Drug and Alcohol Dependence 153 (2015) 50–58

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Peers and social network on alcohol drinking through early adolescence in Taiwan

I.-Chen Lee[a,1], Te-Tien Ting[b,c,1], Duan-Rung Chen[d], Fang-Yi Tseng[a], Wei J. Chen[b], Chuan-Yu Chen[a,e,*]

[a] Institute of Public Health, National Yang-Ming University, Taipei, Taiwan
[b] Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, Taipei 100, Taiwan
[c] Institute of Sociology, Academia Sinica, Taipei 128, Taiwan
[d] Institute of Health Policy and Management, College of Public Health, National Taiwan University, Taipei 100, Taiwan
[e] Center of Neuropsychiatric Center, National Health Research Institutes, Miaoli, Taiwan

ARTICLE INFO

Article history:
Received 2 December 2014
Received in revised form 2 June 2015
Accepted 3 June 2015
Available online 9 June 2015

Keywords:
Peers
Social network
Adolescents
Alcohol

ABSTRACT

Objectives: This study aims to identify peers and social network characteristics associated with drinking occasions through early adolescence.
Methods: The study sample of 1808 middle school students (aged 13–15 years) in northern Taiwan was collected via a two-wave longitudinal study of the Alcohol-Related Experiences among Children (AREC). Data concerning individual sociodemographics, family characteristics, peer influence, and alcohol drinking behaviors were collected via web-based self-administered questionnaire. Building upon the maximum of five friends nominated by young respondents at 7th grade, class-based social network was first constructed via the UCINET and Pajek; the network position (i.e., member, bridge, and isolate) for each student was subsequently ascertained. Complex surveys analyses and negative binominal regression models were used to evaluate concurrent and prospective relationship estimates.
Results: Effects of peers and social network were found to operate differentially by childhood alcohol experience. For the alcohol naïve youngsters, receiving higher peer's nomination at baseline was linked with subsequent increased drinking occasions (adjusted Incidence Rate Ratio [aIRR] = 1.06; 95% CI = 1.01–1.10), whereas having peers against alcohol drinking may reduce drinking occasions at 9th grade (aIRR = 0.59; 95% CI = 0.41–0.87). For the alcohol experienced youngsters, having parental alcohol offer, drinking peers, and attending classes of higher drinking norms may increase future drinking occasions by 90%, 80% and 44%, respectively.
Conclusions: Our results demonstrated that parental alcohol offer, peer norms, and social network may affect adolescent drinking occasions differentially depending on childhood drinking experience. The findings have implications for the interventions to reduce alcohol consumption in underage population.

1. Introduction

Alcohol drinking has gradually become normative in the underage population. Results from 15 to 16 year-old students in 35 European countries reported that approximately 90% of youth have tried alcoholic beverages at least once in their lifetimes (ranges: 66–95%; Hibell et al., 2009), and the corresponding estimate was nearly 40% in Taiwan (Chen et al., 2008). The rise in alcohol involved negative consequences in young people — as manifested in unprotected sexual behaviors, injuries, violent behaviors, and social maladjustment — has emerged as an urgent public health concern in many parts of the world (World Health Organization [WHO], 2014). Data from the WHO's 2004 Global Burden of Disease study indicated that "alcohol use" *per se* is the leading risk factor for the disability-adjusted life-years in the population aged 10 to 24-year-old (Gore et al., 2011). To reduce alcohol-related negative consequences in young population, it is crucial to understand the role of important social contextual predictors for alcohol drinking behaviors in early adolescence — the period when most of alcohol initiation emerges (Windle et al., 2008).

Peers and family have been recognized as two important social agents affecting the occurrence and transition of alcohol drinking problems in the underage population (Bjarnason et al., 2003;

* Corresponding author at: National Yang-Ming University, Institute of Public Health, Medical Building II, Rm 204, No. 155, Sec. 2, Linong Street, Taipei 112, Taiwan. Tel.: +886 02 2826 7344; fax: +886 02 2822 4850.
E-mail address: chuanychen@ym.edu.tw (C.-Y. Chen).
[1] These authors contributed equally to this work.

http://dx.doi.org/10.1016/j.drugalcdep.2015.06.010
0376-8716/

Bronfenbrenner, 1977; Donovan, 2004; Ennett et al., 2008; Institute of Medicine and National Research Council, 2011; Jones et al., 2012; Windle et al., 2008). In adolescence, behavioral similarities between youngsters and their peers gradually emerge in terms of alcohol drinking and substance use behaviors (Valente et al., 2004). Empirical evidence pointed out that the observed behavioral homophily between youngsters and peers may be the mixed results of two pathways (i.e., peer influence and peer selection)(Brechwald and Prinstein, 2011); for alcohol drinking in early adolescence, peer influence is generally thought to be more substantial than peer selection (Mercken et al., 2012). Although the occurrence of alcohol initiation escalates in adolescence, many alcohol-experienced youngsters actually had their first drinks as early as in childhood, at the setting of family gathering wherein parents often served as the provider of alcoholic beverages (Chen et al., 2008; Donovan and Molina, 2014).

In the acquisition and maintenance of drinking behaviors, peer influence on underage drinking can operate via direct and indirect processes (Borsari and Carey, 2001). The direct process often involves increased availability and accessibility toward alcoholic beverages (e.g., alcohol offer; Wood et al., 2001), whereas the indirect process includes descriptive and injunctive norms concerning alcohol drinking (Eisenberg et al., 2014; Rimal and Real, 2005). Specifically, descriptive norms refer to the perceptions of what is actually done by others in one's social group (e.g., perceived peer dinking), and injunctive norms refer to perceptions of others' expectations to the behavior of interest (e.g., perceived peer approval of drinking; Borsari and Carey, 2001; Cialdini et al., 1990; Lapinski and Rimal, 2005). Available evidence generally showed that pro-alcohol descriptive norms (e.g., perceived higher prevalence of peer drinking) predict increased risk of alcohol initiation and consumption (D'Amico and McCarthy, 2006; Kelly et al., 2012; Kobus and Henry, 2010; Lee et al., 2012; Olds and Thombs, 2001), whereas injunctive norms were associated with reduced use of alcoholic beverages via the manifestation of peer disapproval of alcohol use (Keyes et al., 2012; Larimer et al., 2004; Mason et al., 2014; Mrug and McCay, 2013).

