data were collected during sixth grade (W1, W2), seventh grade (W3), eighth grade (W4), and freshman year (W5).

<sup>a</sup>The columns may not add up to 100% due to missingness.

<sup>b</sup>Estimates (%<sub>wt</sub>) were obtained by taking multistage probability sampling procedure into account.

<sup>c</sup>SE: standard error.

<sup>d</sup>NTD: New Taiwan dollars.

<sup>e</sup>NA: not available due to loss-to-follow-up.

### 3. Results

Descriptive statistics for AREC-participating students and schools are shown in Table 1. 44% had ever observed both parents' drinking, 85% lived with two parents at 6th grade, and 17% had a monthly allowance of 500 or more NTD (see the first panel for the 8th-grade sample). At 8th grade, 40% had consumed alcohol at least once in the past year, and drinking occasions ranged from 1 to 50; 14% had experienced binge drinking in the past month in young adulthood. As for school social capital, the teacher–student ratio for participating elementary schools ranged from 0.05 to 0.20.

Compared to the null model (Table 2), the proportional change in variance (PCV) by adding individual characteristics and family social

capital variables was 59%. With simultaneous adjustment for listed variables (Model 2), the association estimate of parental involvement was only slightly attenuated (adjusted OR [aOR] = 0.54, 95% CI = 0.31–0.95). A higher teacher–student ratio (aOR = 0.80, 95% CI = 0.63–0.98) appeared to be the most salient school social capital predictor for past-year occasional drinking at 8th grade. The PCV by adding three school-level social capital variables was 19%. Furthermore, the PCVs between model 1 and the model adding teacher–student conflict at 6th grade, school size, and teacher–student ratio one by one were 10.0%, 4.3%, and 5.7%, respectively.

Table 3 shows the association estimates linking late childhood's social capital with binge drinking in young adulthood. In comparison with the null model, the proportional change in variance (PCV) by

**Table 2**  
Association estimates linking family social capital and school social capital with occasional alcohol drinking in mid-adolescence (n = 783).

Variables	Past-year drinking on four or more occasions <sup>a</sup>					
	Crude		Model 1		Model 2	
	OR (95% CI)	P-value	aOR (95% CI)	P-value	aOR (95% CI)	P-value
<b>Fixed effects<sup>b</sup></b>						
<b>Level-1 Individual characteristics</b>						
Gender (Ref: Female)	0.99 (0.63-1.57)	0.99	0.91 (0.56-1.49)	0.72	0.91 (0.56-1.49)	0.72
Parental educational attainment (Ref: Both high school)	0.66 (0.41-1.05)	0.08	0.68 (0.41-1.12)	0.13	0.68 (0.41-1.12)	0.13
Observing parental drinking (6th grade) (Ref: No)						
Only one	2.53 (1.07-6.02)	<b>0.04</b>	2.33 (0.94-5.75)	0.07	2.29 (0.93-5.65)	0.07
Both	4.07 (1.80-9.23)	<b>&lt; 0.001</b>	3.57 (1.46-8.78)	<b>0.005</b>	3.55 (1.45-8.69)	<b>0.006</b>
Observing peers' drinking (7th grade) (Ref: No)	2.02 (1.20-3.43)	<b>0.009</b>	1.81 (1.04-3.15)	<b>0.04</b>	1.69 (0.97-3.00)	0.07
Alcohol initiation (6th grade) (Ref: No)	3.32 (2.04-5.39)	<b>&lt; 0.001</b>	2.49 (1.48-4.18)	<b>&lt; 0.001</b>	2.42 (1.44-4.07)	<b>&lt; 0.001</b>
<b>Family social capital (6th grade)</b>						
Parental employment (Ref: At least one unemployed)	1.51 (0.87-2.63)	0.14	1.43 (0.80-2.57)	0.23	1.44 (0.80-2.59)	0.22
Living with parents (Ref: One or none)	0.88 (0.44-1.74)	0.71	0.76 (0.33-1.75)	0.52	0.77 (0.33-1.77)	0.53
Parental involvement/reinforcement (Ref: Low)	0.56 (0.33-0.95)	<b>0.03</b>	0.53 (0.30-0.94)	<b>0.03</b>	0.54 (0.31-0.95)	<b>0.03</b>
Monthly allowance (Ref: 0-499 NTD)	1.67 (0.97-2.89)	0.12	1.57 (0.89-2.79)	0.12	1.57 (0.88-2.79)	0.12
<b>Level-2 School social capital<sup>c</sup> (6th grade)</b>						
Teacher-student conflict (6th grade) (Ref: Low)	1.41 (0.75-2.63)	0.84			1.34 (0.66-2.34)	0.50
School size (Ref: Small)	0.85 (0.43-1.69)	0.65			0.75 (0.36-1.51)	0.38
Teacher-student ratio	0.57 (0.34-0.99)	<b>0.03</b>			0.80 (0.63-0.98)	<b>&lt; 0.001</b>
<b>Random effects</b>						
Intercept (u <sub>0j</sub> )	0.13632 <sup>d</sup>		0.05547		0.04496	
Proportional change in variance (PCV)			59.2%		18.9%	

