Social Supply of Alcohol to Korean Teenagers- A cross-sectional International Alcohol Control Study

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Social Supply of Alcohol to Korean Teenagers- A cross-sectional International Alcohol Control Study

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ARTICLE SUMMARY

Article Focus

- Alcohol remains accessible to Korean teenagers through social supply from parents and friends.

Key messages

- Among Korean teenage drinkers, fathers, friends and mothers were the lead suppliers of alcoholic beverages. Whilst mothers were the main providers to teenage girls, friends contributed the most alcohol with 205grams of absolute alcohol.
- Prohibitive laws of underage drinking in South Korea can be extended and strictly monitored to cover supply of alcohol in private premises to curb the increasing rates of underage alcohol consumption.

Strengths and Limitations

- Limited by sample size and its cross-sectional nature, this study is however strengthened by the diversity of location of participants.
- The use of the International Control Study as a survey instrument lends support to the credibility of this survey.

ABSTRACT

Purpose: Underage drinking is strictly prohibited by law, nevertheless, adolescents report having access through social supply from family, friends and other members of the society. The aim of this study was to determine the primary suppliers of alcohol to Korean teenagers.

Design: Cross-sectional study

Setting: Data were collected from seven cities and nine provinces: Seoul, Busan, Incheon, Daegu, Gwangju, Daejeon, Ulsan and Gyeoung Gi, Gang Won, Chung Buk, Chung Nam, Jeon Buk, Jeon Nam, Gyung Buk, Gyung Nam, Je Ju

Participants: Data were analysed from 247 teenagers aged 16 to 18 years old as part of the International Alcohol Control Study.

Primary and secondary outcome measures: Social supply to adolescents

Results: More than 56% of adolescents who participated in the International Alcohol Control Survey had been supplied alcohol at least once. Of this number, approximately 59% were males. Parents (especially fathers) and friends were the main suppliers with friends contributing greater volumes (205 grams) of alcohol. Of the number of students provided by mothers, 52% of them were females whilst 73% of respondents provided by friends were males. Beer and soju were the main alcoholic beverages provided to teenagers by their suppliers.

Conclusion: These results support previous findings about the role of parents and friends in underage drinking in South Korean teenage drinkers.

I. Introduction

Adolescent alcohol consumption is a source of increasing concern in a number of countries[1]. This concern stems from the fact that underage drinking is associated with a number of negative health and social consequences such as impaired brain development and poor academic performance[2] loss of memory, high risk sexual behaviour, addiction, suicidal ideation, alcohol related injury and deaths[3-4]. The reasons adolescents drink may differ in relation to culture and the circumstances in which they find themselves. Teenagers report that alcohol is an important ingredient in social interactions, permitting the drinker to lower their inhibitions while feeling more relaxed in social situations, fostering courage and increasing a sense of power, reducing worry and tension[5].

Although most countries have a set legal drinking age, underage drinking is still on the rise: Of the 73 countries which responded to the 2008 WHO Global Survey on Alcohol and Health, 71% reported an increase during the 5 years prior to the survey (WHO, 2011)[6]. The age at first drink in most countries has been found to be normally within the early teen years[7]. In South Korea where the legal drinking age is nineteen (19) years, statistics from the 2011 Korean Adolescent Health Behavior Online Survey showed that the age of first drinking experience was 13 years. Current drinking rates of middle, general high and characterization-based (vocational) high schools were 12.0%, 24.8% and 43.2% respectively. The same survey indicated that between 2005 and 2010 the prevalence of drinking rates among high school boys and girls trended downward[8]. **S**ocial supply by parents, friends and others, including strangers contribute to the overall increasing prevalence of underage drinking in Korea.

Parental attitudes and peer influence have been cited as two of the most influential mediating factors of underage drinking. Parents' consumption patterns, especially the

father's, have been found to affect adolescents' drinking habits[9-11]. Parents' permissive attitude to alcohol consumption contributed to 82.4% of impulsive alcohol drinking in adolescent drinkers- an indication that parents' attitude is an important factor in the drinking motivation of adolescents[12]. Another survey suggested that "the more parents drink, the more children drink[13].

The Korean Youth Panel data however, indicated that parental attachment and supervision variables as an explanation for adolescents' drinking behaviors are not as strongly supported as the variable of delinquent peer[14]. A vast body of research has documented a strong association between friends' and adolescents' alcohol use[15] especially when adolescents had a higher level of peer pressure[16, 17].

Numerous studies have examined the effects that parents' and friends' consumption patterns have on adolescents in South Korea, but none has provided an overview of the impact of social supply on underage drinking. The aim of the present study was, thus, to examine the social supply among Korean adolescents, the characteristics of primary suppliers, places where alcohol is usually supplied and the typical amount of alcohol supplied.

II. Methods

A. Participants

A sample of 2617 participants was involved in the International Alcohol Control (IAC) study. Of this number, 438 were high school students, thus eligible for selection. Students were made of 233 boys and 205 girls, 247 of whom self-identified as drinkers. For the purpose of this study, only data from the drinkers (145 boys and 102 girls) were analysed. Data were collected from June through July 2012 from 7 cities: Seoul, Busan, Incheon, Daegu, Gwangju, Daejeon, Ulsan and 9 provinces: Gyeoung Gi, Gang Won, Chung Buk,

Chung Nam, Jeon Buk, Jeon Nam, Gyung Buk, Gyung Nam, Je Ju located in geographically diverse regions of Korea.

Institutional Review Board (IRB) permission was obtained and approved for this study (SYUIRB 2011-018). Participants in the study received a coded packet that contained the questionnaire and a copy of the informed consent which delineated the proposed use of the data, benefits and risks of participating in the study as well as confidentiality rights. Completion of the questionnaire took approximately 30 minutes. All participants completed the questionnaire at the time given and received a gift.

B. Survey Instrument

The IAC questionnaire includes mediating and outcome variables of underage drinking patterns. For the purpose of this study, variables which had the tendency to mediate alcohol consumption in the teen years were analyzed.

Variables

i. Social supplier

This variable referred to persons who could at one time or the other provide alcohol to teenagers. The present study considers fathers, mothers, siblings, other relatives, friends, partner (boyfriends and girlfriends), senior and younger schoolmates (fellow students) and strangers as the social suppliers of adolescents.

ii. Frequency of secondary supply

The frequency with which alcohol is socially supplied was analyzed using time-periods which included twice a week, once a week, once every ten days, once a fortnight, four to five times in the last six months, two to three times in the last six months, at least once.

iii. Absolute Alcohol Volume

The absolute alcohol volume was calculated for all brands under study. This was to determine the total quantity (in grams) of alcohol provided to teenagers by social suppliers.

Alcoholic beverages

The types of alcoholic beverages used in this study included common brands usually available in South Korea. The brands included beer, home brewed beer, low alcohol beer, wine, spirits, mixed cocktail, soju, takju, yakju and Korean traditional wine.

iv. Place

Places cited in the questionnaire included own home, someone else's home, pubs, hotels or taverns, nightclubs, sports clubs, other clubs, groups or meetings (such as hobby groups or committee meetings), restaurants, cafes or coffee shops, theatres or movies, workplaces (part-time jobs), sports events, outdoor public places such as beaches or parks, special events such as festivals, music events or dance parties and 'other' places.

C. Methods of Data Analysis

This study utilized Pearson correlation analysis using the SPSS vl8.0 to determine if there were significant relationships between social supply and place where alcohol is supplied. Chi-square, Fisher's exact and t-test were used to determine differences between gender and the frequency with which alcohol is supplied. A $p<.05$ was accepted as statistically significant.

III. Results

Responses to questions about the supplier revealed that 31% of adolescents received alcohol from individuals less than 19 years of age (under the legal purchasing age), whilst 69% reported the suppliers were over 18. 47.5% of respondents answered negatively when

asked whether suppliers other than parents had obtained parental consent before providing alcohol. 74% of respondents reported being supervised by the supplier whilst 26% had received no supervision (table 1).

Of the 126 students who responded to the question of frequency with which they received alcohol, 52 teenagers (41.27% of total respondents) had been supplied at least once in the last 6 months while the remainder received alcohol quite regularly. 33 students (26.19% of respondents) had been provided with alcohol quite frequently within the last six months whilst 12% (15 respondents) had been supplied alcohol once a month. About 8% (10 teenagers) of respondents were supplied alcohol at least weekly. (figure 1).

Responses about the social sources of alcohol showed that fathers, friends and mothers were the primary social suppliers of alcohol to teenagers. Whilst a total of 146 respondents mentioned their fathers and friends as their suppliers (73 apiece), 54 had received alcohol from their mothers. Of the 54, 33 of them were girls. Siblings and fellow students had provided alcohol to 34 students. Other relatives besides parents and siblings were the social suppliers to 28 respondents. 3 respondents had been supplied alcohol by strangers whilst 9 respondents had received alcohol from their partners (figure 2).

The results presented in Table 2 are representative of the supply of alcohol to teenagers by parents and friends. The table presents frequency of distribution as it pertains to both males and females. Fathers and friends were the lead distributors of alcohol to both male and female respondents. Significant statistical differences were found with (respect to gender) between mother and friends as social suppliers of alcohol to teens. With a p-value<.05, 11.4% of males and 26% of females reported having received alcohol from their mother at least once in the last 6 months. In total, 33% of female respondents compared with 18.5% of males had

been supplied at least once by their mother. Of the 74 respondents who had been given alcohol by friends, almost 69% of them were males and approximately 31% females. No significant differences were found between gender when fathers were the suppliers (table 2). Over the last six months, friends typically supplied 205grams of absolute alcohol, or the equivalent of 17 drinks (with a drink here defined as 12g±20% absolute alcohol). Mothers provided 122g of absolute alcohol (10.2 drinks) and fathers usually supplied 115g of absolute alcohol (10 drinks).

Correlation analysis showed that there were significant differences as it pertains to the supplier and the place where alcohol is supplied. Whereas a positive correlation was found between mothers and the supply of alcohol in their own home (p<.o1), an inverse correlation existed for friends. The likelihood that a mother would supply alcohol at someone else's home was negative (p=004). On the other hand, friends would supply alcohol with significant differences at someone else's home (p=001), outdoor event (p=021), special events (p=016) and other places (p=001) (table 3)

Results from this survey indicate that beer, the most frequently supplied beverage to adolescent drinkers was almost as twice as popular as soju the next preferred alcoholic beverage. About 156 respondents had been supplied with beer, whilst 94 others had received soju. All other beverages combined were not as popular as soju. (table 4)

IV. Discussion

Despite the existence and enforcement of prohibition laws against purchasing of alcohol by minors (<19 years), alcohol remains accessible to teenagers through alternate channels[18]. The focus of this study was to examine the various sources of alcohol to Korean teenage drinkers. Major findings include (a) Among teenage drinkers, an adult was the most

common source of alcohol, (b) almost 50% of parents consented to minors being provided alcohol, (c) mothers were the main providers to females and (d) friends supplied more alcohol (in greater volumes) than parents.

The issue of social supply seems to be undermining set policies and underage drinking continues unabated. One of the mechanisms by which social supply may influence alcohol-related problems is by decreasing the age of onset of drinking. Generally studies have shown that the age at which people start regular drinking is predictive of consumption and alcohol-related problems in subsequent years[19-26]. Korean teenage drinkers obtain alcohol from multiple sources including parents, siblings, other relatives, friends, fellow students, partners and even strangers. Of these sources, persons older than 19 years were the main sources.

Adults, especially parents have an important role in the socialization of their children on the issue of alcohol use[27]. However more than 50% of respondents indicated their parents had consented to their drinking. Research has proven that providing alcohol to an adolescent explicitly indicates approval of underage alcohol use[28]. This disregard of underage drinking may however lead to future substance abuse[29, 30]. Parental approval of underage drinking is surprisingly rife as 13% of American youth, aged 11 to 17 years, have drunk alcohol with their families [30, 31].

The assumption is that when parents provide alcohol to their children, it may serve a protective effect for alcohol abuse. However, conflicting knowledge exists regarding the protective effect of parental approval of underage alcohol consumption. Whilst some studies indicate that parents who provide alcohol to their children are more likely to have children who never abuse alcohol[27], others show that consuming alcohol at home leads to increased drinking among teenagers[30]. Other studies have found that parents who monitor young

peoples' alcohol use and who implement house rules around alcohol use are less likely to have children abuse alcohol in later years[31].

Our results showed that the volume of alcohol provided by friends exceeded that of parents. Peer pressure has been found to be a stronger variable affecting adolescents' drinking than parental influence[17]. Although the influence of peers on alcohol use is of greater magnitude, contradictory research indicates that a positive family environment could attenuate the negative impact of peers on adolescent drinking[32].

The Food Sanitation Act of South Korea prohibits the act of allowing minors access to licensed liquor establishments and providing any alcoholic beverages to children[33]. These prohibitive laws against underage drinking do not, however, explicitly cover supply in private premises. The United States, on the other, has introduced initiatives aimed at restricting social sources of supply, including laws against adult provision of alcohol to minors and the creation of enforcement mechanisms that allow police to enter private premises where underage drinking is happening[34]. There have also been efforts to register beer kegs so that police can trace the adult purchaser of alcohol provided to underage drinkers[34, 35].

Results from this research will pave the way in Korea for a more detailed exploration of all factors associated with the social supply of alcohol to teenagers as well as the long-term effects of this supply on adolescent development. This study, limited by its cross sectional design is however strengthened by the use of the International Control Study questionnaire as an assessment tool. Generalizations of the whole population of South Korean teenagers cannot be made as the sample of this survey was limited. However, the diversity of locations used is advantageous as results for drinking rates (33.1% males: 23.1% females) are similar to information from the Ministry of Health and Welfare showing prevalence of underage

drinking (26.1% males: 22.6% females). Future studies of a larger sample can be used to assess the full extent of social supply in South Korean teenage drinkers.

Table 1: Supplier Characteristic

Characteristic	Respondents (%)	
	Yes	No
Age of supplier(age<19)	77(31)	170(69)
Parental Consent	130(52.5)	117(47.5)
Supervision	183(74)	64(26)

Figure 1: Frequency with which 16-18 year olds were supplied alcohol.