Other than easy access and norms favorable toward alcohol, peers can also exert effects on underage drinking behaviors in the form of social relationships (Ennett et al., 2006; Kobus and Henry, 2010; Mundt, 2011; Valente et al., 2004). One's social relationship can be characterized by social ties (e.g., indegree) and network position (e.g., members, bridges, and isolates); within a peer network, social ties and position may represent not only differential opportunities to access resources (e.g., information or material sharing; Wasserman and Faust, 1994), but also differential pressure to conform to social norms (Valente et al., 2004). As to social ties, *indegree* refers to the number of friendship nominations received from others; a higher indegree value often indicates greater popularity. In terms of network position, people with *member* position have more social ties/links within their peer group than those who occupied bridge position or were isolators. The *bridge* position indicates having connections to two or more peer groups and the *isolate* position refers to no nominations received or sent (De Nooy et al., 2005; Wasserman and Faust, 1994). To date, findings have generally supported the observation that popular students (i.e., higher indegree) are more likely to drink (Mundt, 2011; Tucker et al., 2011, 2013); however, the effects of social network position are rather mixed. Some evidence found that students occupying the bridge position were more likely to consume alcoholic beverages (Henry and Kobus, 2007; Valente et al., 2004), and some studies have linked increased risk of alcohol drinking with the member position (Osgood et al., 2014).

Although studies on peer influence and social networks have added valuable evidence in the topic of underage drinking behaviors (Ennett et al., 2006; Henry and Kobus, 2007; Mundt et al., 2012; Tucker et al., 2013), available evidence is not without limitations. First, prior studies approaching peer factors on underage drinking often treated young people with different drinking experience as a homogeneous group. Because prior alcohol experience may affect one's access to alcohol and peer selection, the pooled analyses may miss the opportunity to detect possible subgroup heterogeneity (e.g., prevalent and incident drinkers) and associated drinking stage-dependent predictors (Anthony and Chen, 2004). In addition, when social network constructs were examined in relation to drinking behaviors among adolescents, alcohol consumption has often been approached in a dichotomous nature. The extent to which the social ties and position may affect drinking occasion or intensity is less understood, particularly in early adolescence when the escalation of alcohol drinking emerges. Finally, prior evidence concerning social network effects on adolescent alcohol drinking was mainly derived from western societies (e.g., Unites States). Given that cultural variation may exist in peer network formation and peer interaction process (Chen and French, 2008), it would be worthwhile to explore whether social network attributes may have similar effects in other societies. To address these scientific gaps, the present study turned to a prospective cohort of middle school adolescents who were followed-up over a year. Our longitudinal study is aimed at examining the extent to which direct/indirect peer influences and peer network may affect alcohol drinking occasions through early adolescence in Taiwan. Also, to address stage-dependent liability (Anthony and Chen, 2004), the analyses were carried out with stratification by alcohol drinking experience in childhood.

2. Methods

2.1. Study design and participants

The study sample of 1808 middle school students (aged 13–15 years) in northern Taiwan was collected via a two-wave longitudinal survey of the Alcohol-Related Experiences among Children (AREC) project. The multi-stage probability sampling method was used to randomly select 11 schools from all 73 public middle schools in Taipei in academic year (AY) 2009 on the basis of school characteristics (e.g., school size) and physical environment surrounding schools (e.g., mass transportation density). All seventh-grade students attending the sampled schools in the fall semester of the AY 2009 were eligible to participate. The baseline survey was conducted during the spring semester of seventh grade and the fall semester of eighth grade (i.e., through the whole 2010 year). The baseline sample comprised 1926 youngsters, aged 13–14 years (baseline response rate = 55%); subsequent follow-up was conducted in ninth grade during the AY 2011 (n = 1857, follow-up rate = 96%). The relatively lower baseline response rate was primarily due to lack of active parental consent (e.g., absent parents or guardians). The average interval between two waves of assessment was 13 months. This study has been approved by the institutional review board at the National Health Research Institutes (EC0980605). Positive written informed consents from parents and youngsters were both required. All respondents received a stationary gift set with a value of NT 45 dollars (~1.5 USD) upon completion.

2.2. Measures

To gain better validity and assure confidentiality, the AREC II study collected data via web-based self-administered questionnaires during class hours in school. Most of respondents took 25–30 min to complete the survey. The questionnaire covered

individual sociodemographic background, family characteristics, peer influence and networks, and individual drinking experience.

2.2.1. Outcome variables. We measured alcohol drinking experience by several questions. At wave I (i.e., 7th–8th grade), students were asked "*Not including a sip or alcohol in food, have you ever drunk any alcoholic beverages in your lifetime?*" If the response was positive, further questions assessed drinking status (yes vs. no) and cumulative drinking occasion in the 12 months preceding the survey; the latter question's response option was continuous, ranging from 0 to 100 occasions. Similar questions were asked at follow-up wave II (i.e., 9th grade). Past-year alcohol consumption was assessed by "*On how many occasions have you drunk alcoholic beverages in the past 12 months?*" In the present study, cumulative occasions of drinking in the past year at baseline (concurrent model) and wave II (predictive model) were outcome variables.

2.2.2. Independent variables. Peer-level variables were all ascertained from the baseline survey: (i) Peer influences: students were asked to nominate up to five close friends they had contacted during the past six months. The nominations were not restricted to friends at school. For each nominated close friend, the answer to "*Has this friend ever offered you any alcoholic beverages?*" served as the measure for direct influence, and "*Does your friend drink?*" was used to reflect descriptive peer norms. The item "*Is your friend against your drinking?*" was used for injunctive norms. For each question, the percentage of peer alcohol offer (direct influence), drinking peers (descriptive norms), and peers against alcohol (injunctive norms) was first calculated via dividing the summation of positive responses of nominated friends by the total number of close friends. Given the skewed distribution for these three measures, we dichotomized direct influence and descriptive norms on the basis of any positive response vs. none; for injunctive norms we used the 75th percentile as the cutoff point, as suggested in prior works (see Arthur et al., 2007; Farrington and Loeber, 2000). (ii) Peer network structures: in the present study, the percentage of nominated friends from the same class, different classes in the same school, and different schools was estimated at 67%, 20%, and 13% at wave I, respectively. Since middle school students in Taiwan mostly spend at least 9 h (8 AM to 5 PM) with their classmates in school, and even attend the same cram school or participate in the same afterschool activities (usually 1–2 h), we decided to construct peer social network on the basis of class-based friendship nominations (Wasserman and Faust, 1994). Indegree, interpreted as popularity, is the nomination received from the classmates participating in the survey. Network positions were categorized into three positions: member (a person who is closely tied to friends in the same peer group), bridge (a person who is connected to more than two different groups), and isolate (a person who has no connection to anyone in class). As to class drinking norm, we first calculated the class-specific prevalence of students who had drunk on three or more occasions in the year preceding the survey at baseline for 100 classes in analyses. Next, on the basis of 3rd quartile of drinking prevalence, we categorized students into two subgroups: students attending classes with lower drinking norms (0–11.54%) vs. classes with higher drinking norms (11.76–40%).