Note. ICC = 0.0398.

<sup>a</sup>Statistically significant effects are printed in boldface (p ≤ 0.05).

<sup>b</sup>Multilevel logistic regression analysis, aOR, adjusted odds ratio; CI, confidence interval.

<sup>c</sup>School-level sample size = 17.

<sup>d</sup>Null model intercept = 0.13632.

**Table 3**  
Association estimates linking family social capital and school social capital with binge drinking in young adulthood (n = 645).

Variables	Binge drinking in young adulthood							
	Crude		Model 1		Model 2		Model 3	
	OR (95% CI)	P-value	aOR (95% CI)	P-value	aOR (95% CI)	P-value	aOR (95% CI)	P-value
<b>Fixed effects<sup>b</sup></b>								
<b>Level-1 Individual characteristics</b>								
Gender (Ref: Female)	2.18 (1.48-3.22)	<b>&lt; 0.001</b>	2.26 (1.44-3.56)	<b>&lt; 0.001</b>	2.27 (1.44-3.57)	<b>&lt; 0.001</b>	2.37 (1.46-3.85)	<b>&lt; 0.001</b>
Parental educational attainment (Ref: Both high school)	0.65 (0.35-1.23)	0.20	0.73 (0.39-1.37)	0.33	0.73 (0.39-1.36)	0.32	0.74 (0.42-1.34)	0.31
Observing parental drinking (6th grade) (Ref: No)								
Only one	0.98 (0.47-2.07)	0.97	0.75 (0.31-1.83)	0.53	0.75 (0.31-1.83)	0.53	0.83 (0.36-1.91)	0.65
Both	1.27 (0.62-2.60)	0.52	1.25 (0.62-2.53)	0.54	1.25 (0.62-2.52)	0.54	1.44 (0.75-2.77)	0.27
Observing peers' drinking (7th grade) (Ref: No)	1.43 (0.77-2.63)	0.26	1.30 (0.69-2.54)	0.44	1.30 (0.68-2.54)	0.44	1.38 (0.69-2.77)	0.36
Alcohol initiation (6th grade) (Ref: No)	1.66 (0.90-3.05)	0.10	1.52 (0.80-2.86)	0.20	1.52 (0.80-2.86)	0.20	-	
Past-year occasional drinking (8th grade) (Ref: No)	1.98 (0.69-5.73)	0.21			-		1.71 (0.54-5.41)	0.36
<b>Family social capital (6th grade)</b>								
Parental employment (Ref: At least one unemployed)	0.78 (0.44-1.38)	0.40	0.68 (0.34-1.34)	0.27	0.68 (0.35-1.34)	0.27	0.69 (0.35-1.35)	0.28
Living with parents (Ref: One or none)	0.74 (0.38-1.43)	0.18	0.76 (0.40-1.45)	0.41	0.76 (0.40-1.45)	0.41	0.71 (0.36-1.41)	0.33
Parental involvement/reinforcement (Ref: Low)	0.75 (0.46-1.23)	0.26	0.90 (0.49-1.65)	0.73	0.90 (0.49-1.64)	0.72	0.90 (0.50-1.64)	0.74
Monthly allowance (Ref: 0-499 NTD)	2.09 (1.06-4.12)	<b>0.03</b>	2.01 (1.03-3.92)	<b>0.04</b>	2.01 (1.03-3.91)	<b>0.04</b>	1.99 (1.01-4.04)	<b>0.05</b>
<b>Level-2 School social capital<sup>c</sup> (6th grade)</b>								
Teacher-student conflict (6th grade) (Ref: Low)	1.79 (1.12-2.86)	<b>0.02</b>			1.19 (0.79-1.80)	0.40	1.23 (0.84-1.79)	0.29
School size (Ref: Small)	0.95 (0.42-2.16)	0.91			0.63 (0.28-1.38)	0.24	0.65 (0.30-1.44)	0.28
Teacher-student ratio	0.80 (0.70-0.91)	<b>&lt; 0.001</b>			0.71 (0.67-0.86)	<b>&lt; 0.001</b>	0.76 (0.68-0.86)	<b>&lt; 0.001</b>
<b>Random effects</b>								
Intercept (u <sub>0j</sub> )	0.06612 <sup>d</sup>		0.02975		0.02591		0.02546	
Proportional change in variance (PCV)			55.0%		12.9%		14.4%	