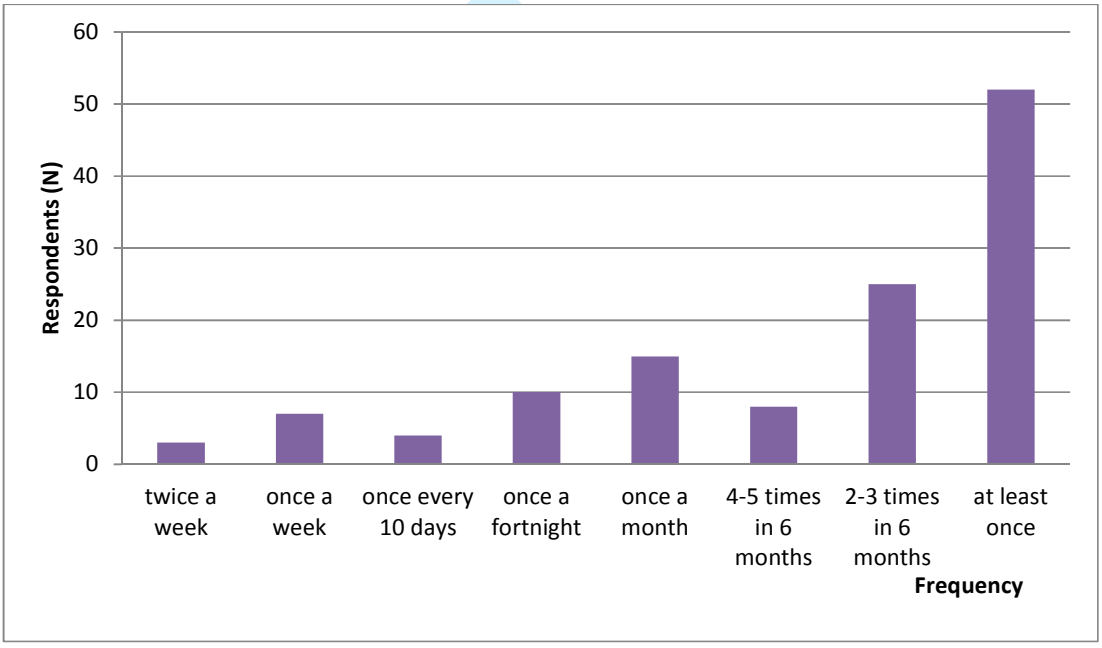

Figure 2: Source of socially supplied alcohol to teenagers aged 16-18 years

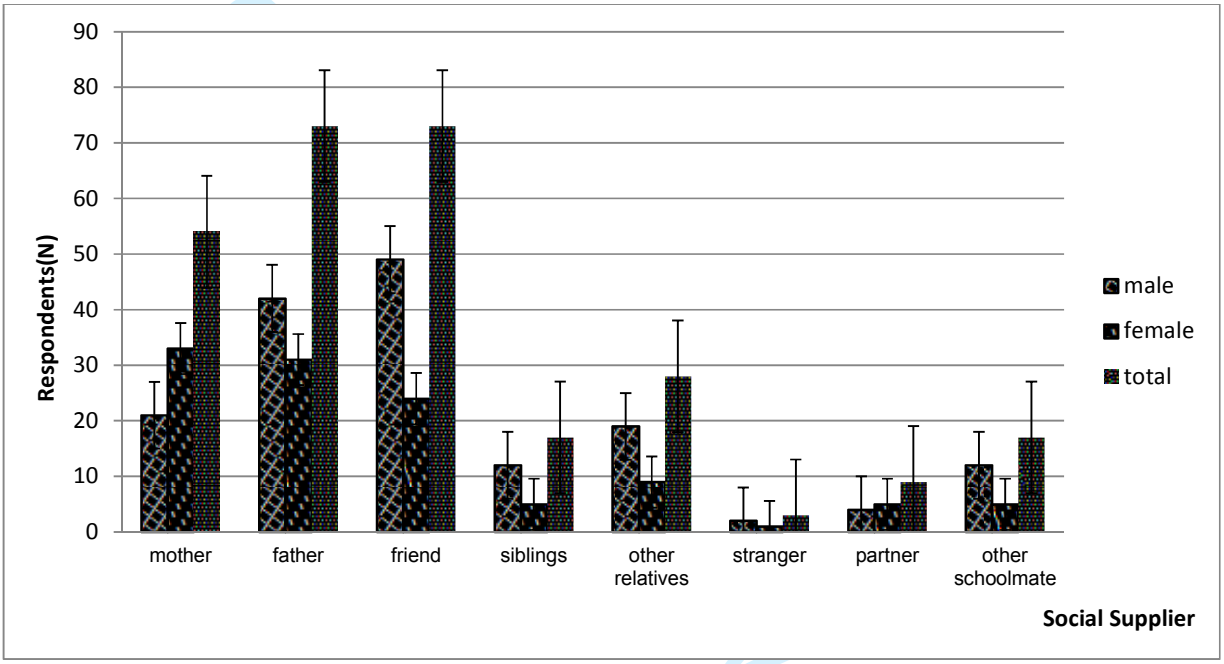

Table 2: Frequency of social supply of Alcohol by parents and friends

Supplier	Gender	N (%)	How often alcohol is supplied (N %)			Fisher's Exact (p-value)
			Monthly or more	Less than monthly	Never	
Mother	Males	140	10(7.1)	16(11.4)	114(81.4)	8.553(.013)
	Females	100	7(7.0)	26(26)	67(67)	
Father	Males	141	16(11.3)	27(19.1)	98(69.5)	2.250(.319)
	Females	101	6(5.9)	23(22.8)	72(71.3)	
Friends	Males	143	23(16.1)	28(19.6)	92(64.3)	18.179(.000)
	Females	102	1(1.0)	22(21.6)	79(77.5)	

Table 3: Correlation between supplier and place of supply

Variable	Own Home	Someone else's home	Outdoor Place such as beach or park	Special event such as festival	Other Place
Mother	.268**	-.239**	-.057	-.077	-0.95
Friend	-.152*	.173**	.209*	.128*	.201**

*** Correlation is significant at 0.01 level (2-tailed)*

** Correlation is significant at 0.05 level (2-tailed)*

Table 4 Alcoholic beverage usually supplied to 16-18 year olds

Type of Beverage	Number of Respondents

	Male	Female	Total
Beer	91	65	156
Soju	65	29	94
Home brewed beer	12	5	17
Wine	7	10	17
Takju	5	6	11
Korean traditional wine	5	1	6
Spirits	2	3	5
Low alcohol beer	2	2	4
Yakju	1	3	4
Mixed cocktail	1	1	2

References

1. World Health Organization. *Addressing the harmful use of alcohol: a guide to developing effective alcohol legislation.* Geneva: 2011.
2. Tapert SF, Caldwell L, Burke C. Alcohol and the adolescent brain: Human studies. *Alcohol Research and Health* 2004; 28: 205−212.
3. Seong JC, Hong JJ, Kim JK, Suh TW et al. Prevalence of suicide behaviors (Suicidal ideation and suicide attempt) and risk factors of suicide attempts in Junior and High School Adolescents. *J Korean Neuropsychiatr Assoc* 2002; Vol 41: No 6
4. Bonomo YA, Bowes G, Coffey C et al. Adverse outcomes of alcohol use in adolescents. *Addiction* 2001; 96: 1485-1485.
5. Jones BT, Corbin W, Fromme K. A review of expectancy theory and alcohol consumption. *Addiction* 2001; 96(1): 427-436.
6. World Health Organization. *Global status report on alcohol and health*. Geneva: 2011.
7. U.S Department of Health and Human Services. *Alcohol Alert* Number 67, January 2006
8. Korea National Legislation Information Center (http://www.law.go.kr). Youth Protection Law. 2011 [http://www.law.go.kr/lsInfoP.do?lsiSeq=121990&efYd=20120916#0000 accessed 2013 may 9]
9. Kim SG, Kim SK. The determinants influencing adolescents' alcohol use. *Korean journal of youth studies* 2009; 16(9): 105-124.
10. Chartier KG, Hesselbrock MN, Hesselbrock VM. Development and vulnerability factors in adolescent alcohol use. *Child Adolesc Psychiatr Clin N Am*. 2010; 19(3):493-504.

11. Cranford JA, Zucker RA, Jester JM, Puttler LI, Fitzgerald HE. Parental alcohol involvement and adolescent alcohol expectancies predict alcohol involvement in male adolescents. *Psychol Addict Behav.* 2010; 24(3):386-96.

12. Lee YK. Psychological characteristics of the youth in substance abuse. Thesis of the Korea University.1999

13. Won YH. The influences of parents' drinking and parent-child relationship perceived by juvenile on juvenile's drinking. Thesis of the Soong-sil University 2008; pp 54-58.

14. Hwang SH. Parental and peer factors influence on adolescents' drinking and smoking behaviors. *Health and social-science* 2010; 27:81-103.

15. Andrews JA, Tildesley E, Hops H, Li F. The influence of peers on young adult substance use. *Health Psychology* 2002; 21: 349−357.

16. Kim GE, Cho NA. The effects of drinking environment on the degree of youth drinking-moderating effects on the interaction of parents and adolescents. *Korean Journal of Youth Studies* 2012; 19(11): 45-68.

17. Hwang SH, Akers RL. Substance use by Korean adolescents-A cross-cultural test of social learning, social bonding, and self-control theories 2003 in Roland L. Alkers and Gary F. Jensen. (eds) Social learning theory and the explanation of crime: *A Guide for the New Century Advances in Criminological Theory.* 11:39-64.

18. Williams TP, Lillis RP, Changes in alcohol consumption by 18-year-olds following an increase in New York state's purchase age to 19.*J Stud Alcohol* 1986; 47: 290-296

19. Grant B. Prevalence and correlates of alcohol use and DSM-IV alcohol dependence in the United States: results of the National Longitudinal Alcohol Epidemiologic Survey. *Journal of Studies on Alcohol*, 1997; 58: 464-473.

20. Swandi H. Alcohol, drugs and adolescence: A longitudinal perspective on adolescent substance abuse. Wellington, *Alcohol Advisory Council* 1998.

21. Fergusson D, Lynskey M, Horwood L. Alcohol misuse and juvenile offending in adolescence. *Addiction* 1996; 91: 483-494.

22. Casswell S, Zhang J. Access to alcohol from licensed premises during adolescence: A longitudinal study. *Addiction* 1997; 92: 737-745.

23. Chou SP, Pickering RB. Early onset of drinking as a risk factor for lifetime alcohol related problems. *Addiction* 1992; 87: 1999-1204.

24. Fillmore KM, Hartka E, Johnstone BM et al. A meta-analysis of life course variation in drinking. *British Journal of Addiction* 1991; 86: 1221-1288.

25. Hingson RW, Edwards EM, Heeren T, Rosenbloom D. Age of drinking onset and injuries, motor vehicle crashes and physical fights after drinking and when not drinking. *Alcoholism: Clinical and Experimental Research* 2009; 33: 783-790.

26. Wells JE, Horwood LJ, Fergusson DM. Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood. *Addiction* 2004; 99: 1529-41.

27. Foley KL, Altman D, Durant RH, Wolfson M. Adults' approval and adolescents' alcohol use. *Journal of Adolescent health* 2004; Vol 35,345:e17-345.e26

28. Harburg E, Davis DR, Caplan R. Parent and offspring alcohol use, imitative and aversive transmission. *J Stud Alcohol* 1982; 43:497–516

29. Baumrind D. The influence of parenting style on adolescent competence and substance use. *J Early Adolesc* 1991: 11:56–95

30. Ary DV, Tildesley E, Hops H, Andrews J. The influence of parent, sibling, and peer modeling and attitudes on adolescent alcohol use. *Int J Addict* 1993; 28:853–880

31. Jackson C, Henriksen L, Dickinson D. Alcohol-specific socialization, parenting behaviors, and alcohol use by children .*J Stud Alcohol* 1999; 60:362–367

32. Nash SG, McQueen A, Bray JH. Pathways to adolescent alcohol use: family environment, peer influence, and parental expectations. *Journal of Adolescent Health* 2005; 37(1)19–28.

33. Chun S. A comparative study on the alcohol laws and policies between USA and Korea. *J Med Law* 2003; 11(1) 21-34.

34. Prevention Research Center. *Preventing Underage Alcohol Access: Essential Elements for Policy, Deterrence and Public Support. Prevention Research Center* 2004.

35. Komro KA,Toomey T L. Strategies to Prevent Underage Drinking. *Alcohol Research & Health* 2002; 26: 5-14.

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Social Supply of Alcohol to Korean High School Students- A cross-sectional International Alcohol Control Study

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ABSTRACT

Purpose: Underage drinking is strictly prohibited by law, nevertheless, adolescents report having access through social supply from family, friends and other members of the society. The aim of this study was to determine the primary suppliers of alcohol to Korean teenagers.

Design: Cross-sectional study

Setting: Data were collected from 21 High schools in geographically diverse regions in South Korea from June to July 2012 as part of the International Alcohol Control Study.

Participants: Data were analysed from 247 high schoolers aged 16 to 18 years old as part of the International Alcohol Control Study.

Primary and secondary outcome measures: Social supply to adolescents

Results: More than 56% of high schoolers who participated in the International Alcohol Control Survey had been supplied alcohol at least once. Of this number, approximately 59% were males. Parents (especially fathers) and friends were the main suppliers with friends contributing greater volumes (205 grams) of alcohol. Of the number of students provided by mothers, 52% of them were females whilst 73% of respondents provided by friends were males. The most significant place for alcohol supply was at special events. Males were at higher odds for hazardous drinking.

Conclusion: These results support previous findings about the role of parents and friends in underage drinking in South Korean high school drinkers.

Keywords: Alcohol, Underage drinking, Social supply, High schoolers

ARTICLE SUMMARY

Article Focus

- Alcohol remains accessible to Korean high schoolers through social supply from parents and friends.

Key messages

- Among Korean high school drinkers, fathers, friends and mothers were the lead suppliers of alcoholic beverages. Whilst mothers were the main providers to teenage girls, friends contributed the most alcohol with 205grams of absolute alcohol.
- Prohibitive laws of underage drinking in South Korea can be extended and strictly monitored to cover supply of alcohol in private premises to curb the increasing rates of underage alcohol consumption.

Strengths and Limitations

- Limited by sample size and its cross-sectional nature, this study is however strengthened by the diversity of location of participants.
- The use of the International Control Study as a survey instrument lends support to the credibility of this survey.

I. Introduction

Adolescent alcohol consumption is a source of increasing concern in a number of countries[1]. This concern stems from the fact that underage drinking is associated with a number of negative health and social consequences such as impaired brain development and poor academic performance[2] loss of memory, high risk sexual behaviour, addiction, suicidal ideation, alcohol related injury and deaths[3-4]. The reasons adolescents drink may differ in relation to culture and the circumstances in which they find themselves. Teenagers report that alcohol is an important ingredient in social interactions, permitting the drinker to lower their inhibitions while feeling more relaxed in social situations, fostering courage and increasing a sense of power, reducing worry and tension[5].

Although most countries have a set legal drinking age, underage drinking is still on the rise: Of the 73 countries which responded to the 2008 WHO Global Survey on Alcohol and Health, 71% reported an increase during the 5 years prior to the survey (WHO, 2011) [6]. The first use of alcohol (defined as drinking a whole drink) typically occurs in early adolescence (at 13–14 years of age)[7]. In South Korea where the legal drinking age is nineteen (19) years, statistics from the 2011 Korean Adolescent Health Behavior Online Survey showed that the age of first drinking experience was 13 years. Whereas overall report of alcohol consumption among teenagers (13-18 years) trended downwards over the period of 2005 to 2011 from 54.1% to 51%, alcohol consumption is still high among older teenagers aged 16 (57.2%), 17 (67.15) and 18 (75.5%)[8].