2.2.3. Potential confounders. In the present study, potential confounders covered individual, family/parents, and class characteristics assessed at baseline assessment. Individual sociodemographics included gender and pubertal development. Pubertal development was measured by a self-rating scale for pubertal development (Carskadon and Acebo, 1993; Petersen et al., 1988), with Cronbach's alpha value of 0.88. The scores can be categorized into five stages: prepubertal, early pubertal, midpubertal, late pubertal, and postpubertal. We combined the prepubertal, early pubertal, and midpubertal stages to form the reference group; the remaining two stages were classified as late stage. Family characteristics were assessed by family structure, parental education, monthly allowance, and parental alcohol offer. Family structure was classified into "living with both parents" and "living with only one parent." Parental education was grouped into two categories: "at least one parent is a college graduate" and "both high school or below." Monthly allowance was categorized into two groups: "0–499 New Taiwan Dollars (NTD)" (approx. US$16.60) and "500 NTD or above." Parental alcohol offer, assessed by two questions "*Has your father ever offered you any alcoholic beverages?*" and "*Has your mother ever offered you any alcoholic beverages?*", was coded as positive if either one of parents had ever offered alcoholic beverages.

2.3. Statistical methods

Since the intraclass correlations (ICC) between classes were less than 6%, we decided to use complex survey analyses, rather than multilevel analyses, to accommodate the multistage probability sampling procedures (e.g., differential probability sampling and within cluster correlation) by applying SAS 9.2 (SAS Institute, Inc., Cary, North Carolina). As to social network attributes, indegree was calculated via UCINET 6.232 software, and network positions (i.e., member, bridge, isolate) were determined via Pajek 1.02. In the present analyses, we excluded those lost to follow-up, having missing values in questions concerning alcohol drinking, and attending classes with a lower response rate (<25%), yielding the final analytic sample of 1808. Attrition analyses on all independent and outcome variables indicated no significant differences between the analytic and excluded samples, except in peer alcohol use and alcohol offer (analytic vs. excluded: 31% vs. 18%; 13% vs. 5%, respectively).

Analyses indicated that lifetime drinking experience at baseline strongly modified the relationship between peers against alcohol and class drinking norms with follow-up alcohol use (p-value = 0.029 and 0.002, respectively). Considering that alcohol drinking experience may play a role in shaping one's social network and peer relationships (Knecht et al., 2011), individual, family, peer, and social network characteristics of young participants were first summarized, with stratification by lifetime drinking experience at baseline. Due to the count data and overdispersion distribution, the negative binomial regression models were utilized to evaluate relationship estimates via STATA 12 software while simultaneously taking sampling parameters into account. For the predictive model (Tables 3 and 4), the analyses examining individual and contextual explanatory factors for past-year cumulative drinking occasions in ninth grade were carried out with stratification by drinking experience to reduce possible problems resulting from reverse causality and to probe possible childhood-onset drinking related variation in the profile of predictors. Variables with missing values were analyzed as a subcategory to examine potential informative missingness and maintain a fixed sample size across models.

3. Results

The study sample consisted of 1808 middle school attending 7th graders in AY 2009 (Table 1). Compared with the alcohol-naïve, those who had ever drunk alcohol in childhood were more likely to have higher monthly allowance, live with only one parents, and have obtained alcoholic beverages from parents ($ps < 0.001$). In terms of peer characteristics, the alcohol-experienced students tended to have more drinking peers, more peers offering alcohol, and fewer peers against their drinking. No significant lifetime drinking-experience differences were found in social network attributes, although the indegree (popularity) and the proportion of

Table 1
Selective characteristics of adolescents at baseline survey in 2010, the AREC II ($n = 1808$).

Variables	Overall ($n = 1808$)		Alcohol naïve ($n = 1029$)		Alcohol experienced ($n = 779$)		p value[a]
	n	(%wt)	n	(%wt)	n	(%wt)	
Baseline survey (Wave I)							
Sociodemographics							
Gender							0.264
Female	954	(53.0)	548	(53.9)	406	(51.8)	
Male	854	(47.0)	481	(46.1)	373	(48.2)	
Pubertal development							0.038
Early/middle stage	809	(44.8)	478	(46.2)	331	(42.9)	
Late stage	968	(53.5)	535	(52.2)	433	(55.1)	
Family characteristics							
Monthly allowance (NTD)[b]							<0.001
0–499	843	(46.7)	539	(52.6)	304	(39.0)	
500 or above	934	(51.5)	472	(45.7)	462	(59.3)	
Living with parents							<0.001
Both	1505	(83.9)	898	(87.9)	607	(78.7)	
Only one parent	254	(13.5)	109	(10.1)	145	(17.9)	
Parental education							0.222
At least one college	1187	(67.5)	689	(69.0)	498	(65.6)	
Both high school or below	571	(29.9)	317	(29.0)	254	(31.1)	
Parental alcohol offer[c]	1260	(69.8)	640	(62.4)	620	(79.6)	<0.001
Peer characteristics							
Peer alcohol offer	88	(4.7)	17	(1.6)	71	(08.6)	<0.001
Drinking peers	323	(17.4)	87	(8.2)	236	(29.4)	<0.001
Peers against alcohol	362	(20.0)	276	(27.0)	86	(10.9)	<0.001
Peer network							
Received nomination[d]							0.138
Indegree (0–10), mean (SE)	1.59	(0.14)	1.52	(0.11)	1.69	(0.19)	
Network position							0.796
Member	1116	(61.6)	641	(62.2)	475	(60.9)	
Bridge	527	(29.1)	298	(28.9)	229	(29.4)	
Isolate	165	(9.3)	90	(8.9)	75	(9.7)	
Class drinking norm[e]							<0.001
Low (0–11.54%)	1374	(76.7)	820	(80.3)	554	(72.0)	
High (11.76–40%)	434	(23.3)	209	(19.7)	225	(28.0)	
Past-year drinking							
Alcohol naïve	1029	(56.9)	1029	(100)			
No	294	(16.2)			294	(37.7)	
Yes	485	(26.9)			485	(62.3)	
Past year cumulative occasions of alcohol drinking (Q_1, Q_2, Q_3)[f]	(0, 0, 1)		(0, 0, 0)		(0, 1, 2)		<0.001
Follow-up (Wave II)							
Past-year drinking							
Alcohol naïve	565	(31.2)	565	(54.9)			
No	613	(33.9)	259	(25.2)	354	(45.4)	
Yes	630	(34.9)	205	(19.9)	425	(54.6)	
Past year cumulative occasions of alcohol drinking (Q_1, Q_2, Q_3)[g]	(0, 0, 1)		(0, 0, 0)		(0, 1, 3)		<0.001