Note. ICC = 0.0197.

<sup>a</sup>Statistically significant effects are printed in boldface (p ≤ 0.05).

<sup>b</sup>Multilevel logistic regression analysis, aOR, adjusted odds ratio; CI, confidence interval.

<sup>c</sup>School-level sample size = 17.

<sup>d</sup>Null model intercept = 0.06612.

adding individual characteristics and family social capital variables was 55%. With simultaneous adjustment for individual characteristics, alcohol initiation, and all-listed social capital variables (Model 2), the association estimate of monthly allowance at 6th grade was slightly attenuated (aOR = 2.01, 95% CI = 1.03–3.91) and the teacher–student ratio became more prominent (aOR = 0.71, 95% CI = 0.67–0.86). When we took occasional drinking in mid-adolescence into account (Model 3), the association estimates of monthly allowance at 6th grade (aOR = 1.99, 95% CI = 1.01–4.04) and the teacher–student ratio (aOR = 0.76, 95% CI = 0.68–0.86) were both slightly attenuated. Finally, the PCVs between model 1 and the model adding teacher–student conflict at 6th grade, school size, and teacher–student ratio one by one were 7.5%, 3.9%, and 2.7%, respectively.

#### 4. Discussion

Social capital at home has been gradually recognized as a crucial factor shaping children's health and development (Alvarez et al., 2017; Hoffmann and Dufur, 2008; Wen, 2017). Several studies have shown that the stronger the parent–child relationships or bonds are, the less likely youngsters will get involved in alcohol and drugs (Ackard et al., 2006; Farrell and White, 1998; Wen, 2017). Although the assessment indicators we employed are slightly different from prior research, the present study found that parental involvement may exert short-term protective effects on subsequent drinking behaviors. Through the involvement in children's daily activity, parents may lower their children's engagement in unsupervised alcohol-involved events or scenes and reinforce pro-social norms and behaviors in a timely manner; this process is especially critical during the transition into adolescence when exposure to pro-alcohol social activities increases and experimental alcohol drinking behaviors escalate (Chen et al., 2005). However, such protective effects appear nonsignificant for problematic drinking in young adulthood, suggesting that possible mechanic roles of parenting practices through activity involvement, prosocial norm reinforcement, or alcohol-free norm instillation are gradually attenuated through late teen-years when most of subjects attended a college or landed on a job away from home. Other possible explanatory factors, such as drinking peer's influence, pro-alcohol social norms, and alcohol-involved social events, became more prominent in young adulthood when family is no longer the most critical social organization.