Parental attitudes and peer influence have been cited as two of the most influential mediating factors of underage drinking. Previous studies have shown parental alcohol use as an important determinant of adolescents' drinking [9]**.** Parents' consumption patterns, especially the father's, have been found to affect adolescents' drinking habits[10-12]. Recent

research however shows that this relationship decreases once other factors are taken into account[14]. A vast body of research has documented a strong association between friends' and adolescents' alcohol use[13] especially when adolescents had a higher level of peer pressure[15,16].

In South Korea, previous studies have examined the effects that parents' and friends' consumption patterns have on adolescents in South Korea, but none has provided an overview of the impact of social supply on underage drinking. The aim of the present study was, thus, to examine the social supply among Korean high schoolers, the characteristics of primary suppliers, places where alcohol is usually supplied and the odds of hazardous drinking (report of drinking more than four drinks on a usual drinking occasion in the last six months).

II. Methods

A. Survey Instrument

The survey instrument used for this study was the International Alcohol Control (IAC) study questionnaire. The IAC study is a collaborative cohort study across seven countries. It measures the impacts of key national level alcohol policies. Alcohol consumption measures included in this instrument include availability, pricing and taxation, social supply, marketing and drink driving interventions. For purposes of the present study, variables under social supply were assessed [17].

B. Sampling

Of the 2617 individuals who participated in the IAC study (June-July 2012), 438 (17%) were high school students aged 16-18. A total of twenty-one high schools (urban- seven, suburban-eight and rural-six) were randomly selected from geographically diverse regions of Korea.

247 (56.4%) high schoolers self-identified as drinkers. This number constituted the sample for the present study. Institutional Review Board (IRB) permission was obtained and approved for this study (SYUIRB 2011-018). Participants in the study received a coded packet that contained the questionnaire and a copy of the informed consent which delineated the proposed use of the data, benefits and risks of participating in the study as well as confidentiality rights. Completion of the questionnaire took approximately 30 minutes. All participants completed the questionnaire at the time given and received a gift.

Variables

i. Social supplier

This variable referred to persons who could at one time or the other (in the last six months) provide alcohol to teenagers. The present study considers fathers, mothers, siblings, other relatives, friends, partner (boyfriends and girlfriends), fellow schoolmates and strangers as the social suppliers of adolescents.

ii. Frequency of secondary supply

The frequency with which alcohol was socially supplied within the last six months was analyzed using time-periods which included weekly (once or more during the week), once a month, more than once monthly (several times in a month) and at least once in the last six months.

iii. Absolute Alcohol Volume

The absolute alcohol volume was calculated for all brands under study. This was to determine the standard amount of pure ethanol (12g of ethanol) per glass and estimate the total quantity (in grams) of alcohol provided to teenagers by social suppliers on a usual drinking occasion. Volume of absolute alcohol intake (in millilitres) was computed as (% pure alcohol) x (drink size) x (number of drinks consumed) for each beverage consumed on

any usual occasion in the last six months. The sum of the various beverage types determined the total absolute alcohol. The brands included beer, home brewed beer, low alcohol beer, wine, spirits, mixed cocktail, soju, takju, yakju and Korean traditional wine.

iv. Place

Places cited in the analysis included own home, another home, pubs, other clubs, restaurants, workplace (part-time jobs), special events and other places.

C. Methods of Data Analysis

This study utilized Pearson correlation analysis using the SPSS vl8.0 to determine if there were significant relationships between social supply and place where alcohol is supplied. Chi-squared test was used to determine differences between demographic variables and supply of alcohol variables. A $p<.05$ was accepted as statistically significant. Logistic regression analysis was used to determine the associations between hazardous drinking (drinking more than four drinks on a usual occasion), demographic and social supply variables.

Results

Of the total sample of 2617 Korean drinkers and non-drinkers recruited for the International Alcohol Control Study in 2012, almost 17% were high-school students aged 16 to 18 years. Of the 438 students, 247 self-identified as drinkers. More than half of all age groups reported ever drinking alcohol. With the exception of suburban respondents, more than 60% of teenagers from urban and rural communities had consumed alcohol at least once in their lifetime. Characteristics of the sample are shown in table 1.

Generally, more than half of all respondents (54.8%) had been provided alcohol more than once in the last six months. More males (13.7%) had been supplied alcohol more frequently than females (7.2%) in the last six months. Older teenagers (13%) received alcohol more frequently compared with their juniors. Urban dwellers reported more frequent supply of alcohol in the last six months compared with suburban and rural dwellers. (see Table 2)

Table 3 examines the supplier of alcohol to high school students in the last six months. Stratified by gender, statistical significance at $p < .05$ was found when mothers and friends were suppliers. Mothers were the main supplier to female respondents whilst friends supplied alcohol to male students. With increase in age, supply shifted from mothers and friends to siblings, other relatives and schoolmates. Table 3

Self-report of places where alcohol was usually provided in the last six months were generally higher in own home, others' home and at special events. Significant differences were reported between gender at other home, pubs and other places. At p=.035, 60.7% and 48% of male and female respondents received alcohol at other homes. 46.5% male respondents and 28% of females received alcohol at pubs (p=.003). Supply at special events was significantly different between the different age groups with a greater percentage of 16 year olds. Among the different places of residence, significant differences were found for supply of alcohol at other places. (See Table 4)

Table 5 examines the association between hazardous drinking, demographic and supplier variables. On a usual drinking occasion, boys were seven times more likely to report hazardous drinking at statistically significant levels (p=.000). The odds of hazardous drinking was significantly greater for high schoolers provided alcohol by friends (OR 5.67; 95% CI 2.54 to 12.68) compared to other suppliers. Those who drank in pubs had higher odds of hazardous drinking (OR 1.99; CI 1.09 to 3.65).

IV. Discussion

Despite the existence and enforcement of prohibition laws against purchasing of alcohol by minors (<19 years), alcohol remains accessible to teenagers through alternate channels[18]. The focus of this study was to examine the various sources of alcohol to Korean high school drinkers. Major findings include (a) Among high school drinkers, an adult (person aged 19 and above) was the most common source of alcohol, (b) whilst mothers were the main providers to females, friends supplied more alcohol (in greater volumes) than parents and (c) high schoolers who consumed alcohol in pubs and clubs were more likely to engage in hazardous drinking.

A significant factor contributing to underage drinking is social supply of alcohol to teenagers. One of the mechanisms by which this supply may influence alcohol-related problems is by decreasing the age of onset of drinking[19, 20]. Korean high school drinkers reported obtaining alcohol from multiple sources including parents, siblings, other relatives, friends, fellow students, partners and even strangers. Of these sources, persons older than 19 years were the main sources. Adults, especially parents have an important role in the socialization of their children on the issue of alcohol use. Contrary to medical reports of the problems associated with early initiation of drinking, some parents are of the view that providing alcohol to their children teaches responsible drinking and controls the quantity consumed[21, 22]. Results from our analysis showed that South Korean parents, especially fathers were more likely to supply alcohol to their children than mothers (30.4% vs. 21.1% of adolescents).

The assumption is that when parents provide alcohol to their children, it may serve a protective effect for alcohol abuse. However, conflicting knowledge exists regarding the

protective effect of parental approval of underage alcohol consumption. Whilst some studies indicate that parents who provide alcohol to their children are more likely to have children who never abuse alcohol[23], others show that consuming alcohol at home leads to increased drinking among teenagers[24]. Our research supported the former assumption that teenagers supplied alcohol by their parents were more likely to consume lower amounts of absolute alcohol (122grams and 115grams by mothers and fathers respectively compared to friends) and less likely to be involved in hazardous drinking (OR 0.92; CI 0.49 to 1.74). Research has proven that providing alcohol to an adolescent indicates approval of underage alcohol use. This disregard of underage drinking may however lead to future substance abuse[25]. Parental approval of underage drinking is however rife as 13% of American youth, aged 11 to 17 years, have drunk alcohol with their families[26, 27]. Our results showed that the volume of alcohol provided by friends exceeded that of parents (205grams of absolute alcohol). At the same time, teenagers who were supplied alcohol by friends (OR 5.67; CI 2.54 to 12.68) and those who drank at locations other than their own homes i.e. at pubs (OR 1.99; CI 1.09 to 3.65) were at higher risk of hazardous drinking. We speculate that high schoolers had access to alcohol at pubs, special events and other places without age identification. South Korean laws that require suppliers to ascertain the age of a youth (under the age of 19) before supply of any harmful drugs need to be enforced to decrease supply of alcohol to teenagers at pubs, special events and other places. Although the influence of peers on alcohol use is of greater magnitude, contradictory research indicates that a positive family environment could attenuate the negative impact of peers on adolescent drinking [28].

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aimed at restricting social sources of supply, including laws against adult provision of alcohol to minors and the creation of enforcement mechanisms that allow police to enter private premises where underage drinking is happening[30]. There have also been efforts to register beer kegs so that police can trace the adult purchaser of alcohol provided to underage drinkers [31]. Prohibitive laws in South Korea can be extended to cover, not just purchase but supply of alcohol at all places including private premises.

Results from this research will pave the way in Korea for a more detailed exploration of all factors associated with the social supply of alcohol to teenagers as well as the long-term effects of this supply on adolescent development. This study, limited by its cross sectional design is however strengthened by the use of the International Control Study questionnaire as an assessment tool. Generalizations of the whole population of South Korean teenagers cannot be made as the sample of this survey was limited by age and total sample size. However, the diversity of locations used is advantageous as results for drinking rates (33.1% males: 23.1% females) are similar to information from the Ministry of Health and Welfare showing prevalence of underage drinking (26.1% males: 22.6% females). Future studies of a larger sample (across a larger and diverse age grouping) can be used to assess the full extent of social supply in South Korean teenage drinkers. Studies to determine the relationship between social supply and outlet density would be an interesting topic for future research.

Table 1: Characteristics of sample N (%)

	Drinker	Non-Drinker
	247(56.4)	191(43.6)
Gender		
Male (n=233)	145(62.2)	88(37.8)
Female (n=205)	102(49.8)	103(50.2)
Age		
16 (n=113)	68(60.2)	45(39.8)
17 (n=146)	82(56.2)	64(43.8)
18 (n=179)	97(54.2)	82(45.8)
Residence		
Urban (n=240)	145(60.4)	95(39.6)
Suburban (n=152)	73(48)	79(52)
Rural (n=45)	28(62.2)	17(37.8)

Table 2: Frequency (percentages) of supply of alcohol in the last 6 months to High schoolers

	Frequency (%)			
	Weekly	Monthly	More than monthly	At least once
Total	6.1	4.8	43.9	43.9
Gender				
Male(n=131)	8.4	5.3	40.5	45.8
Female(n=97)	3.1	4.1	48.5	44.3
Age				
16 (n=62)	3.2	4.8	45.2	46.8
17 (n=74)	8.1	2.7	45.9	43.2
18 (n=92)	6.5	6.5	41.3	45.7
Residence				
Urban (n=240)	7.5	6.0	38.1	48.5
Suburban (n=152)	4.3	4.3	49.3	42
Rural (n=45)	4.0	-	60.0	36.0

Table 3: Supplier of Alcohol in the last 6 months

	Supplier of Alcohol (% in the last 6 months)[a]							
	Father	Mother	Siblings	Other Relatives	Friends	Partner	Schoolmate	Stranger
Total	30.4	21.1	6.1	10.1	25.5	1.6	6.1	0.8
Gender								
Male	29.7	**17.2**	5.5	11	**31.7**	1.4	7.6	0.7
Female	31.4	**26.5**	6.9	8.8	**16.7**	2	3.9	1.0
Age								
16	32.4	22.1	4.4	8.8	29.4	1.5	4.4	1.5
17	25.6	22	6.1	11	24.4	2.4	6.1	-
18	33	19.6	7.2	10.3	23.7	1	7.2	1
Residence								
Urban	29.7	20.7	6.2	11.7	25.5	2.1	4.8	-
Suburban	28.8	23.3	6.8	8.2	26	1.4	8.2	2.7
Rural	39.3	17.9	3.6	7.1	25	-	7.1	-

[a] *Percentages do not add up to 100% as respondents selected more than one source.*
Bold figures show chi-square significance at p<.05

Table 4: Supply of Alcohol at Place(x) in the last 6 months

	Places where alcohol is usually supplied (% in the last 6 months)[a]							
	Own Home	Other Home	Pubs	Other Clubs	Restaurants	Meetings	Special Events	Other Places
Total	56.3	53.4	38.1	17	3.2	37.2	45.4	25.8
Gender								
Male	56.3	**60.7**	**46.5**	18.4	3.5	37.1	47.3	**36.4**
Female	64.9	**48**	**28**	16.1	3	40	46.1	**10.9**
Age								
16	59.1	60.3	33.8	24.7	7.5	40.3	**70.1**	32.3
17	60	58.2	37	9.8	-	33.3	**37.1**	18.1
18	60.5	49.5	44.1	18.4	3.3	41.3	**38.1**	28.7
Residence								
Urban	63.7	53.2	42.9	18.7	4.2	39.7	45	**25.1**
Suburban	55.1	59.2	37	16.5	2.8	39.4	45.4	**34.5**
Rural	55.6	59.3	21.4	7.1	-	29.6	38.6	**7.1**

[a] *Percentages do not add up to 100% as respondents selected more than one source. Bold figures show chi-square significance at p<.05*

Table 5: Odds Ratio of Risky drinking on a usual drinking occasion in the last six months

Covariate	Odds Ratio (95% C.1)	P-value
Gender		
Male	7.38(4.05 to 13.46)	.000
Female	1	
Age		
16	1.26(.59 to 2.71)	.555
17	.84(.40 to 1.74)	.637
18	1	
Supplier		
Parent	.92(.49 to 1.74)	.804
Friend	5.67(2.54 to12.68)	.000
Other	1.26(.49 to 1.74)	.557
Stranger	1	
Place		
Own Home	1	
Another home	1.13(.637 to 2.02)	.669
Pubs/Clubs	1.99(1.09 to 3.65)	.025
Special Events	1.78(.80 to 3.96)	.159

Competing Interests

None

Contributorship

SC is the study and KIAP Director responsible for study design.MY and LSA contributed to the study concept, analysis and interpretation. LSA was the lead writer while SC, MY and MN provided draft revisions with contributions to intellectual content. The manuscript was recirculated among all authors for critical revision. SC, LSA, MY and MN approved the final version of the manuscript.