[a] The categorical variables were tested by Rao-Scott likelihood ratio tests except the descriptive norms by Chi-Square test. The continuous variables were tested by survey regression models except cumulative occasions of alcohol drinking variable by Wilcoxon Sign-Rank test.
[b] NTD: New Taiwan Dollars.
[c] Either parent had offered alcoholic beverages.
[d] Every student has nominated one to five friends in wave 1 and the total number of nominated friends were 6208 (i.e., alcohol naïve nominated 3554 friends and alcohol experienced nominated 2654 friends).
[e] Class drinking norm was defined the prevalence of students who had drunk no less than three times in the past year at baseline.
[f] Drinking occasions among past-year drinkers at seventh grade: mix, max:1, 30.
[g] Drinking occasions among past-year drinkers at ninth grade: mix, max:1, 30.

bridge or isolate position were slightly higher in the alcohol experienced. The percentage of the alcohol naive who attended the classes with higher drinking norms was significantly lower than that of the alcohol experienced (19.7% vs. 28%). Nearly 27% of youngsters at baseline had ever drunk in the year preceding the survey, and the 3rd quartile of past-year drinking occasion was 1, with 30 as the maximum value. Less than one quarter of the alcohol naïve 7th graders drank alcohol at 9th grade and the corresponding estimate for the alcohol-experienced 7th graders was 55% (with three as the 3rd quartile for drinking occasions).

The cross-sectional association estimates between selected characteristics and past-year drinking occasions at baseline survey are displayed in Table 2. With simultaneous adjustment for listed covariates, parental alcohol offer (Model 2: adjusted Prevalence Rate Ratio [aPRR] = 2.44, 95% CI = 1.83–3.27, $p < 0.001$) and having higher allowance (Model 2: aPRR = 1.68, 95% CI = 1.43–1.98, $p < 0.001$) appeared linked with increased occasions of alcohol drinking in the year preceding the survey. Youngsters having drinking peers and have peer alcohol offer tend to drink on more occasions (Model 2: aPRR = 3.02, 95% CI = 1.92–4.75, $p < 0.001$; aPRR = 1.76, 95% CI = 1.24–2.50, $p < 0.01$), whereas those who had peers against their drinking (i.e., perceived $\geq$75% peers against drinking) tended to drink less frequently (Model 2: aPRR = 0.21, 95% CI = 0.16–0.27, $p < 0.001$). Students in the classes with higher drinking norms tend to consume alcoholic beverages on more occasions (Model 2: aPRR = 1.84, 95% CI = 1.52–2.22, $p < 0.001$).

For those who had never drunk before the baseline survey (see Table 3), having peers against drinking at baseline appeared to be a significant predictor for reduced drinking occasions in ninth grade (Model 2: adjusted Incidence Rate Ratio [aIRR] = 0.59,

Table 2
Concurrent correlates for past-year cumulative drinking occasions at baseline survey ($n = 1808$).

Variables at baseline	Univariate		Model 1		Model 2	
	cPRR	(95% CI)[a]	aPRR	(95% CI)[a]	aPRR	(95% CI)[a]
Sociodemographics						
Gender						
Female	1.00				1.00	
Male	0.83	(0.48–1.46)			1.40	(1.21–1.62)**
Pubertal development						
Early/middle stage	1.00				1.00	
Late stage	1.48	(0.88–2.47)			1.40	(1.13–1.73)*
Family characteristics						
Monthly allowance (NTD)[b]						
0–499	1.00				1.00	
500 or above	1.92	(1.28–2.88)**			1.68	(1.43–1.98)***
Living with parents						
Both	1.00				1.00	
Only one parent	1.10	(0.74–1.63)			0.82	(0.57–1.18)
Parental education						
At least one college	1.00				1.00	
Both high school or below	1.27	(1.03–1.56)*			0.93	(0.65–1.33)
Parental alcohol offer[c]	3.68	(2.22–6.12)**			2.44	(1.83–3.27)***
Peer characteristics						
Peer alcohol offer	4.52	(3.17–6.44)***	1.66	(1.28–2.15)**	1.76	(1.24–2.50)**
Drinking peers	4.08	(3.02–5.51)***	2.93	(1.89–4.56)***	3.02	(1.92–4.75)***
Peers against alcohol	0.16	(0.09–0.28)***	0.17	(0.12–0.26)***	0.21	(0.16–0.27)***
Peer network						
Received nomination (indegree)[d]	0.99	(0.89–1.11)	0.99	(0.84–1.18)	0.99	(0.91–1.08)
Network position						
Member	1.00		1.00		1.00	
Bridge	1.34	(0.87–2.06)	1.18	(0.67–2.07)	1.12	(0.84–1.49)
Isolate	1.50	(0.97–2.32)	0.86	(0.60–1.21)	0.90	(0.68–1.19)
Class drinking norm[e]						
Low (0–11.54%)	1.00		1.00		1.00	
High (11.76–40%)	2.24	(1.82–2.75)***	1.63	(1.21–2.21)**	1.84	(1.52–2.22)***

cPRR: crude prevalence rate ratio; aPRR: adjusted prevalence rate ratio.
Model 1 adjusted for peer influence, social network structures, and class characteristics.
Model 2 adjusted for individual, family, peer influence, social network structures, and class characteristics.
[a] Prevalence rate ratios were obtained from negative binomial regression model.
[b] NTD: New Taiwan Dollars.
[c] Either parent had offered alcoholic beverages.
[d] The indegree variable was centered at 2.
[e] Class drinking norm was defined as the prevalence of students who had drunk no fewer than three times in the past year at baseline.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

95% CI = 0.41–0.87, $p < 0.05$). In terms of social network attributes, receiving one more peer nomination (indegree) was linked with increased occasions of alcohol drinking by 6% (Model 2: aIRR = 1.06, 95% CI = 1.01–1.10, $p < 0.05$). Network position was generally not predictive for drinking occasions among incident drinkers. Those with missing values in living with both parents tend to consume alcohol in more occasions (aIRR = 2.04, $p < 0.05$, data not shown here).