Our longitudinal analyses showed that children receiving higher monthly allowance at 6th grade were twice as likely to engage in binge drinking in young adulthood. Disposable income (or spending money) have been documented to have a positive association with alcohol drinking and tobacco smoking in underage population (Chen et al., 2013; Darling et al., 2006; Zhang et al., 2008); one of possible explanations is that higher pocket money elevates the accessibility to substance via participating substance-involved social gatherings (e.g., karaoke party) or mitigating purchasing barriers (Chen et al., 2013; Darling et al., 2006). In this study population, it is common for parents or caregivers to take their children to purchase snacks, stationery, and leisure goods upon requests, thus the allowance is generally unnecessary or restrained during the elementary school period. However, some parents would give children allowance instead of having dinner or buy goods together when having long working hours and no other adult family members around (Parcel and Menaghan, 1994). Hence, pocket money here may be viewed as a proxy for parental companionship or response to children's school needs (Currie et al., 1997; Feather, 1991; Kerr and Cheadle, 1997), rather than family socioeconomic status (the correlation between parental educational attainment and monthly allowance = -0.06, p-value = 0.1). Alternatively, higher monthly allowance may be a reflection of other unmeasured unfavorable parent–child interaction or parenting practices (e.g., low parental monitoring) (Swartz, 2008; Turrisi and Ray, 2010; Waithaka, 2014; White et al., 2006), which may subsequently increase children's link with the social networks with pro-alcohol norms.

In the present study, school social capital in childhood, as indexed by elementary school's teacher–student ratio, was found to have short-term and prolonged effects on drinking behavior in adolescence and young adulthood. This piece of evidence may highlight the school-based clustering phenomena of youngsters' drinking behaviors and shed light on the role of elementary school as a critical milieu in shaping the occurrence and evolution of drinking problems over the second decade of one's life. Several reasons may explain the reduced risk of occasional and binge drinking associated with a higher teacher–student ratio: (i) students may foster more knowledge, healthy behaviors, and anti-drinking skills through teacher–student bonds; (ii) intense teacher–student interactions may provide emotional support and build up mutual beliefs; and (iii) informal social control may help youngsters adhere to healthy norms (Kawachi and Berkman, 2000; McNeely and Falci, 2004). The inverse connection remained significant for binge drinking in a model with adjustment for alcohol-drinking experience in childhood or adolescence, suggesting that social capital during elementary schools may exert its influences on drinking problems in young adulthood through relevant variables or pathways not assessed in the present analyses (e.g., social capital in college ages) (Perna and Titus, 2005; Weitzman and Kawachi, 2000). It should be noted that unlike the United States the teacher–student ratio, a measure for school social capital, may not be positively associated with school-level compositional SES, given different funding sources and shrinking birth rates. In Taiwan, more than 98% of elementary school-aged children attend public schools. Better (or elite) primary schools, characterized by high academic achievement (e.g., entering prestigious high schools/universities), commonly fulfilled their enrollment quota. These school districts are often located in inner-city neighborhoods with expensive housing prices and high earning, usually highly-educated, taxpayers.

Different from some of previous studies indicating that social capital at home matters more than the capital at school (Dufur et al., 2013a), our analyses suggested that late childhood's social capital at the family and school levels both have significant influences on drinking behaviors and problems during the teenage years. The observed discrepancies may be explained by (i) the variation in measures of social capital. For instance, the variables of family capital derived from the National Educational Longitudinal Study were mostly focused on parental involvement in children's school-related activities (e.g., a parent checks the student's homework) (Dufur et al., 2013a; Hoffmann and Dufur, 2008); and (ii) variations in social settings or cultural frameworks. Specifically, elementary school-aged students in Taiwan often spend seven or more hours a day at school, more than students in many Western countries. Given that social capital can be formed and utilized only when agents (e.g., teachers and students) invest sufficient time and interaction in the networks of embedded social relationships, the salience of school social capital may emerge more strongly when school hours occupy the majority of waking time in late childhood in Taiwan.