Data sharing

No additional data are available

References

1. World Health Organization. *Addressing the harmful use of alcohol: a guide to developing effective alcohol legislation.* Geneva: 2011.
2. Tapert SF, Caldwell L, Burke C. Alcohol and the adolescent brain: Human studies. *Alcohol Research and Health* 2004; 28: 205−212.
3. Seong JC, Hong JJ, Kim JK, Suh TW et al. Prevalence of suicide behaviors (Suicidal ideation and suicide attempt) and risk factors of suicide attempts in Junior and High School Adolescents. *J Korean Neuropsychiatr Assoc* 2002; Vol 41: No 6
4. Bonomo YA, Bowes G, Coffey C et al. Adverse outcomes of alcohol use in adolescents. *Addiction* 2001; 96: 1485-1485.
5. Jones BT, Corbin W, Fromme K. A review of expectancy theory and alcohol consumption. *Addiction* 2001; 96(1): 427-436.
6. World Health Organization. *Global status report on alcohol and health*. Geneva: 2011.

7. Faden VB. Trends in initiation of alcohol use in the United States 1975 to 2003. Alcohol Clin Exp Res. 2006;30(6):1011–1022

8. Li C, Pentz MA, Chou CP. Parental substance use as a modifier of adolescent substance use risk. *Addiction* 2002; 97: 1537-1550

9. Korea National Legislation Information Center (http://www.law.go.kr). Youth Protection Law. 2011 [http://www.law.go.kr/lsInfoP.do?lsiSeq=121990&efYd=20120916#0000 accessed 2013 may 9]

10. Kim SG, Kim SK. The determinants influencing adolescents' alcohol use. *Korean journal of youth studies* 2009; 16(9): 105-124.

11. Chartier KG, Hesselbrock MN, Hesselbrock VM. Development and vulnerability factors in adolescent alcohol use. *Child Adolesc Psychiatr Clin N Am*. 2010; 19(3):493-504.

12. Cranford JA, Zucker RA, Jester JM, Puttler LI, Fitzgerald HE. Parental alcohol involvement and adolescent alcohol expectancies predict alcohol involvement in male adolescents. *Psychol Addict Behav.* 2010; 24(3):386-96.

13. Hwang SH. Parental and peer factors influence on adolescents' drinking and smoking behaviors. *Health and social-science* 2010; 27:81-103.

14. Warner L, White H. Longitudinal effects of age at onset and first drinking situation on problem drinking. *Substance use and misuse*. 2003; 38 (14): 1983-2016

15. Andrews JA, Tildesley E, Hops H, Li F. The influence of peers on young adult substance use. *Health Psychology* 2002; 21: 349−357.

16. Kim GE, Cho NA. The effects of drinking environment on the degree of youth drinking-moderating effects on the interaction of parents and adolescents. *Korean Journal of Youth Studies* 2012; 19(11): 45-68.

17. International Alcohol Control Study [www.iacstudy.org/index.php accessed 16 August 2013]

18. Hwang SH, Akers RL. Substance use by Korean adolescents-A cross-cultural test of social learning, social bonding, and self-control theories 2003 in Roland L. Alkers and Gary F. Jensen. (eds) Social learning theory and the explanation of crime: *A Guide for the New Century Advances in Criminological Theory.* 11:39-64.

19. Williams TP, Lillis RP, Changes in alcohol consumption by 18-year-olds following an increase in New York state's purchase age to 19.*J Stud Alcohol* 1986; 47: 290-296

20. Grant B. Prevalence and correlates of alcohol use and DSM-IV alcohol dependence in the United States: results of the National Longitudinal Alcohol Epidemiologic Survey. *Journal of Studies on Alcohol*, 1997; 58: 464-473.

21. Hingson RW, Edwards EM, Heeren T, Rosenbloom D. Age of drinking onset and injuries, motor vehicle crashes and physical fights after drinking and when not drinking. *Alcoholism: Clinical and Experimental Research* 2009; 33: 783-790.

22. Kypri K, Dean JI, Stojanovski E. Parent attitudes on the supply of alcohol to minors. *Drug Education Alcohol Rev*, 2007; 26:41-7.

23. Wells JE, Horwood LJ, Fergusson DM. Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood. *Addiction* 2004; 99: 1529-41.

24. Foley KL, Altman D, Durant RH, Wolfson M. Adults' approval and adolescents' alcohol use. *Journal of Adolescent health* 2004; Vol 35,345:e17-345.e26

25. Harburg E, Davis DR, Caplan R. Parent and offspring alcohol use, imitative and aversive transmission. *J Stud Alcohol* 1982; 43:497–516

26. Baumrind D. The influence of parenting style on adolescent competence and substance use. *J Early Adolesc* 1991: 11:56–95

27. Ary DV, Tildesley E, Hops H, Andrews J. The influence of parent, sibling, and peer modeling and attitudes on adolescent alcohol use. *Int J Addict* 1993; 28:853–880

28. Nash SG, McQueen A, Bray JH. Pathways to adolescent alcohol use: family environment, peer influence, and parental expectations. *Journal of Adolescent Health* 2005; 37(1)19–28.

29. Chun S. A comparative study on the alcohol laws and policies between USA and Korea. *J Med Law* 2003; 11(1) 21-34.

30. Prevention Research Center. *Preventing Underage Alcohol Access: Essential Elements for Policy, Deterrence and Public Support. Prevention Research Center* 2004.

31. Komro KA, Toomey T L. Strategies to Prevent Underage Drinking. *Alcohol Research & Health* 2002; 26: 5-14.

I. Introduction

Adolescent alcohol consumption is a source of increasing concern in a number of countries[1]. This concern stems from the fact that underage drinking is associated with a number of negative health and social consequences such as impaired brain development and poor academic performance[2] loss of memory, high risk sexual behaviour, addiction, suicidal ideation, alcohol related injury and deaths[3-4]. The reasons adolescents drink may differ in relation to culture and the circumstances in which they find themselves. Teenagers report that alcohol is an important ingredient in social interactions, permitting the drinker to lower their inhibitions while feeling more relaxed in social situations, fostering courage and increasing a sense of power, reducing worry and tension[5].

Although most countries have a set legal drinking age, underage drinking is still on the rise: Of the 73 countries which responded to the 2008 WHO Global Survey on Alcohol and Health, 71% reported an increase during the 5 years prior to the survey (WHO, 2011)[6]. The first use of alcohol (defined as drinking a whole drink) typically occurs in early adolescence (at 13–14 years of age)[7]. In South Korea where the legal drinking age is nineteen (19) years, statistics from the 2011 Korean Adolescent Health Behavior Online Survey showed that the age of first drinking experience was 13 years. Whereas overall report of alcohol consumption among teenagers (13-18 years) trended downwards over the period of 2005 to 2011 from 54.1% to 51%, alcohol consumption is still high among older teenagers aged 16 (57.2%), 17 (67.15) and 18 (75.5%)[8].

Parental attitudes and peer influence have been cited as two of the most influential mediating factors of underage drinking. Previous studies have shown parental alcohol use as an important determinant of adolescents' drinking [9]. Parents' consumption patterns, especially the father's, have been found to affect adolescents' drinking habits[10-12]. Recent research however shows that this relationship decreases once other factors are taken into

account[14]. A vast body of research has documented a strong association between friends' and adolescents' alcohol use[13] especially when adolescents had a higher level of peer pressure[15,16].

In South Korea, previous studies have examined the effects that parents' and friends' consumption patterns have on adolescents in South Korea, but none has provided an overview of the impact of social supply on underage drinking. The aim of the present study was, thus, to examine the social supply among Korean high schoolers, the characteristics of primary suppliers, places where alcohol is usually supplied and the odds of hazardous drinking (report of drinking more than four drinks on a usual drinking occasion in the last six months).

II. Methods

A. Survey Instrument

The survey instrument used for this study was the International Alcohol Control (IAC) study questionnaire. The IAC study is a collaborative cohort study across seven countries. It measures the impacts of key national level alcohol policies. Alcohol consumption measures included in this instrument include availability, pricing and taxation, social supply, marketing and drink driving interventions. For purposes of the present study, variables under social supply were assessed [17].

B. Sampling

Of the 2617 individuals who participated in the IAC study (June-July 2012), 438 (17%) were high school students aged 16-18. A total of twenty-one high schools (urban- seven, suburban-eight and rural-six) were randomly selected from geographically diverse regions of Korea. 247 (56.4%) high schoolers self-identified as drinkers. This number constituted the sample

for the present study. Institutional Review Board (IRB) permission was obtained and approved for this study (SYUIRB 2011-018). Participants in the study received a coded packet that contained the questionnaire and a copy of the informed consent which delineated the proposed use of the data, benefits and risks of participating in the study as well as confidentiality rights. Completion of the questionnaire took approximately 30 minutes. All participants completed the questionnaire at the time given and received a gift.

Variables

i. Social supplier

This variable referred to persons who could at one time or the other (in the last six months) provide alcohol to teenagers. The present study considers fathers, mothers, siblings, other relatives, friends, partner (boyfriends and girlfriends), fellow schoolmates and strangers as the social suppliers of adolescents.

ii. Frequency of secondary supply

The frequency with which alcohol was socially supplied within the last six months was analyzed using time-periods which included weekly (once or more during the week), once a month, more than once monthly (several times in a month) and at least once in the last six months.

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Residence		
Urban (n=240)	145(60.4)	95(39.6)
Suburban (n=152)	73(48)	79(52)
Rural (n=45)	28(62.2)	17(37.8)

Table 2: Frequency (percentages) of supply of alcohol in the last 6 months to High schoolers

	Frequency (%)			
	Weekly	Monthly	More than monthly	At least once
Total	6.1	4.8	43.9	43.9
Gender				
Male(n=131)	8.4	5.3	40.5	45.8
Female(n=97)	3.1	4.1	48.5	44.3
Age				
16 (n=62)	3.2	4.8	45.2	46.8
17 (n=74)	8.1	2.7	45.9	43.2
18 (n=92)	6.5	6.5	41.3	45.7
Residence				
Urban (n=240)	7.5	6.0	38.1	48.5
Suburban (n=152)	4.3	4.3	49.3	42
Rural (n=45)	4.0	-	60.0	36.0

Table 3: Supplier of Alcohol in the last 6 months

	Supplier of Alcohol (% in the last 6 months)[a]							
	Father	Mother	Siblings	Other Relatives	Friends	Partner	Schoolmate	Stranger
Total	30.4	21.1	6.1	10.1	25.5	1.6	6.1	0.8
Gender								
Male	29.7	**17.2**	5.5	11	**31.7**	1.4	7.6	0.7
Female	31.4	**26.5**	6.9	8.8	**16.7**	2	3.9	1.0
Age								
16	32.4	22.1	4.4	8.8	29.4	1.5	4.4	1.5
17	25.6	22	6.1	11	24.4	2.4	6.1	-
18	33	19.6	7.2	10.3	23.7	1	7.2	1
Residence								
Urban	29.7	20.7	6.2	11.7	25.5	2.1	4.8	-
Suburban	28.8	23.3	6.8	8.2	26	1.4	8.2	2.7
Rural	39.3	17.9	3.6	7.1	25	-	7.1	-

[a] *Percentages do not add up to 100% as respondents selected more than one source.*
Bold figures show chi-square significance at p<.05

Table 4: Supply of Alcohol at Place(x) in the last 6 months

	Places where alcohol is usually supplied (% in the last 6 months)[a]							
	Own Home	Other Home	Pubs	Other Clubs	Restaurants	Meetings	Special Events	Other Places
Total	56.3	53.4	38.1	17	3.2	37.2	45.4	25.8
Gender								
Male	56.3	**60.7**	**46.5**	18.4	3.5	37.1	47.3	**36.4**
Female	64.9	**48**	**28**	16.1	3	40	46.1	**10.9**
Age								
16	59.1	60.3	33.8	24.7	7.5	40.3	**70.1**	32.3
17	60	58.2	37	9.8	-	33.3	**37.1**	18.1
18	60.5	49.5	44.1	18.4	3.3	41.3	**38.1**	28.7
Residence								
Urban	63.7	53.2	42.9	18.7	4.2	39.7	45	**25.1**
Suburban	55.1	59.2	37	16.5	2.8	39.4	45.4	**34.5**
Rural	55.6	59.3	21.4	7.1	-	29.6	38.6	**7.1**

[a] *Percentages do not add up to 100% as respondents selected more than one source. Bold figures show chi-square significance at p<.05*

Table 5: Odds Ratio of Risky drinking on a usual drinking occasion in the last six months

Covariate	Odds Ratio (95% C.1)	P-value
Gender		
Male	7.38(4.05 to 13.46)	.000
Female	1	
Age		
16	1.26(.59 to 2.71)	.555
17	.84(.40 to 1.74)	.637
18	1	
Supplier		
Parent	.92(.49 to 1.74)	.804
Friend	5.67(2.54 to12.68)	.000
Other	1.26(.49 to 1.74)	.557
Stranger	1	
Place		
Own Home	1	
Another home	1.13(.637 to 2.02)	.669
Pubs/Clubs	1.99(1.09 to 3.65)	.025
Special Events	1.78(.80 to 3.96)	.159

References

1. World Health Organization. *Addressing the harmful use of alcohol: a guide to developing effective alcohol legislation.* Geneva: 2011.
2. Tapert SF, Caldwell L, Burke C. Alcohol and the adolescent brain: Human studies. *Alcohol Research and Health* 2004; 28: 205−212.
3. Seong JC, Hong JJ, Kim JK, Suh TW et al. Prevalence of suicide behaviors (Suicidal ideation and suicide attempt) and risk factors of suicide attempts in Junior and High School Adolescents. *J Korean Neuropsychiatr Assoc* 2002; Vol 41: No 6
4. Bonomo YA, Bowes G, Coffey C et al. Adverse outcomes of alcohol use in adolescents. *Addiction* 2001; 96: 1485-1485.
5. Jones BT, Corbin W, Fromme K. A review of expectancy theory and alcohol consumption. *Addiction* 2001; 96(1): 427-436.
6. World Health Organization. *Global status report on alcohol and health*. Geneva: 2011.
7. Faden VB. Trends in initiation of alcohol use in the United States 1975 to 2003. Alcohol Clin Exp Res. 2006;30(6):1011–1022
8. Li C, Pentz MA, Chou CP. Parental substance use as a modifier of adolescent substance use risk. *Addiction* 2002; 97: 1537-1550
9. Korea National Legislation Information Center (http://www.law.go.kr). Youth Protection Law. 2011 [http://www.law.go.kr/lsInfoP.do?lsiSeq=121990&efYd=20120916#0000 accessed 2013 may 9]
10. Kim SG, Kim SK. The determinants influencing adolescents' alcohol use. *Korean journal of youth studies* 2009; 16(9): 105-124.

11. Chartier KG, Hesselbrock MN, Hesselbrock VM. Development and vulnerability factors in adolescent alcohol use. *Child Adolesc Psychiatr Clin N Am*. 2010; 19(3):493-504.