Among those who had drunk alcohol in childhood (see Table 4), having a higher allowance may increase drinking occasions in ninth grade by 29% (Model 2: 95% CI = 1.08–1.55, $p < 0.05$). Having received parental alcohol offer and drinking peers at baseline appeared to be significant predictors for increased drinking occasions in ninth grade (parents: aIRR = 1.90, 95% CI = 1.48–2.43, $p < 0.001$; drinking peers: aIRR = 1.80, 95% CI = 1.09–2.95, $p < 0.05$). Students in the classes with higher drinking norms were more likely to have elevated alcohol drinking occasions in ninth grade by 44% (CI = 1.32–1.57, $p < 0.001$).

4. Discussion

Following a cohort of 1808 seventh graders in the northern Taiwan through early adolescence, the main findings of the present study can be summarized as follows. First, both direct (i.e., peer alcohol offer) and indirect (i.e., descriptive and injunctive norms) peer influences correlate strongly with concurrent drinking occasions. Second, the effects of peer and network predictors for drinking occasions were found to vary by prior alcohol drinking experience. For those alcohol naïve, peer injunctive norms (i.e., peers against drinking) and popularity (e.g., receiving higher nomination) were prominent in predicting drinking occasions in 9th grade, whereas for the alcohol experienced, peer descriptive norm (i.e., peer drinking) and network drinking norm appeared more salient (increasing drinking occasions by 80% and 44% respectively). Finally, family may affect youngsters' drinking behaviors via increased accessibility and availability: higher monthly allowance and parental alcohol offer may serve as significant predictors for those who initiated alcohol drinking in childhood.

The relationship between direct peer influences (i.e., peer alcohol offer) with drinking occasions appears significant only in the concurrent models. The observed strong cross-sectional relationship of peer alcohol offer may be the results of not only peer socialization but also peer selection. Specifically, adolescents tend to make friends with those who have similar attributes (e.g., sharing alcohol; Mundt et al., 2012; Steinberg and Morris, 2001), and peer alcohol offer can be changed by their outward manifestation of drinking behaviors. Meanwhile, parental alcohol offer emerged as a significant concurrent correlate and predictor for increased drinking occasions (particularly in the alcohol experienced youngsters). Linking with the observation that approximately 70% of

Table 3
Prospective predictors for past-year cumulative drinking occasions in ninth grade among the alcohol naïve at baseline survey ($n = 1029$).

Variables at baseline	Univariate		Model 1		Model 2	
	cIRR	(95% CI)[a]	aIRR	(95% CI)[a]	aIRR	(95% CI)[a]
Sociodemographics						
Gender						
Female	1.00				1.00	
Male	0.96	(0.65–1.43)			1.10	(0.53–2.31)
Pubertal development						
Early/middle stage	1.00				1.00	
Late stage	1.01	(0.55–1.87)			0.97	(0.39–2.41)
Family characteristics						
Monthly allowance (NTD)[b]						
0–499	1.00				1.00	
500 or above	1.22	(0.69–2.15)			1.31	(0.98–1.76)
Living with parents						
Both	1.00				1.00	
Only one parent	1.71	(0.43–6.83)			1.30	(0.41–4.09)
Parental education						
At least one college	1.00				1.00	
Both high school or below	1.22	(0.64–2.30)			1.11	(0.93–1.33)
Parental alcohol offer[c]	1.23	(0.69–2.17)			1.16	(0.73–1.82)
Peer characteristics						
Peer alcohol offer	1.36	(0.69–2.68)	1.16	(0.53–2.58)	1.13	(0.66–1.95)
Drinking peers	1.51	(0.75–3.03)	1.56	(0.66–3.66)	1.30	(0.72–2.33)
Peers against alcohol	0.63	(0.31–1.26)	0.65	(0.40–1.07)	0.59	(0.41–0.87)*
Peer network						
Received nomination (indegree)[d]	1.02	(0.85–1.23)	1.04	(1.01–1.07)*	1.06	(1.01–1.10)*
Network position						
Member	1.00		1.00		1.00	
Bridge	0.92	(0.59–1.44)	0.91	(0.55–1.51)	0.90	(0.60–1.34)
Isolate	1.36	(0.21–8.89)	1.37	(0.25–7.53)	1.25	(0.36–4.35)
Class drinking norm[e]						
Low (0–11.54%)	1.00		1.00		1.00	
High (11.76–40%)	0.89	(0.30–2.64)	0.93	(0.32–2.71)	0.89	(0.30–2.61)

cIRR: crude incidence rate ratio; aIRR: adjusted incidence rate ratio.
Model 1 adjusted for peer influence, social network structures, and class characteristics.
Model 2 adjusted for individual, family, peer influence, social network structures, and class characteristics.
[a] Incidence rate ratios were obtained from negative binomial regression model.
[b] NTD: New Taiwan Dollars.
[c] Either parent had offered alcoholic beverages.
[d] The indegree variable was centered at 2.
[e] Class drinking norm was defined as the prevalence of students who had drunk no fewer than three times in the past year at baseline.
* $p < 0.05$.

7th–8th grade respondents reported ever receiving alcohol offers from parents and less than 5% from peers (see Table 1), our analyses implicated that receiving alcohol offer from parents in childhood may reinforce pro-alcohol norm or behavior in early adolescence. Whether source-specific alcohol offer (i.e., parents and peers) differentially or collectively shapes the evolution of alcohol drinking behaviors during the transition through adolescence should warrant further research.