The findings should be interpreted in light of several limitations. First, the AREC data were not designed specifically to investigate childhood's social capital. We lacked information on several features of social capital in the family and at school (e.g., a child's trust in parents and parental engagement in children's school activities). Therefore, it is possible that our analyses did not fully address the effects of social capital in two important social milieus for children (Gase et al., 2017; Hoffmann and Dufur, 2008; Kopak et al., 2012; Lau and Li, 2011). Second, even though our sample size at the school level was 17, slightly higher than the minimum number of clusters recommended for accurate estimates in two-level model estimates (McNeish and Stapleton, 2016), the relatively small sample size and limited variables were not sufficient to examine potential complicating effects of family and school capital, such as the mediating roles of school capital existing between family capital and alcohol-drinking behaviors, given that certain school resources are often determined by or even contributed by parental social networks. Third, we used a data-driven approach to define the cut-off points for certain social capital variables at the school level (e.g.,

school size) in the study sample. Although this approach has been commonly used in prior studies of school capital (Dufur et al., 2013a; Gase et al., 2017; Hoffmann and Dufur, 2008), the cut-off points should be interpreted in a relative rather than an absolute sense. Additionally, the measure of drinking occasions was collected only by one question item. Although we have limited the assessment period to the year preceding the survey (rather than lifetime) and self-reports on alcohol consumption via one single item have indicated good test-retest reliability among youngsters (Dollinger and Malmquist, 2009), potential bias may arise if the validity of self-reported drinking occasions was differentially associated with family and school capitals. Finally, because the AREC study only enrolled students from public elementary schools in Taipei and the response rate at the baseline was 61%, the generalizability of our analyses to other regions or societies may be restrained. Similarly, the follow-up rates at adolescence and young adulthood were 83% and 68%, respectively. The observed higher retention rate of lower monthly allowance in young adulthood suggested that allowance-related binge drinking risk may be underestimated. The post-hoc sensitivity analyses included individuals lost to follow-up have resulted in similar estimates of certain baseline social capital indicators, in terms of crude association (see Supplementary Tables 2 and 3).

Despite the aforementioned limitations, the study has several strengths. First, the study adopted a prospective longitudinal design, which ensures the investigation of the effects of family- and school-social capital in late childhood on alcohol involvement has an accurate temporal sequence. Second, we obtained the assessment of social capital at the school level from both students' self-reports and administrative data. This approach may reduce potential bias associated with variations in individual characteristics in the assessment validity. Finally, the application of multilevel analyses added to our understanding of social capital endorsed by children on subsequent drinking behaviors and problems. The acknowledgment of clustering or shared assets at school may serve as a useful model for how teacher-student relationships may be constructed and processed beyond individual-level interactions.

The present study provides new insight into how social capital at home and school during childhood may be associated with alcohol-related problems during the second decade of life. Research conducted in different parts of the world is needed to confirm our observations, particularly those with developmentally and culturally validated instruments or variables of social capital and longitudinal design. In addition, programs should be devised to encourage families to strengthen community-tailored parenting styles as well as to nurture relationship networks between students and teachers in childhood.

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### Contributors

Y. Lo was responsible for the analysis and the first draft. W.T. Chen assisted data analyses and the manuscript revision, and I.A. Wang assisted with the data preparation and data analysis. C.Y. Liu and W.J. Chen guided the interpretation of results. C.Y. Chen conceptualized the research theme and supervised research. All authors have critically

reviewed the manuscript. All authors read and approved the final manuscript.

### Declaration of competing interest

No of conflict declared.

### Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.drugalcdep.2019.05.014>.

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