12. Cranford JA, Zucker RA, Jester JM, Puttler LI, Fitzgerald HE. Parental alcohol involvement and adolescent alcohol expectancies predict alcohol involvement in male adolescents. *Psychol Addict Behav.* 2010; 24(3):386-96.

13. Hwang SH. Parental and peer factors influence on adolescents' drinking and smoking behaviors. *Health and social-science* 2010; 27:81-103.

14. Warner L, White H. Longitudinal effects of age at onset and first drinking situation on problem drinking. *Substance use and misuse*. 2003; 38 (14): 1983-2016

15. Andrews JA, Tildesley E, Hops H, Li F. The influence of peers on young adult substance use. *Health Psychology* 2002; 21: 349−357.

16. Kim GE, Cho NA. The effects of drinking environment on the degree of youth drinking-moderating effects on the interaction of parents and adolescents. *Korean Journal of Youth Studies* 2012; 19(11): 45-68.

17. International Alcohol Control Study [www.iacstudy.org/index.php accessed 16 August 2013]

18. Hwang SH, Akers RL. Substance use by Korean adolescents-A cross-cultural test of social learning, social bonding, and self-control theories 2003 in Roland L. Alkers and Gary F. Jensen. (eds) Social learning theory and the explanation of crime: *A Guide for the New Century Advances in Criminological Theory.* 11:39-64.

19. Williams TP, Lillis RP, Changes in alcohol consumption by 18-year-olds following an increase in New York state's purchase age to 19.*J Stud Alcohol* 1986; 47: 290-296

20. Grant B. Prevalence and correlates of alcohol use and DSM-IV alcohol dependence in the United States: results of the National Longitudinal Alcohol Epidemiologic Survey. *Journal of Studies on Alcohol*, 1997; 58: 464-473.

21. Hingson RW, Edwards EM, Heeren T, Rosenbloom D. Age of drinking onset and injuries, motor vehicle crashes and physical fights after drinking and when not drinking. *Alcoholism: Clinical and Experimental Research* 2009; 33: 783-790.

22. Kypri K, Dean JI, Stojanovski E. Parent attitudes on the supply of alcohol to minors. *Drug Education Alcohol Rev*, 2007; 26:41-7.

23. Wells JE, Horwood LJ, Fergusson DM. Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood. *Addiction* 2004; 99: 1529-41.

24. Foley KL, Altman D, Durant RH, Wolfson M. Adults' approval and adolescents' alcohol use. *Journal of Adolescent health* 2004; Vol 35,345:e17-345.e26

25. Harburg E, Davis DR, Caplan R. Parent and offspring alcohol use, imitative and aversive transmission. *J Stud Alcohol* 1982; 43:497–516

26. Baumrind D. The influence of parenting style on adolescent competence and substance use. *J Early Adolesc* 1991: 11:56–95

27. Ary DV, Tildesley E, Hops H, Andrews J. The influence of parent, sibling, and peer modeling and attitudes on adolescent alcohol use. *Int J Addict* 1993; 28:853–880

28. Nash SG, McQueen A, Bray JH. Pathways to adolescent alcohol use: family environment, peer influence, and parental expectations. *Journal of Adolescent Health* 2005; 37(1)19–28.

29. Chun S. A comparative study on the alcohol laws and policies between USA and Korea. *J Med Law* 2003; 11(1) 21-34.

30. Prevention Research Center. *Preventing Underage Alcohol Access: Essential Elements for Policy, Deterrence and Public Support. Prevention Research Center* 2004.

31. Komro KA, Toomey T L. Strategies to Prevent Underage Drinking. *Alcohol Research & Health* 2002; 26: 5-14.

	Item No	Recommendation with Page No to Indicate Compliance
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract—*see page 3 of main document*
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found—*see Title page*
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported—*see page 1 of main document lines 2-46*
Objectives	3	State specific objectives, including any prespecified hypotheses—*see page 2 of main document lines 13-22*
Methods		
Study design	4	Present key elements of study design early in the paper—*see line 13 of abstract, page 2 lines 48-58 and page 3 line 4 of the main document*
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection—*see page 2 lines 48-58 and page 3 line 4 of the main document*
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of Participants—*see page 2 of main document in sampling section*
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable—*see page 3 lines 4-57 and page 4 lines 4-13 of main document*
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—*see page 2 lines 29-43 of main document*
Bias	9	Describe any efforts to address potential sources of bias—*N/A*
Study size	10	Explain how the study size was arrived at-- *see page 2 lines 48-58 and page 3 line 4 of the main document*
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why—*N/A*
Statistical methods	12	*(a)*Describe all statistical methods, including those used to control for confounding—*See page 4 lines25-35 of main document*
		(*b*) Describe any methods used to examine subgroups and interactions—*N/A*
		(*c*) Explain how missing data were addressed—*N/A*
		(*d*) If applicable, describe analytical methods taking account of sampling strategy—*N/A*
		(*e*) Describe any sensitivity analyses—*N/A*
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—*see page page 4 lines 42 to 46 of main document*
		(b) Give reasons for non-participation at each stage—*N/A*
		(c) Consider use of a flow diagram—*N/A*
Descriptive data	14	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders—s*ee Tables 1- 4 on pages 9-11 of main document*
		(b) Indicate number of participants with missing data for each variable of interest—*N/A*
Outcome data	15	Report numbers of outcome events or summary measures—*N/A*
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—*N/A*
		(*b*) Report category boundaries when continuous variables were categorized—*N/A*

		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period—*N/A*
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses—*see Table 5 on page 12 of main document*
Discussion		
Key results	18	Summarise key results with reference to study objectives—*see page 6 lines 16-25 of main document*
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—*see page 8 lines 22-27 of main document*
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence—*see page 6 lines 27-57 and page 7 lines 4 -49*
Generalisability	21	Discuss the generalisability (external validity) of the study results—*see page 8 lines 27-36*
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—*see page 13 of main document*

Social Supply of Alcohol to Korean Teenagers- A cross-sectional International Alcohol Control Study

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Social Supply of Alcohol to Korean High School Students: A cross-sectional International Alcohol Control Study

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ABSTRACT

Purpose: Underage drinking is strictly prohibited by law, nevertheless, adolescents report having access through social supply from family, friends and other members of the society. The aim of this study was to determine the primary suppliers of alcohol to Korean teenagers.

Design: Cross-sectional study

Setting: Data were collected from 21 High schools in geographically diverse regions in South Korea from June to July 2012 as part of the International Alcohol Control Study.

Participants: Data were analysed from 247 high schoolers aged 16 to 18 years old as part of the International Alcohol Control Study.

Primary and secondary outcome measures: Social supply to high school students

Results: More than 56% of high schoolers who participated in the International Alcohol Control Survey had been supplied alcohol at least once. Of this number, approximately 59% were males. Parents (especially fathers) and friends were the main suppliers with friends contributing greater volumes (205 grams) of alcohol. Of the number of students provided by mothers, 52% of them were females whilst 73% of respondents provided by friends were males. The most significant place for alcohol supply was at special events. Males were at higher odds for risky drinking.

Conclusion: These results support previous findings about the role of parents and friends in underage drinking in South Korean high school drinkers.

ARTICLE SUMMARY

Article Focus

- Alcohol remains accessible to Korean high schoolers through social supply from parents and friends.

Key messages

- Among Korean high school drinkers, fathers, friends and mothers were the lead suppliers of alcoholic beverages. Whilst mothers were the main providers to teenage girls, friends contributed the most alcohol with 205grams of absolute alcohol.
- Prohibitive laws of underage drinking in South Korea can be extended and strictly monitored to cover supply of alcohol in private premises to curb the increasing rates of underage alcohol consumption.

Strengths and Limitations

- Limited by sample size and its cross-sectional nature, this study is however strengthened by the diversity of location of participants.
- The use of the International Control Study as a survey instrument lends support to the credibility of this survey.

I. Introduction

Adolescent alcohol consumption is a source of increasing concern in a number of countries[1]. This concern stems from the fact that underage drinking is associated with a number of negative health and social consequences such as impaired brain development and poor academic performance[2] loss of memory, high risk sexual behaviour, addiction, suicidal ideation, risky behaviours, alcohol related injury and deaths[3-4]. The reasons adolescents drink may differ in relation to culture and the circumstances in which they find themselves. Teenagers report that alcohol is an important ingredient in social interactions, permitting the drinker to lower their inhibitions while feeling more relaxed in social situations, fostering courage and increasing a sense of power, reducing worry and tension[5.] Although adolescents drink less often than adults, reports indicate that adolescents usually drink more when they do by risky drinking[6].

Although most countries have a set legal drinking age, underage drinking is still on the rise: Of the 73 countries which responded to the 2008 WHO Global Survey on Alcohol and Health, 71% reported an increase during the 5 years prior to the survey (WHO, 2011) [7]. The first use of alcohol (defined as drinking a whole drink) typically occurs in early adolescence (at 13–14 years of age)[8]. In South Korea where the legal drinking age is nineteen (19) years, statistics from the 2011 Korean Adolescent Health Behavior Online Survey showed that the age of first drinking experience was 13 years. Whereas overall report of alcohol consumption among teenagers (13-18 years) trended downwards over the period of 2005 to 2011 from 54.1% to 51%, alcohol consumption is still high among older teenagers aged 16 (57.2%), 17 (67.15) and 18 (75.5%)[9].

Parental attitudes and peer influence have been cited as two of the most influential mediating factors of underage drinking. Previous studies have shown parental alcohol use as an important determinant of adolescents' drinking [10]**.** Parents' consumption patterns,

especially the father's, have been found to affect adolescents' drinking habits[11-13]. Recent research however shows that this relationship decreases once other factors are taken into account[14.] A vast body of research has documented a strong association between friends' and adolescents' alcohol use[15] especially when adolescents had a higher level of peer pressure[16,17].

In South Korea, previous studies have examined the effects that parents' and friends' consumption patterns have on adolescents in South Korea, but none has provided an overview of the impact of social supply on underage drinking. The aim of the present study was, thus, to examine the social supply among Korean high schoolers, the characteristics of primary suppliers, places where alcohol is usually supplied and the odds of risky drinking (report of drinking more than four drinks on a usual drinking occasion in the last six months).

II. Methods

A. Survey Instrument

The survey instrument used for this study was the International Alcohol Control (IAC) study questionnaire. The IAC study is a collaborative cohort study across seven countries. It measures the impacts of key national level alcohol policies. Alcohol consumption measures included in this instrument include availability, pricing and taxation, social supply, marketing and drink driving interventions. For purposes of the present study, variables under social supply were assessed [18].

B. Sampling

Of the 2617 individuals who participated in the IAC study (June-July 2012), 438 (16.7%) were high school students aged 16-18. A total of twenty-one high schools (urban- seven, suburban-eight and rural-six) were randomly selected from geographically diverse regions of

Korea. 247 (56.4%) high schoolers self-identified as drinkers. This number constituted the sample for the present study. Institutional Review Board (IRB) permission was obtained and approved for this study (SYUIRB 2011-018). Participants in the study received a coded packet that contained the questionnaire and a copy of the informed consent which delineated the proposed use of the data, benefits and risks of participating in the study as well as confidentiality rights. Completion of the questionnaire took approximately 30 minutes. All participants completed the questionnaire at the time given and received a gift.

Variables

i. Social supplier

This variable referred to persons who could at one time or the other (in the last six months) provide alcohol to teenagers. The present study considers fathers, mothers, siblings, other relatives, friends, partner (boyfriends and girlfriends), fellow schoolmates and strangers as the social suppliers of adolescents.

ii. Frequency of secondary supply

The frequency with which alcohol was socially supplied within the last six months was analyzed using time-periods which included weekly (once or more during the week), once a month, more than once monthly (several times in a month) and at least once in the last six months.

iii. Absolute Alcohol Volume

The absolute alcohol volume was calculated for all brands under study. This was to determine the standard amount of pure ethanol (12g of ethanol) per glass and estimate the total quantity (in grams) of alcohol provided to teenagers by social suppliers on a usual drinking occasion. Volume of absolute alcohol intake (in millilitres) was computed as (% pure alcohol) x (drink size) x (number of drinks consumed) for each beverage consumed on

any usual occasion in the last six months. The sum of the various beverage types determined the total absolute alcohol. The brands included beer, home brewed beer, low alcohol beer, wine, spirits, mixed cocktail, soju, takju, yakju and Korean traditional wine.

iv. Place

Places cited in the analysis included own home, another home, pubs, other clubs, restaurants, workplace (part-time jobs), special events and other places.

v. Risky Drinking

Risky drinking in this analysis refers to the consumption of more than four standard drinks of alcohol on a single occasion for both male and female high-schoolers.

C. Methods of Data Analysis

Using the SPSS vl8.0, chi-squared and Fisher's Exact tests were used to determine differences between demographic variables and supply of alcohol variables. A pvalue <.05 was accepted as statistically significant. Logistic regression analysis was used to determine the associations between risky drinking (drinking more than four drinks on a usual occasion), demographic and social supply variables.

Results

Of the total sample of 2617 Korean drinkers and non-drinkers recruited for the International Alcohol Control Study in 2012, almost 16.7% (438) were high-school students aged 16 to 18 years. Of the 438 students, 247, representing 56.4 % self-identified as drinkers. More than half of all age groups reported ever drinking alcohol. With the exception of suburban respondents, more than 60% of teenagers from urban and rural communities had consumed alcohol at least once in their lifetime. Characteristics of the sample are shown in table 1.

Generally, 125 respondents representing more than half of all respondents (54.8%) had been provided alcohol more than once in the last six months. More males (13.7%) had been supplied alcohol more frequently than females (7.2%) in the last six months. Older teenagers aged 18 (13%) received alcohol more frequently compared with their juniors. Urban dwellers reported more frequent supply of alcohol in the last six months compared with suburban and rural dwellers. (see Table 2)

Table 3 examines the supplier of alcohol to high school students in the last six months. Stratified by gender, statistical significance at $p < .05$ was found when mothers and friends were suppliers. Mothers were the main supplier to female respondents whilst friends supplied alcohol to male students. With increase in age, supply shifted from mothers and friends to siblings, other relatives and schoolmates. Table 3

Self-report of places where alcohol was usually provided in the last six months were generally higher in own home, others' home and at special events. Significant differences were reported between gender at other home, pubs and other places. At $p=.035$, 60.7% and 48% of male and female respondents received alcohol at other homes. 46.5% male respondents and 28% of females received alcohol at pubs ($p=.003$). Supply at special events was significantly different between the different age groups with a greater percentage of 16 year olds. Among the different places of residence, significant differences were found for supply of alcohol at other places. (see Table 4)

Table 5 examines the association between risky drinking, demographic and supplier variables. On a usual drinking occasion, boys were seven times more likely to report risky drinking at statistically significant levels ($p<.001$). The odds of risky drinking was significantly greater for high schoolers provided alcohol by friends (OR 5.67; 95% CI 2.54 to

12.68) compared to other suppliers. Those who drank in pubs had higher odds of risky drinking (OR 1.99; CI 1.09 to 3.65).