Prior studies have suggested that positive perceptions of peer alcohol drinking may increase subsequent risk of alcohol use in early adolescence and alcohol abuse in young adulthood (D'Amico and McCarthy, 2006; Kobus and Henry, 2010; Lee et al., 2012; Olds and Thombs, 2001). Our longitudinal results offer further evidence that the effects of descriptive norms of peers (i.e., perceived peer drinking) appeared more prominent for the alcohol experienced. Through adolescence, peers gradually become a major source of important others (Gardner and Steinberg, 2005). Youngsters may imitate peers whom they admire as a model or think they are conformed to do the same to maintain friendships (Bandura, 1971). In contrast to descriptive norms, it is interesting to note that peer anti-alcohol attitudes were significantly associated with preventing children from drinking among the alcohol naïve. It is possible that adolescents may be more likely to engage in behaviors that match peer's expectations in order to increase acceptance and maintain friendships in middle school years (Brechwald and Prinstein, 2011; Rimal and Real, 2005). Taken together, our analyses indicated that the connection between indirect peer influences with future drinking occasions is not homogeneous across subgroups defined by prior drinking experience. A plausible explanation is that for those who had actual experience with alcoholic beverages, their willingness for alcohol abstinence and negative alcohol expectancy may be lowered as compared with their alcohol-naïve counterparts (Ting et al., 2015; Wood et al., 2001). Consequently, their increase in drinking occasions may be enhanced by popular behaviors (i.e., drinking behaviors in peer network and class) than by socially approved behaviors (i.e., perceived peers against drinking) in the context of daily life.

Similar with prior studies (Ennett et al., 2006; Mundt, 2011; Tucker et al., 2011, 2013), our prospective analyses on peer network attributes in Taiwan found increased alcohol drinking occasions were associated with popularity, but only among the middle school students who had not tried alcohol before 7th grade. It is possible that non-drinkers considered as friends by their classmates are more likely to be invited to peer-oriented social activities wherein alcoholic beverages are widely available (e.g., karaoke singing or birthday parties). Therefore, being popular may give them more access to alcoholic beverages and lower their negative alcohol expectancy (Chen et al., 2004; Mundt, 2011). Finally, although peer network position had no connection with drinking occasions, a slightly increased risk of drinking on more occasions was found in the alcohol-experienced students occupying the bridge position at 7th grade as well as the alcohol-naïve students occupying the

Table 4
Prospective predictors for past-year cumulative drinking occasion at ninth grade among the alcohol experienced at baseline ($n = 779$).

Variables at baseline	Univariate		Model 1		Model 2	
	cIRR	(95% CI)[a]	aIRR	(95% CI)[a]	aIRR	(95% CI)[a]
Sociodemographics						
Gender						
Female	1.00				1.00	
Male	1.65	(0.83–3.27)			1.11	(0.86–1.44)
Pubertal development						
Early/middle stage	1.00				1.00	
Late stage	0.59	(0.23–1.49)			0.74	(0.44–1.27)
Family characteristics						
Monthly allowance (NTD)[b]						
0–499	1.00				1.00	
500 or above	1.71	(0.79–3.72)			1.29	(1.08–1.55)*
Living with parents						
Both	1.00				1.00	
Only one parent	0.92	(0.50–1.69)			0.83	(0.68–1.02)
Parental education						
At least one parent college	1.00				1.00	
Both high school or below	0.67	(0.25–1.80)			0.86	(0.53–1.40)
Parental alcohol offer[c]	2.20	(1.08–4.48)*			1.90	(1.48–2.43)***
Peer characteristics						
Peer alcohol offer	1.36	(0.83– 2.24)	1.02	(0.77–1.36)	1.22	(0.91–1.65)
Drinking peers	2.47	(0.74– 8.30)	1.84	(1.07–3.16)*	1.80	(1.09–2.95)*
Peers against alcohol	2.76	(0.32–23.59)	1.58	(0.35–7.10)	1.34	(0.43–4.16)
Peer network						
Received nomination (indegree)[d]	1.11	(0.72–1.71)	0.97	(0.84–1.13)	0.97	(0.85–1.11)
Network position						
Member	1.00		1.00		1.00	
Bridge	1.97	(0.61–6.33)	1.31	(0.93–1.84)	1.29	(0.84–1.97)
Isolate	1.06	(0.77–1.46)	0.90	(0.46–1.78)	0.91	(0.52–1.58)
Class drinking norm[e]						
Low (0–11.54%)	1.00		1.00		1.00	
High (11.76–40%)	2.24	(0.90–5.55)	1.46	(1.30–1.65)***	1.44	(1.32–1.57)***

cIRR: crude incidence rate ratio; aIRR: adjusted incidence rate ratio.
Model 1 adjusted for peer influence, social network structures, and class characteristics.
Model 2 adjusted for individual, family, peer influence, social network structures, and class characteristics.
[a] Incidence rate ratios were obtained from negative binomial regression model.
[b] NTD: New Taiwan Dollars.
[c] Either parent had offered alcoholic beverages.
[d] The indegree variable was centered at 2.
[e] Class drinking norm was defined as the prevalence of students who had drunk no fewer than three times in the past year at baseline.
* $p < 0.05$.
*** $p < 0.001$.

isolate position, suggesting that the effects of network position may depend on stage of alcohol involvement.

Some limitations of this study should be considered while interpreting the results. First, selection bias may arise as a result of differential response rates associated with variables of interest in the present study. For example, since active parental consent is required in this school-based research, youngsters with absent parents/guardians may be under-represented in the study population. Similarly, due to various class-level response rates at baseline (i.e., 25–95%), the social network attributes (i.e., indegree and positions) obtained from the participants may not be representative of the *de facto* social network when not all students were included in the analyses. Biased estimates may occur when the participation status is linked with network attributes (e.g. isolate or bridge). Second, it is very possible that social networks, peer influence, and other covariates (e.g., pubertal development) may change over time. The present model built upon from only one wave of assessment at baseline may limit our ability to assess the time-varying aspect of peers and social network on underage drinking through early adolescence and even lead to bias when alcohol drinking may serve as a factor shaping social network stability (Lansford et al., 2009). Future research exploring the dynamic of peer networks is needed to provide more aspects of peers and social network affecting related evolution. Finally, the sample was drawn from middle schools in the metropolitan region in northern Taiwan. Generalization to other regions and other parts of the world may not be applicable.

Notwithstanding the aforementioned limitations, a distinguishing feature of our study is that we organized the social risk factors, including family and class characteristics, associated with underage drinking behaviors through the perspective of the ecological system model (Botticello, 2009). In contrast to the dichotomous approach (i.e., drinker vs. abstainer; heavy drinker vs. non heavy drinkers), the measure of drinking occasions may help to assess peer and social networks in terms of quantitative effects. Also, sensitive information (such as alcohol drinking) collected via the web-based questionnaire in the present study may lower the likelihood of underestimation (Wang et al., 2005). Finally, the high follow-up rate (94%) may reduce susceptibility toward bias associated with differential participation.