IV. Discussion

Despite the existence and enforcement of prohibition laws against purchasing of alcohol by minors (<19 years), alcohol remains accessible to teenagers through alternate channels[19]. The focus of this study was to examine the various sources of alcohol to Korean high school drinkers. Major findings include (a) Among high school drinkers, an adult (person aged 19 and above) was the most common source of alcohol, (b) whilst mothers were the main providers to females, friends supplied more alcohol (in greater volumes) than parents and (c) high schoolers who consumed alcohol in pubs and clubs were more likely to engage in risky drinking.

A significant factor contributing to underage drinking is social supply of alcohol to teenagers. One of the mechanisms by which this supply may influence alcohol-related problems is by decreasing the age of onset of drinking[20, 21]. Korean high school drinkers reported obtaining alcohol from multiple sources including parents, siblings, other relatives, friends, fellow students, partners and even strangers. Of these sources, persons older than 19 years were the main sources. Adults, especially parents have an important role in the socialization of their children on the issue of alcohol use. Contrary to medical reports of the problems associated with early initiation of drinking, some parents are of the view that providing alcohol to their children teaches responsible drinking and controls the quantity consumed[22, 23]. Results from our analysis showed that South Korean parents, especially fathers were more likely to supply alcohol to their children than mothers (30.4% vs. 21.1% of adolescents).

The assumption is that when parents provide alcohol to their children, it may serve a protective effect for alcohol abuse. However, conflicting knowledge exists regarding the protective effect of parental approval of underage alcohol consumption. Whilst some studies indicate that parents who provide alcohol to their children are more likely to have children who never abuse alcohol[24], others show that consuming alcohol at home leads to increased drinking among teenagers[25]. Our research supported the former assumption that teenagers supplied alcohol by their parents were more likely to consume lower amounts of absolute alcohol (122grams and 115grams by mothers and fathers respectively compared to friends) and less likely to be involved in risky drinking (OR 0.92; CI 0.49 to 1.74). Research has proven that providing alcohol to an adolescent indicates approval of underage alcohol use. This disregard of underage drinking may however lead to future substance abuse[26]. Parental approval of underage drinking is however rife as 13% of American youth, aged 11 to 17 years, have drunk alcohol with their families[27, 28]. Our results showed that the volume of alcohol provided by friends exceeded that of parents (205grams of absolute alcohol). At the same time, teenagers who were supplied alcohol by friends (OR 5.67; CI 2.54 to 12.68) and those who drank at locations other than their own homes i.e. at pubs (OR 1.99; CI 1.09 to 3.65) were at higher odds of risky drinking. We speculate that high schoolers may have had access to alcohol at pubs, special events and other places without age identification. South Korean laws that require suppliers to ascertain the age of a youth (under the age of 19) before supply of any harmful drugs need to be enforced to decrease supply of alcohol to teenagers at pubs, special events and other places. Although the influence of peers on alcohol use is of greater magnitude, contradictory research indicates that a positive family environment could attenuate the negative impact of peers on adolescent drinking [29].

The Food Sanitation Act of South Korea prohibits the act of allowing minors access to licensed liquor establishments and providing any alcoholic beverages to children[30]. These

prohibitive laws against underage drinking do not, however, explicitly cover supply in private and off licensed premises. The United States, on the other hand, has introduced initiatives aimed at restricting social sources of supply, including laws against adult provision of alcohol to minors and the creation of enforcement mechanisms that allow police to enter private premises where underage drinking is happening[31]. There have also been efforts to register beer kegs so that police can trace the adult purchaser of alcohol provided to underage drinkers [32]. Prohibitive laws in South Korea can be extended to cover, not just purchase but supply of alcohol at all places including private premises.

Results from this research will pave the way in Korea for a more detailed exploration of all factors associated with the social supply of alcohol to teenagers as well as the long-term effects of this supply on adolescent development. This study, limited by its cross sectional design is however strengthened by the use of the International Control Study questionnaire as an assessment tool. Generalizations of the whole population of South Korean teenagers cannot be made as the sample of this survey was limited by age and total sample size. However, the diversity of locations used is advantageous as results for drinking rates (33.1% males: 23.1% females) are similar to information from the Ministry of Health and Welfare showing prevalence of underage drinking (26.1% males: 22.6% females). Future studies of a larger sample (across a larger and diverse age grouping) can be used to assess the full extent of social supply in South Korean teenage drinkers. Studies to determine the relationship between social supply and outlet density would be an interesting topic for future research.

Table 1: Characteristics of sample N (%)

	Drinker	Non-Drinker
	247(56.4)	191(43.6)
Gender		
Male (n=233)	145(62.2)	88(37.8)
Female (n=205)	102(49.8)	103(50.2)
Age		
16 (n=113)	68(60.2)	45(39.8)
17 (n=146)	82(56.2)	64(43.8)
18 (n=179)	97(54.2)	82(45.8)
Residence		
Urban (n=240)	145(60.4)	95(39.6)
Suburban (n=152)	73(48)	79(52)
Rural (n=45)	28(62.2)	17(37.8)

Table 2: Frequency (percentages) of supply of alcohol in the last 6 months to High schoolers

N (%)

	Frequency (%)			
	Weekly	Monthly	More than monthly	At least once
Total	14(6.1)	11(4.8)	100(43.9)	103(45.2)
Gender				
Male(n=131)	11 (8.4)	7(5.3)	53(40.5)	60(45.8)
Female(n=97)	3(3.1)	4(4.1)	47(48.5)	43(44.3)
Age				
16 (n=62)	2(3.2)	3(4.8)	28(45.2)	29(46.8)
17 (n=74)	6(8.1)	2(2.7)	34(45.9)	32(43.2)
18 (n=92)	6(6.5)	6(6.5)	38 (41.3)	42(45.7)
Residence				
Urban (n=134)	10(7.5)	8(6.0)	51(38.1)	65(48.5)
Suburban (n=69)	3(4.3)	3(4.3)	34(49.3)	29(42)
Rural (n=25)	1 (4.0)	-	15(60.0)	9(36.0)

Table 3: Supplier of Alcohol in the last 6 months (N)%

Supplier of Alcohol (% in the last 6 months)[a]							
Father	Mother	Siblings	Other Relatives	Friends	Partner	Schoolmate	Stranger

Total	(75)30.4	(52)21.1	(15)6.1	(25)10.1	(63)25.5	(4)1.6	(15)6.1	(2)0.8
Gender								
Male(n=145)	(43)29.7	(25)**17.2**	(8)5.5	(16)11	(46)**31.7**	(2)1.4	(11)7.6	(1)0.7
Female(n=102)	(32)31.4	(27)**26.5**	(7)6.9	(9)8.8	(17)**16.7**	(2)2	(4)3.9	(1)1.0
Age								
16(n=68)	(22)32.4	(15)22.1	(3)4.4	(6)8.8	(20)29.4	(1)1.5	(3)4.4	(1)1.5
17(n=82)	(21)25.6	(18)22	(5)6.1	(9)11	(20)24.4	(2)2.4	(5)6.1	-
18(n=97)	(32)33	(19)19.6	(7)7.2	(10)10.3	(23)23.7	(1)1	(7)7.2	(1)1
Residence								
Urban(n=145)	(43)29.7	(30)20.7	(9)6.2	(17)11.7	(37)25.5	(3)2.1	(7)4.8	-
Suburban(n=73)	(21)28.8	(17)23.3	(5)6.8	(6)8.2	(19)26	(1)1.4	(6)8.2	(2)2.7
Rural(n=28)	(11)39.3	(5)17.9	(1)3.6	(2)7.1	(7)25	-	(2)7.1	-

[a] *Percentages of positive responses do not add up to 100% as respondents selected more than one source. Bold figures show chi-square significance at p<.05*

Table 4: Supply of Alcohol at Place(x) in the last 6 months (N) %

	Places where alcohol is usually supplied (% in the last 6 months)[a]							
	Own Home	Other Home	Pubs	Other Clubs	Restaurants	Meetings	Special Events	Other Places

Total	(139)56.3	(132)53.4	(94)38.1	(42)17	(8)3.2	(39)37.2	(112)46.6	(62)25.1
Gender								
Male(n=145)	(76)56.3	**(85)60.7**	**(66)46.5**	(26)18.4	(5)3.5	(52)37.1	(66)47.3	**(41)36.4**
Female(n=102)	(63)64.9	**(47)48**	**(28)28**	(16)16.1	(3)3	(40)40	(46)46.1	**(11)10.9**
Age								
16(n=68)	(39)59.1	(41)60.3	(23)33.8	(17)24.5	(5)7.5	(27)40.3	**(47)70.1**	(22)32.4
17(n=82)	(48)60	(46)58.2	(30)37	(8)9.8	-	(27)33.3	**(30)37.1**	(14)18.1
18(n=97)	(52)60.5	(45)49.5	(41)44.1	(17)18.4	(3)3.3	(38)41.3	**(35)38.1**	(26)28.7
Residence								
Urban(n=145)	(86)63.7	(74)53.2	(60)42.9	(26)18.7	(6)4.2	(56)39.7	(62)45	**(35)25.1**
Suburban(n=73)	(38)55.1	(42)59.2	(27)37	(12)16.5	(2)2.8	(28)39.4	(33)45.4	**(25)34.5**
Rural(n=28)	(15)55.6	(16)59.3	(6)21.4	(2)7.1	-	(8)29.6	(17)38.6	**(2)7.1**

[a] *Percentages of positive responses do not add up to 100% as respondents selected more than one source. Bold figures show chi-square significance at p<.05*

Table 5: Odds Ratio of Risky drinking on a usual drinking occasion in the last six months

Covariate	%(S.E)	Odds Ratio (95% C.1)	P-value
Gender			
Male	74.36(.31)	7.38(4.05 to 13.46)	.000
Female	25.63(.31)	1	
Age			
16	26.86(.39)	1.26(.59 to 2.71)	.555
17	34.38(.37)	.84(.40 to 1.74)	.637
18	38.75(.31)	1	
Supplier			
Parent	32.5(.32)	.92(.49 to 1.74)	.804
Friend	47.5(.37)	5.67(2.54 to12.68)	.000
Other	18.75(.39)	1.26(.49 to 1.74)	.557
Stranger	1.25(.21)	1	
Place			
Own Home	22.5(.30)	1	
Another home	18.75(.29)	1.13(.637 to 2.02)	.669
Pubs/Clubs	43.13(.31)	1.99(1.09 to 3.65)	.025
Special Events	15.63(.41)	1.78(.80 to 3.96)	.159

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References

1. World Health Organization. *Addressing the harmful use of alcohol: a guide to developing effective alcohol legislation.* Geneva: 2011.
2. Tapert SF, Caldwell L, Burke C. Alcohol and the adolescent brain: Human studies. *Alcohol Research and Health* 2004; 28: 205−212.
3. Seong JC, Hong JJ, Kim JK, Suh TW et al. Prevalence of suicide behaviors (Suicidal ideation and suicide attempt) and risk factors of suicide attempts in Junior and High School Adolescents. *J Korean Neuropsychiatr Assoc* 2002; Vol 41: No 6
4. Bonomo YA, Bowes G, Coffey C et al. Adverse outcomes of alcohol use in adolescents. *Addiction* 2001; 96: 1485-1485.
5. Jones BT, Corbin W, Fromme K. A review of expectancy theory and alcohol consumption. *Addiction* 2001; 96(1): 427-436.
6. National Institute on Alcohol Abuse and Alcoholism. Underage drinking (2013). Retrieved from http://www.pubs.niaaa.nih.gov/publications/UnderageDrinking/Underage_Fact.pdf
7. World Health Organization. *Global status report on alcohol and health*. Geneva: 2011.
8. Faden VB. Trends in initiation of alcohol use in the United States 1975 to 2003. Alcohol Clin Exp Res. 2006;30(6):1011–1022
9. Li C, Pentz MA, Chou CP. Parental substance use as a modifier of adolescent substance use risk. *Addiction* 2002; 97: 1537-1550
10. Korea National Legislation Information Center (http://www.law.go.kr). Youth Protection Law. 2011

[http://www.law.go.kr/lsInfoP.do?lsiSeq=121990&efYd=20120916#0000 accessed 2013 may 9]

11. Kim SG, Kim SK. The determinants influencing adolescents' alcohol use. *Korean journal of youth studies* 2009; 16(9): 105-124.
12. Chartier KG, Hesselbrock MN, Hesselbrock VM. Development and vulnerability factors in adolescent alcohol use. *Child Adolesc Psychiatr Clin N Am*. 2010; 19(3):493-504.
13. Cranford JA, Zucker RA, Jester JM, Puttler LI, Fitzgerald HE. Parental alcohol involvement and adolescent alcohol expectancies predict alcohol involvement in male adolescents. *Psychol Addict Behav.* 2010; 24(3):386-96.
14. Hwang SH. Parental and peer factors influence on adolescents' drinking and smoking behaviors. *Health and social-science* 2010; 27:81-103.
15. Warner L, White H. Longitudinal effects of age at onset and first drinking situation on problem drinking. *Substance use and misuse*. 2003; 38 (14): 1983-2016
16. Andrews JA, Tildesley E, Hops H, Li F. The influence of peers on young adult substance use. *Health Psychology* 2002; 21: 349−357.
17. Kim GE, Cho NA. The effects of drinking environment on the degree of youth drinking-moderating effects on the interaction of parents and adolescents. *Korean Journal of Youth Studies* 2012; 19(11): 45-68.
18. Casswell S, Meier P, MacKintosh AM., Brown A, Hastings G, Thamarangsi T, Chaiyasong S, Chun SS, Huckle T, Wall M, You RQ. The International Alcohol Control (IAC) Study—Evaluating the Impact of Alcohol Policies. *Alcoholism: Clinical And Experimental Research* 2012; 36(8).
19. Hwang SH, Akers RL. Substance use by Korean adolescents-A cross-cultural test of social learning, social bonding, and self-control theories 2003 in Roland L. Alkers and

Gary F. Jensen. (eds) Social learning theory and the explanation of crime: *A Guide for the New Century Advances in Criminological Theory.* 11:39-64.