This study investigated the effects of peer influence and social networks on the number of drinking occasions through early adolescence. Our results revealed that underage drinking may be prospectively influenced by peers mainly via indirect processes (i.e., alcohol norms) in Taiwan. For the alcohol naïve seventh-eighth graders, peer injunctive norms toward alcohol had great influence predicting drinking occasions in the ninth grade, whereas for those had ever drunk alcoholic beverage in childhood peer descriptive norms and parental alcohol offer appeared more salient. Additionally, being popular in peer network was associated with increased

drinking occasion in ninth grade, particularly among those who never drank in childhood. The observed differential effects of peer influence and network could inform interventions design to reduce the initiation and cessation of drinking behaviors in adolescence.

Role of funding source

Nothing declared.

Contributors

ICL was responsible for the development of the research theme, the analysis, and the drafting of the manuscript. TTT was responsible for data analysis, results interpretation, and draft revision. DRC assisted the analyses of social network analyses and interpretation. FYT helped with the field work and data collection. WJC was responsible for study design and data interpretation. CYC originated the study, supervised its progress, oversaw the data analyses, and advised on the writing. All authors have critically reviewed the content and approved the final version submitted for publication.

Conflict of interest

The authors declare no conflict of interest with respect to the conduct or content of this work.

Acknowledgments

This work was supported by grants from the Ministry of Science and Technology (95-2314-B-400-009-MY3, 98-2314-B-010-038-MY3, and 101-2628-B-010-004-MY3 to C. Y. Chen), the National Health Research Institutes (MDPP04-014), and a grant from the Ministry of Education of Taiwan ROC, Aim for the Top University Plan to CYC. The funding agencies had no role in the study design; in the collection, analysis, or interpretation of data; in the writing of the report; or in the decision to submit the paper for publication.

References

Anthony, J.C., Chen, C.Y., 2004. Epidemiology of drug dependence. In: Galanter, M., Kleber, H.D. (Eds.), Textbook of Substance Abuse Treatment. American Psychiatric Press Inc., Washington DC, pp. 55–72.
Arthur, M.W., Briney, J.S., Hawkins, J.D., Abbott, R.D., Brooke-Weiss, B.L., Catalano, R.F., 2007. Measuring risk and protection in communities using the Communities That Care Youth Survey. Eval. Program Plann. 30, 197–211.
Bandura, A., 1971. Social Learning Theory. General Learning Press, New York.
Bjarnason, T., Andersson, B., Choquet, M., Elekes, Z., Morgan, M., Rapinett, G., 2003. Alcohol culture, family structure and adolescent alcohol use: multilevel modeling of frequency of heavy drinking among 15–16 year old students in 11 European countries. J. Stud. Alcohol 64, 200–208.
Borsari, B., Carey, K.B., 2001. Peer influences on college drinking: a review of the research. J. Subst. Abuse 13, 391–424.
Botticello, A.L., 2009. School contextual influences on the risk for adolescent alcohol misuse. Am. J. Community Psychol. 43, 85–97.
Brechwald, W.A., Prinstein, M.J., 2011. Beyond homophily: a decade of advances in understanding peer influence processes. J. Res. Adolesc. 21, 166–179.
Bronfenbrenner, U., 1977. Toward an experimental ecology of human development. Am. Psychol. 32, 513–531.
Carskadon, M.A., Acebo, C., 1993. A self-administered rating scale for pubertal development. J. Adolesc. Health 14, 190–195.
Chen, X., French, D.C., 2008. Children's social competence in cultural context. Ann. Rev. Psychology 59, 591–616.
Chen, C.Y., Dormitzer, C.M., Gutierrez, U., Vittetoe, K., Gonzalez, G.B., Anthony, J.C., 2004. The adolescent behavioral repertoire as a context for drug exposure: behavioral autarcesis at play. Addiction 99, 897–906.
Chen, C.Y., Tang, G.M., Huang, S.L., Lee, C.M., Lew-Ting, C.Y., Hsiao, C.K., Chen, D.R., Chen, W.J., 2008. Transition from alcohol to other drugs among adolescents in Taiwan: the first drinking context matters. J. Stud. Alcohol Drugs 69, 378–387.
Cialdini, R.B., Reno, R.R., Kallgren, C.A., 1990. A focus theory of normative conduct: recycling the concept of norms to reduce littering in public places. J. Pers. Soc. Psychol. 58, 1015–1026.
D'Amico, E.J., McCarthy, D.M., 2006. Escalation and initiation of younger adolescents' substance use: the impact of perceived peer use. J. Adolesc. Health 39, 481–487.
De Nooy, W., Mrvar, A., Batagelj, V., 2005. Exploratory Social Network Analysis with Pajek. Cambridge University Press, New York.
Donovan, J.E., 2004. Adolescent alcohol initiation: a review of psychosocial risk factors. J. Adolesc. Health 35, 529.e007–529.e018.
Donovan, J.E., Molina, B.S.G., 2014. Antecedent predictors of children's initiation of sipping/tasting alcohol. Alcohol. Clin. Exp. Res. 38, 2488–2495.
Eisenberg, M.E., Toumbourou, J.W., Catalano, R.F., Hemphill, S.A., 2014. Social norms in the development of adolescent substance use: a longitudinal analysis of the international youth development study. J. Youth Adolesc. 43, 1486–1497.
Ennett, S.T., Bauman, K.E., Hussong, A., Faris, R., Foshee, V.A., Cai, L., DuRant, R.H., 2006. The peer context of adolescent substance use: findings from social network analysis. J. Res. Adolesc. 16, 159–186.
Ennett, S.T., Foshee, V.A., Bauman, K.E., Hussong, A., Cai, L., Reyes, H.L., Faris, R., Hipp, J., Durant, R., 2008. The social ecology of adolescent alcohol misuse. Child. Dev. 79, 1777–1791.
Farrington, D.P., Loeber, R., 2000. Some benefits of dichotomization in psychiatric and criminological research. Crim. Behav. Ment. Health 10, 100–122.
Gardner, M., Steinberg, L., 2005. Peer influence on risk taking, risk preference, and risky decision making in adolescence and adulthood: an experimental study. Dev. Psychol. 41, 625–635.
Gore, F.M., Bloem, P.J., Patton, G.C., Ferguson, J., Joseph, V., Coffey, C., Sawyer, S.M., Mathers, C.D., 2011. Global burden of disease in young people aged 10-24 years: a systematic analysis. Lancet 377, 2093–2102.
Henry, D.B., Kobus, K., 2007. Early adolescent social networks and substance use. J. Early Adolesc. 27, 346–362.
Hibell, B., Guttormsson, U., Ahlström, S., Balakireva, O., Bjarnason, T., Kokkevi, A., Kraus, L., 2009. The 2007 ESPAD Report: Substance Use Among Students in 35 European Countries. The Swedish Council for Information on Alcohol and Other Drugs. Stockholm, Sweden.
Institute of Medicine and National Research Council, 2011. The Science of Adolescent Risk-Taking: Workshop Report. The National Academies Press, Washington, DC.
Jones, D.E., Feinberg, M.E., Cleveland, M.J., Cooper, B.R., 2012. A multidomain approach to understanding risk for underage drinking: converging evidence from 5 data sets. Am. J. Public Health 102, 2080–2087.
Kelly, A.B., Chan, G.C.K., Toumbourou, J.W., O'Flaherty, M., Homel, R., Patton, G.C., Williams, J., 2012. Very young adolescents and alcohol: evidence of a unique susceptibility to peer alcohol use. Addict. Behav. 37, 414–419.
Keyes, K.M., Schulenberg, J.E., O'Malley, P.M., Johnston, L.D., Bachman, J.G., Li, G., Hasin, D., 2012. Birth cohort effects on adolescent alcohol use: the influence of social norms from 1976 to 2007. Arch. Gen. Psychiatry 69, 1304–1313.
Knecht, A.B., Burk, W.J., Weesie, J., Steglich, C., 2011. Friendship and alcohol use in early adolescence: a multilevel social network approach. J. Res. Adolesc. 21, 475–487.
Kobus, K., Henry, D.B., 2010. Interplay of network position and peer substance use in early adolescent cigarette, alcohol, and marijuana use. J. Early Adolesc. 30, 225–245.
Lansford, J.E., Killeya-Jones, L.A., Miller, S., Costanzo, P.R., 2009. Early adolescents' social standing in peer groups: behavioral correlates of stability and change. J. Youth Adolesc. 38, 1084–1095.
Lapinski, M.K., Rimal, R.N., 2005. An explication of social norms. Commun. Theor. 15, 127–147.
Larimer, M.E., Turner, A.P., Mallett, K.A., Geisner, I.M., 2004. Predicting drinking behavior and alcohol-related problems among fraternity and sorority members: examining the role of descriptive and injunctive norms. Psychol. Addict. Behav. 18, 203–212.
Lee, J.O., Hill, K.G., Guttmannova, K., Bailey, J.A., Hartigan, L.A., Hawkins, J.D., Catalano, R.F., 2012. The effects of general and alcohol-specific peer factors in adolescence on trajectories of alcohol abuse disorder symptoms from 21 to 33 years. Drug Alcohol Depend. 121, 213–219.
Mason, M.J., Mennis, J., Linker, J., Bares, C., Zaharakis, N., 2014. Peer attitudes effects on adolescent substance use: the moderating role of race and gender. Prev. Sci. 15, 56–64.
Mercken, L., Steglich, C., Knibbe, R., Vries, H., 2012. Dynamics of friendship networks and alcohol use in early and mid-adolescence. J. Stud. Alcohol Drugs 73, 99–110.
Mrug, S., McCay, R., 2013. Parental and peer disapproval of alcohol use and its relationship to adolescent drinking: age, gender, and racial differences. Psychol. Addict. Behav. 27, 604–614.
Mundt, M.P., 2011. The impact of peer social networks on adolescent alcohol use initiation. Acad. Pediatr. 11, 414–421.
Mundt, M.P., Mercken, L., Zakletskaia, L., 2012. Peer selection and influence effects on adolescent alcohol use: a stochastic actor-based model. BMC Pediatr. 12, 115–124.
Olds, R.S., Thombs, D.L., 2001. The relationship of adolescent perceptions of peer norms and parent involvement to cigarette and alcohol use. J. Sch. Health 71, 223–228.
Osgood, D.W., Feinberg, M.E., Wallace, L.N., Moody, J., 2014. Friendship group position and substance use. Addict. Behav. 39, 923–933.
Petersen, A.C., Crockett, L., Richards, M., Boxer, A., 1988. A self-report measure of pubertal status: reliability, validity, and initial norms. J. Youth Adolesc. 17, 117–133.
Rimal, R.N., Real, K., 2005. How behaviors are influenced by perceived norms: a test of the theory of normative social behavior. Commun. Res. 32, 389–414.
Steinberg, L., Morris, A.S., 2001. Adolescent development. Annu. Rev. Psychol. 52, 83–110.