20. Williams TP, Lillis RP, Changes in alcohol consumption by 18-year-olds following an increase in New York state's purchase age to 19.*J Stud Alcohol* 1986; 47: 290-296
21. Grant B. Prevalence and correlates of alcohol use and DSM-IV alcohol dependence in the United States: results of the National Longitudinal Alcohol Epidemiologic Survey. *Journal of Studies on Alcohol*, 1997; 58: 464-473.
22. Hingson RW, Edwards EM, Heeren T, Rosenbloom D. Age of drinking onset and injuries, motor vehicle crashes and physical fights after drinking and when not drinking. *Alcoholism: Clinical and Experimental Research* 2009; 33: 783-790.
23. Kypri K, Dean JI, Stojanovski E. Parent attitudes on the supply of alcohol to minors. *Drug Education Alcohol Rev*, 2007; 26:41-7.
24. Wells JE, Horwood LJ, Fergusson DM. Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood. *Addiction* 2004; 99: 1529-41.
25. Foley KL, Altman D, Durant RH, Wolfson M. Adults' approval and adolescents' alcohol use. *Journal of Adolescent health* 2004; Vol 35,345:e17-345.e26
26. Harburg E, Davis DR, Caplan R. Parent and offspring alcohol use, imitative and aversive transmission. *J Stud Alcohol* 1982; 43:497–516
27. Baumrind D. The influence of parenting style on adolescent competence and substance use. *J Early Adolesc* 1991: 11:56–95
28. Ary DV, Tildesley E, Hops H, Andrews J. The influence of parent, sibling, and peer modeling and attitudes on adolescent alcohol use. *Int J Addict* 1993; 28:853–880

29. Nash SG, McQueen A, Bray JH. Pathways to adolescent alcohol use: family environment, peer influence, and parental expectations. *Journal of Adolescent Health* 2005; 37(1)19–28.

30. Chun S. A comparative study on the alcohol laws and policies between USA and Korea. *J Med Law* 2003; 11(1) 21-34.

31. Prevention Research Center. *Preventing Underage Alcohol Access: Essential Elements for Policy, Deterrence and Public Support. Prevention Research Center* 2004.

32. Komro KA, Toomey T L. Strategies to Prevent Underage Drinking. *Alcohol Research & Health* 2002; 26: 5-14.

Social Supply of Alcohol to Korean High School Students: A cross-sectional International Alcohol Control Study

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ABSTRACT

Purpose: Underage drinking is strictly prohibited by law, nevertheless, adolescents report having access through social supply from family, friends and other members of the society. The aim of this study was to determine the primary suppliers of alcohol to Korean teenagers.

Design: Cross-sectional study

Setting: Data were collected from 21 High schools in geographically diverse regions in South Korea from June to July 2012 as part of the International Alcohol Control Study.

Participants: Data were analysed from 247 high schoolers aged 16 to 18 years old as part of the International Alcohol Control Study.

Primary and secondary outcome measures: Social supply to high school students

Results: More than 56% of high schoolers who participated in the International Alcohol Control Survey had been supplied alcohol at least once. Of this number, approximately 59% were males. Parents (especially fathers) and friends were the main suppliers with friends contributing greater volumes (205 grams) of alcohol. Of the number of students provided by mothers, 52% of them were females whilst 73% of respondents provided by friends were males. The most significant place for alcohol supply was at special events. Males were at higher odds for risky drinking.

Conclusion: These results support previous findings about the role of parents and friends in underage drinking in South Korean high school drinkers.

Keywords: Alcohol, Underage drinking, Social supply, High schoolers

ARTICLE SUMMARY

Article Focus

- Alcohol remains accessible to Korean high schoolers through social supply from parents and friends.

Key messages

- Among Korean high school drinkers, fathers, friends and mothers were the lead suppliers of alcoholic beverages. Whilst mothers were the main providers to teenage girls, friends contributed the most alcohol with 205grams of absolute alcohol.
- Prohibitive laws of underage drinking in South Korea can be extended and strictly monitored to cover supply of alcohol in private premises to curb the increasing rates of underage alcohol consumption.

Strengths and Limitations

- Limited by sample size and its cross-sectional nature, this study is however strengthened by the diversity of location of participants.
- The use of the International Control Study as a survey instrument lends support to the credibility of this survey.

I. Introduction

Adolescent alcohol consumption is a source of increasing concern in a number of countries[1]. This concern stems from the fact that underage drinking is associated with a number of negative health and social consequences such as impaired brain development and poor academic performance[2] loss of memory, high risk sexual behaviour, addiction, suicidal ideation, risky behaviours, alcohol related injury and deaths[3-4]. The reasons adolescents drink may differ in relation to culture and the circumstances in which they find themselves. Teenagers report that alcohol is an important ingredient in social interactions, permitting the drinker to lower their inhibitions while feeling more relaxed in social situations, fostering courage and increasing a sense of power, reducing worry and tension[5.] Although adolescents drink less often than adults, reports indicate that adolescents usually drink more when they do by risky drinking[6].

Although most countries have a set legal drinking age, underage drinking is still on the rise: Of the 73 countries which responded to the 2008 WHO Global Survey on Alcohol and Health, 71% reported an increase during the 5 years prior to the survey (WHO, 2011) [7]. The first use of alcohol (defined as drinking a whole drink) typically occurs in early adolescence (at 13–14 years of age)[8]. In South Korea where the legal drinking age is nineteen (19) years, statistics from the 2011 Korean Adolescent Health Behavior Online Survey showed that the age of first drinking experience was 13 years. Whereas overall report of alcohol consumption among teenagers (13-18 years) trended downwards over the period of 2005 to 2011 from 54.1% to 51%, alcohol consumption is still high among older teenagers aged 16 (57.2%), 17 (67.15) and 18 (75.5%)[9].

Parental attitudes and peer influence have been cited as two of the most influential mediating factors of underage drinking. Previous studies have shown parental alcohol use as

an important determinant of adolescents' drinking [10]. Parents' consumption patterns, especially the father's, have been found to affect adolescents' drinking habits[11-13]. Recent research however shows that this relationship decreases once other factors are taken into account[14]. A vast body of research has documented a strong association between friends' and adolescents' alcohol use[15] especially when adolescents had a higher level of peer pressure[16,17].

In South Korea, previous studies have examined the effects that parents' and friends' consumption patterns have on adolescents in South Korea, but none has provided an overview of the impact of social supply on underage drinking. The aim of the present study was, thus, to examine the social supply among Korean high schoolers, the characteristics of primary suppliers, places where alcohol is usually supplied and the odds of risky drinking (report of drinking more than four drinks on a usual drinking occasion in the last six months).

II. Methods

A. Survey Instrument

The survey instrument used for this study was the International Alcohol Control (IAC) study questionnaire. The IAC study is a collaborative cohort study across seven countries. It measures the impacts of key national level alcohol policies. Alcohol consumption measures included in this instrument include availability, pricing and taxation, social supply, marketing and drink driving interventions. For purposes of the present study, variables under social supply were assessed [18].

B. Sampling

Of the 2617 individuals who participated in the IAC study (June-July 2012), 438 (16.7%) were high school students aged 16-18. A total of twenty-one high schools (urban- seven,

suburban-eight and rural-six) were randomly selected from geographically diverse regions of Korea. 247 (56.4%) high schoolers self-identified as drinkers. This number constituted the sample for the present study. Institutional Review Board (IRB) permission was obtained and approved for this study (SYUIRB 2011-018). Participants in the study received a coded packet that contained the questionnaire and a copy of the informed consent which delineated the proposed use of the data, benefits and risks of participating in the study as well as confidentiality rights. Completion of the questionnaire took approximately 30 minutes. All participants completed the questionnaire at the time given and received a gift.

Variables

i. Social supplier

This variable referred to persons who could at one time or the other (in the last six months) provide alcohol to teenagers. The present study considers fathers, mothers, siblings, other relatives, friends, partner (boyfriends and girlfriends), fellow schoolmates and strangers as the social suppliers of adolescents.

ii. Frequency of secondary supply

The frequency with which alcohol was socially supplied within the last six months was analyzed using time-periods which included weekly (once or more during the week), once a month, more than once monthly (several times in a month) and at least once in the last six months.

iii. Absolute Alcohol Volume

The absolute alcohol volume was calculated for all brands under study. This was to determine the standard amount of pure ethanol (12g of ethanol) per glass and estimate the total quantity (in grams) of alcohol provided to teenagers by social suppliers on a usual drinking occasion. Volume of absolute alcohol intake (in millilitres) was computed as (%

pure alcohol) x (drink size) x (number of drinks consumed) for each beverage consumed on any usual occasion in the last six months. The sum of the various beverage types determined the total absolute alcohol. The brands included beer, home brewed beer, low alcohol beer, wine, spirits, mixed cocktail, soju, takju, yakju and Korean traditional wine.

iv. Place

Places cited in the analysis included own home, another home, pubs, other clubs, restaurants, workplace (part-time jobs), special events and other places.

v. Risky Drinking

Risky drinking in this analysis refers to the consumption of more than four standard drinks of alcohol on a single occasion for both male and female high-schoolers.

C. Methods of Data Analysis

Using the SPSS vl8.0, chi-squared and Fisher's Exact tests were used to determine differences between demographic variables and supply of alcohol variables. A pvalue <.05 was accepted as statistically significant. Logistic regression analysis was used to determine the associations between risky drinking (drinking more than four drinks on a usual occasion), demographic and social supply variables.

Results

Of the total sample of 2617 Korean drinkers and non-drinkers recruited for the International Alcohol Control Study in 2012, almost 16.7% (438) were high-school students aged 16 to 18 years. Of the 438 students, 247, representing 56.4 % self-identified as drinkers. More than half of all age groups reported ever drinking alcohol. With the exception of suburban

respondents, more than 60% of teenagers from urban and rural communities had consumed alcohol at least once in their lifetime. Characteristics of the sample are shown in table 1.

Generally, 125 respondents representing more than half of all respondents (54.8%) had been provided alcohol more than once in the last six months. More males (13.7%) had been supplied alcohol more frequently than females (7.2%) in the last six months. Older teenagers aged 18 (13%) received alcohol more frequently compared with their juniors. Urban dwellers reported more frequent supply of alcohol in the last six months compared with suburban and rural dwellers. (see Table 2)

Table 3 examines the supplier of alcohol to high school students in the last six months. Stratified by gender, statistical significance at $p < .05$ was found when mothers and friends were suppliers. Mothers were the main supplier to female respondents whilst friends supplied alcohol to male students. With increase in age, supply shifted from mothers and friends to siblings, other relatives and schoolmates. Table 3

Self-report of places where alcohol was usually provided in the last six months were generally higher in own home, others' home and at special events. Significant differences were reported between gender at other home, pubs and other places. At $p=.035$, 60.7% and 48% of male and female respondents received alcohol at other homes. 46.5% male respondents and 28% of females received alcohol at pubs ($p=.003$). Supply at special events was significantly different between the different age groups with a greater percentage of 16 year olds. Among the different places of residence, significant differences were found for supply of alcohol at other places. (see Table 4)

Table 5 examines the association between risky drinking, demographic and supplier variables. On a usual drinking occasion, boys were seven times more likely to report risky drinking at statistically significant levels ($p<.001$). The odds of risky drinking was

significantly greater for high schoolers provided alcohol by friends (OR 5.67; 95% CI 2.54 to 12.68) compared to other suppliers. Those who drank in pubs had higher odds of risky drinking (OR 1.99; CI 1.09 to 3.65).

IV. Discussion

Despite the existence and enforcement of prohibition laws against purchasing of alcohol by minors (<19 years), alcohol remains accessible to teenagers through alternate channels[19]. The focus of this study was to examine the various sources of alcohol to Korean high school drinkers. Major findings include (a) Among high school drinkers, an adult (person aged 19 and above) was the most common source of alcohol, (b) whilst mothers were the main providers to females, friends supplied more alcohol (in greater volumes) than parents and (c) high schoolers who consumed alcohol in pubs and clubs were more likely to engage in risky drinking.

A significant factor contributing to underage drinking is social supply of alcohol to teenagers. One of the mechanisms by which this supply may influence alcohol-related problems is by decreasing the age of onset of drinking[20, 21]. Korean high school drinkers reported obtaining alcohol from multiple sources including parents, siblings, other relatives, friends, fellow students, partners and even strangers. Of these sources, persons older than 19 years were the main sources. Adults, especially parents have an important role in the socialization of their children on the issue of alcohol use. Contrary to medical reports of the problems associated with early initiation of drinking, some parents are of the view that providing alcohol to their children teaches responsible drinking and controls the quantity consumed[22, 23]. Results from our analysis showed that South Korean parents, especially fathers were more likely to supply alcohol to their children than mothers (30.4% vs. 21.1% of adolescents).

The assumption is that when parents provide alcohol to their children, it may serve a protective effect for alcohol abuse. However, conflicting knowledge exists regarding the protective effect of parental approval of underage alcohol consumption. Whilst some studies indicate that parents who provide alcohol to their children are more likely to have children who never abuse alcohol[24], others show that consuming alcohol at home leads to increased drinking among teenagers[25]. Our research supported the former assumption that teenagers supplied alcohol by their parents were more likely to consume lower amounts of absolute alcohol (122grams and 115grams by mothers and fathers respectively compared to friends) and less likely to be involved in risky drinking (OR 0.92; CI 0.49 to 1.74). Research has proven that providing alcohol to an adolescent indicates approval of underage alcohol use. This disregard of underage drinking may however lead to future substance abuse[26]. Parental approval of underage drinking is however rife as 13% of American youth, aged 11 to 17 years, have drunk alcohol with their families[27, 28]. Our results showed that the volume of alcohol provided by friends exceeded that of parents (205grams of absolute alcohol). At the same time, teenagers who were supplied alcohol by friends (OR 5.67; CI 2.54 to 12.68) and those who drank at locations other than their own homes i.e. at pubs (OR 1.99; CI 1.09 to 3.65) were at higher odds of risky drinking. We speculate that high schoolers may have had access to alcohol at pubs, special events and other places without age identification. South Korean laws that require suppliers to ascertain the age of a youth (under the age of 19) before supply of any harmful drugs need to be enforced to decrease supply of alcohol to teenagers at pubs, special events and other places. Although the influence of peers on alcohol use is of greater magnitude, contradictory research indicates that a positive family environment could attenuate the negative impact of peers on adolescent drinking [29].

The Food Sanitation Act of South Korea prohibits the act of allowing minors access to licensed liquor establishments and providing any alcoholic beverages to children[30]. These

prohibitive laws against underage drinking do not, however, explicitly cover supply in private and off licensed premises. The United States, on the other hand, has introduced initiatives aimed at restricting social sources of supply, including laws against adult provision of alcohol to minors and the creation of enforcement mechanisms that allow police to enter private premises where underage drinking is happening[31]. There have also been efforts to register beer kegs so that police can trace the adult purchaser of alcohol provided to underage drinkers [32]. Prohibitive laws in South Korea can be extended to cover, not just purchase but supply of alcohol at all places including private premises.

Results from this research will pave the way in Korea for a more detailed exploration of all factors associated with the social supply of alcohol to teenagers as well as the long-term effects of this supply on adolescent development. This study, limited by its cross sectional design is however strengthened by the use of the International Control Study questionnaire as an assessment tool. Generalizations of the whole population of South Korean teenagers cannot be made as the sample of this survey was limited by age and total sample size. However, the diversity of locations used is advantageous as results for drinking rates (33.1% males: 23.1% females) are similar to information from the Ministry of Health and Welfare showing prevalence of underage drinking (26.1% males: 22.6% females). Future studies of a larger sample (across a larger and diverse age grouping) can be used to assess the full extent of social supply in South Korean teenage drinkers. Studies to determine the relationship between social supply and outlet density would be an interesting topic for future research.

Table 1: Characteristics of sample N (%)

	Drinker	Non-Drinker
	247(56.4)	191(43.6)
Gender		
Male (n=233)	145(62.2)	88(37.8)
Female (n=205)	102(49.8)	103(50.2)
Age		
16 (n=113)	68(60.2)	45(39.8)
17 (n=146)	82(56.2)	64(43.8)
18 (n=179)	97(54.2)	82(45.8)
Residence		
Urban (n=240)	145(60.4)	95(39.6)
Suburban (n=152)	73(48)	79(52)
Rural (n=45)	28(62.2)	17(37.8)

Table 2: Frequency (percentages) of supply of alcohol in the last 6 months to High schoolers

N (%)

	Frequency (%)			
	Weekly	Monthly	More than monthly	At least once
Total	14(6.1)	11(4.8)	100(43.9)	103(45.2)
Gender				
Male(n=131)	11 (8.4)	7(5.3)	53(40.5)	60(45.8)
Female(n=97)	3(3.1)	4(4.1)	47(48.5)	43(44.3)
Age				
16 (n=62)	2(3.2)	3(4.8)	28(45.2)	29(46.8)
17 (n=74)	6(8.1)	2(2.7)	34(45.9)	32(43.2)
18 (n=92)	6(6.5)	6(6.5)	38 (41.3)	42(45.7)
Residence				
Urban (n=134)	10(7.5)	8(6.0)	51(38.1)	65(48.5)
Suburban (n=69)	3(4.3)	3(4.3)	34(49.3)	29(42)
Rural (n=25)	1 (4.0)	-	15(60.0)	9(36.0)

Table 3: Supplier of Alcohol in the last 6 months (N)%

	Supplier of Alcohol (% in the last 6 months)[a]							
	Father	Mother	Siblings	Other Relatives	Friends	Partner	Schoolmate	Stranger

Total	(75)30.4	(52)21.1	(15)6.1	(25)10.1	(63)25.5	(4)1.6	(15)6.1	(2)0.8
Gender								
Male(n=145)	(43)29.7	(25)**17.2**	(8)5.5	(16)11	(46)**31.7**	(2)1.4	(11)7.6	(1)0.7
Female(n=102)	(32)31.4	(27)**26.5**	(7)6.9	(9)8.8	(17)**16.7**	(2)2	(4)3.9	(1)1.0
Age								
16(n=68)	(22)32.4	(15)22.1	(3)4.4	(6)8.8	(20)29.4	(1)1.5	(3)4.4	(1)1.5
17(n=82)	(21)25.6	(18)22	(5)6.1	(9)11	(20)24.4	(2)2.4	(5)6.1	-
18(n=97)	(32)33	(19)19.6	(7)7.2	(10)10.3	(23)23.7	(1)1	(7)7.2	(1)1
Residence								
Urban(n=145)	(43)29.7	(30)20.7	(9)6.2	(17)11.7	(37)25.5	(3)2.1	(7)4.8	-
Suburban(n=73)	(21)28.8	(17)23.3	(5)6.8	(6)8.2	(19)26	(1)1.4	(6)8.2	(2)2.7
Rural(n=28)	(11)39.3	(5)17.9	(1)3.6	(2)7.1	(7)25	-	(2)7.1	-

[a] *Percentages of positive responses do not add up to 100% as respondents selected more than one source. Bold figures show chi-square significance at p<.05*

Table 4: Supply of Alcohol at Place(x) in the last 6 months (N) %

	Places where alcohol is usually supplied (% in the last 6 months)[a]							
	Own Home	Other Home	Pubs	Other Clubs	Restaurants	Meetings	Special Events	Other Places

Total	(139)56.3	(132)53.4	(94)38.1	(42)17	(8)3.2	(39)37.2	(112)46.6	(62)25.1
Gender								
Male(n=145)	(76)56.3	**(85)60.7**	**(66)46.5**	(26)18.4	(5)3.5	(52)37.1	(66)47.3	**(41)36.4**
Female(n=102)	(63)64.9	**(47)48**	**(28)28**	(16)16.1	(3)3	(40)40	(46)46.1	**(11)10.9**
Age								
16(n=68)	(39)59.1	(41)60.3	(23)33.8	(17)24.5	(5)7.5	(27)40.3	**(47)70.1**	(22)32.4
17(n=82)	(48)60	(46)58.2	(30)37	(8)9.8	-	(27)33.3	**(30)37.1**	(14)18.1
18(n=97)	(52)60.5	(45)49.5	(41)44.1	(17)18.4	(3)3.3	(38)41.3	**(35)38.1**	(26)28.7
Residence								
Urban(n=145)	(86)63.7	(74)53.2	(60)42.9	(26)18.7	(6)4.2	(56)39.7	(62)45	**(35)25.1**
Suburban(n=73)	(38)55.1	(42)59.2	(27)37	(12)16.5	(2)2.8	(28)39.4	(33)45.4	**(25)34.5**
Rural(n=28)	(15)55.6	(16)59.3	(6)21.4	(2)7.1	-	(8)29.6	(17)38.6	**(2)7.1**

[a] *Percentages of positive responses do not add up to 100% as respondents selected more than one source. Bold figures show chi-square significance at p<.05*

Table 5: Odds Ratio of Risky drinking on a usual drinking occasion in the last six months

Covariate	%(S.E)	Odds Ratio (95% C.1)	P-value
Gender			
Male	74.36(.31)	7.38(4.05 to 13.46)	.000
Female	25.63(.31)	1	
Age			
16	26.86(.39)	1.26(.59 to 2.71)	.555
17	34.38(.37)	.84(.40 to 1.74)	.637
18	38.75(.31)	1	
Supplier			
Parent	32.5(.32)	.92(.49 to 1.74)	.804
Friend	47.5(.37)	5.67(2.54 to12.68)	.000
Other	18.75(.39)	1.26(.49 to 1.74)	.557
Stranger	1.25(.21)	1	
Place			
Own Home	22.5(.30)	1	
Another home	18.75(.29)	1.13(.637 to 2.02)	.669
Pubs/Clubs	43.13(.31)	1.99(1.09 to 3.65)	.025
Special Events	15.63(.41)	1.78(.80 to 3.96)	.159

References

1. World Health Organization. *Addressing the harmful use of alcohol: a guide to developing effective alcohol legislation.* Geneva: 2011.
2. Tapert SF, Caldwell L, Burke C. Alcohol and the adolescent brain: Human studies. *Alcohol Research and Health* 2004; 28: 205−212.
3. Seong JC, Hong JJ, Kim JK, Suh TW et al. Prevalence of suicide behaviors (Suicidal ideation and suicide attempt) and risk factors of suicide attempts in Junior and High School Adolescents. *J Korean Neuropsychiatr Assoc* 2002; Vol 41: No 6
4. Bonomo YA, Bowes G, Coffey C et al. Adverse outcomes of alcohol use in adolescents. *Addiction* 2001; 96: 1485-1485.
5. Jones BT, Corbin W, Fromme K. A review of expectancy theory and alcohol consumption. *Addiction* 2001; 96(1): 427-436.
6. National Institute on Alcohol Abuse and Alcoholism. Underage drinking (2013). Retrieved from http://www.pubs.niaaa.nih.gov/publications/UnderageDrinking/Underage_Fact.pdf
7. World Health Organization. *Global status report on alcohol and health*. Geneva: 2011.
8. Faden VB. Trends in initiation of alcohol use in the United States 1975 to 2003. Alcohol Clin Exp Res. 2006;30(6):1011–1022
9. Li C, Pentz MA, Chou CP. Parental substance use as a modifier of adolescent substance use risk. *Addiction* 2002; 97: 1537-1550

10. Korea National Legislation Information Center (http://www.law.go.kr). Youth Protection Law. 2011 [http://www.law.go.kr/lsInfoP.do?lsiSeq=121990&efYd=20120916#0000 accessed 2013 may 9]

11. Kim SG, Kim SK. The determinants influencing adolescents' alcohol use. *Korean journal of youth studies* 2009; 16(9): 105-124.

12. Chartier KG, Hesselbrock MN, Hesselbrock VM. Development and vulnerability factors in adolescent alcohol use. *Child Adolesc Psychiatr Clin N Am*. 2010; 19(3):493-504.

13. Cranford JA, Zucker RA, Jester JM, Puttler LI, Fitzgerald HE. Parental alcohol involvement and adolescent alcohol expectancies predict alcohol involvement in male adolescents. *Psychol Addict Behav.* 2010; 24(3):386-96.

14. Hwang SH. Parental and peer factors influence on adolescents' drinking and smoking behaviors. *Health and social-science* 2010; 27:81-103.

15. Warner L, White H. Longitudinal effects of age at onset and first drinking situation on problem drinking. *Substance use and misuse*. 2003; 38 (14): 1983-2016

16. Andrews JA, Tildesley E, Hops H, Li F. The influence of peers on young adult substance use. *Health Psychology* 2002; 21: 349−357.

17. Kim GE, Cho NA. The effects of drinking environment on the degree of youth drinking-moderating effects on the interaction of parents and adolescents. *Korean Journal of Youth Studies* 2012; 19(11): 45-68.

18. Casswell S, Meier P, MacKintosh AM., Brown A, Hastings G, Thamarangsi T, Chaiyasong S, Chun SS, Huckle T, Wall M, You RQ. The International Alcohol Control (IAC) Study—Evaluating the Impact of Alcohol Policies. *Alcoholism: Clinical And Experimental Research* 2012; 36(8).

19. Hwang SH, Akers RL. Substance use by Korean adolescents-A cross-cultural test of social learning, social bonding, and self-control theories 2003 in Roland L. Alkers and Gary F. Jensen. (eds) Social learning theory and the explanation of crime: *A Guide for the New Century Advances in Criminological Theory.* 11:39-64.

20. Williams TP, Lillis RP, Changes in alcohol consumption by 18-year-olds following an increase in New York state's purchase age to 19.*J Stud Alcohol* 1986; 47: 290-296

21. Grant B. Prevalence and correlates of alcohol use and DSM-IV alcohol dependence in the United States: results of the National Longitudinal Alcohol Epidemiologic Survey. *Journal of Studies on Alcohol*, 1997; 58: 464-473.

22. Hingson RW, Edwards EM, Heeren T, Rosenbloom D. Age of drinking onset and injuries, motor vehicle crashes and physical fights after drinking and when not drinking. *Alcoholism: Clinical and Experimental Research* 2009; 33: 783-790.

23. Kypri K, Dean JI, Stojanovski E. Parent attitudes on the supply of alcohol to minors. *Drug Education Alcohol Rev*, 2007; 26:41-7.

24. Wells JE, Horwood LJ, Fergusson DM. Drinking patterns in mid-adolescence and psychosocial outcomes in late adolescence and early adulthood. *Addiction* 2004; 99: 1529-41.

25. Foley KL, Altman D, Durant RH, Wolfson M. Adults' approval and adolescents' alcohol use. *Journal of Adolescent health* 2004; Vol 35,345:e17-345.e26

26. Harburg E, Davis DR, Caplan R. Parent and offspring alcohol use, imitative and aversive transmission. *J Stud Alcohol* 1982; 43:497–516

27. Baumrind D. The influence of parenting style on adolescent competence and substance use. *J Early Adolesc* 1991: 11:56–95

28. Ary DV, Tildesley E, Hops H, Andrews J. The influence of parent, sibling, and peer modeling and attitudes on adolescent alcohol use. *Int J Addict* 1993; 28:853–880

29. Nash SG, McQueen A, Bray JH. Pathways to adolescent alcohol use: family environment, peer influence, and parental expectations. *Journal of Adolescent Health* 2005; 37(1)19–28.

30. Chun S. A comparative study on the alcohol laws and policies between USA and Korea. *J Med Law* 2003; 11(1) 21-34.

31. Prevention Research Center. *Preventing Underage Alcohol Access: Essential Elements for Policy, Deterrence and Public Support. Prevention Research Center* 2004.

32. Komro KA, Toomey T L. Strategies to Prevent Underage Drinking. *Alcohol Research & Health* 2002; 26: 5-14.

	Item No	Recommendation with Page No to Indicate Compliance
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract—*see page 3 of main document*
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found—*see Title page*
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported—*see page 1 of main document lines 2-46*
Objectives	3	State specific objectives, including any prespecified hypotheses—*see page 2 of main document lines 13-22*
Methods		
Study design	4	Present key elements of study design early in the paper—*see line 13 of abstract, page 2 lines 48-58 and page 3 line 4 of the main document*
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection—*see page 2 lines 48-58 and page 3 line 4 of the main document*
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of Participants—*see page 2 of main document in sampling section*
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable—*see page 3 lines 4-57 and page 4 lines 4-13 of main document*
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—*see page 2 lines 29-43 of main document*
Bias	9	Describe any efforts to address potential sources of bias—*N/A*
Study size	10	Explain how the study size was arrived at-- *see page 2 lines 48-58 and page 3 line 4 of the main document*
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why—*N/A*
Statistical methods	12	*(a)*Describe all statistical methods, including those used to control for confounding—*See page 4 lines25-35 of main document*
		(*b*) Describe any methods used to examine subgroups and interactions—*N/A*
		(*c*) Explain how missing data were addressed—*N/A*
		(*d*) If applicable, describe analytical methods taking account of sampling strategy—*N/A*
		(*e*) Describe any sensitivity analyses—*N/A*
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—*see page page 4 lines 42 to 46 of main document*
		(b) Give reasons for non-participation at each stage—*N/A*
		(c) Consider use of a flow diagram—*N/A*
Descriptive data	14	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders—s*ee Tables 1- 4 on pages 9-11 of main document*
		(b) Indicate number of participants with missing data for each variable of interest—*N/A*
Outcome data	15	Report numbers of outcome events or summary measures—*N/A*
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—*N/A*
		(*b*) Report category boundaries when continuous variables were categorized—*N/A*

		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period—*N/A*
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses—*see Table 5 on page 12 of main document*
Discussion		
Key results	18	Summarise key results with reference to study objectives—*see page 6 lines 16-25 of main document*
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—*see page 8 lines 22-27 of main document*
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence—*see page 6 lines 27-57 and page 7 lines 4 -49*
Generalisability	21	Discuss the generalisability (external validity) of the study results—*see page 8 lines 27-36*
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—*see page 13 of main document*