Ting, T.T., Chen, W.J., Liu, C.Y., Lin, Y.C., Chen, C.Y., 2015. Peer influences on alcohol expectancies in early adolescence: a study of concurrent and prospective predictors in Taiwan. Addict. Behav. 40, 7–15.
Tucker, J.S., Green Jr., H.D., Zhou, A.J., Miles, J.N., Shih, R.A., D'Amico, E.J., 2011. Substance use among middle school students: associations with self-rated and peer-nominated popularity. J. Adolesc. 34, 513–519.
Tucker, J.S., Miles, J.N.V., D'Amico, E.J., Zhou, A.J., Green Jr., H.D., Shih, R.A., 2013. Temporal associations of popularity and alcohol use among middle school students. J. Adolesc. Health 52, 108–115.
Valente, T.W., Gallaher, P., Mouttapa, M., 2004. Using social networks to understand and prevent substance use: a transdisciplinary perspective. Subst. Use Misuse 39, 1685–1712.
Wang, Y.C., Lee, C.M., Lew-Ting, C.Y., Hsiao, C.K., Chen, D.R., Chen, W.J., 2005. Survey of substance use among high school students in Taipei: web-based questionnaire versus paper-and-pencil questionnaire. J. Adolesc. Health 37, 289–295.
Wasserman, S., Faust, K., 1994. Social Network Analysis: Methods and Applications. Cambridge University Press, New York.
Windle, M., Spear, L.P., Fuligni, A.J., Angold, A., Brown, J.D., Pine, D., Smith, G.T., Giedd, J., Dahl, R.E., 2008. Transitions into underage and problem drinking: developmental processes and mechanisms between 10 and 15 years of age. Pediatrics 121 (Suppl. 4), S273–S289.
Wood, M.D., Read, J.P., Palfai, T.P., Stevenson, J.F., 2001. Social influence processes and college student drinking: the mediational role of alcohol outcome expectancies. J. Stud. Alcohol 62, 32–43.
World Health Organization, 2014. Global Status Report on Alcohol and Health-2014. World Health Organization Press, Switzerland.