Familial alcohol supply, adolescent drinking and early alcohol onset in 45 low and middle income countries.

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Abstract

Aims: This study estimated the extent of familial alcohol supply in 45 low and middle income countries (LMIC), and examined the country-level effects of familial alcohol supply on adolescents' alcohol use.

Method: We used data from 45 LMICs that participated in the Global School-Based Student Health Survey (GSHS) between 2003 and 2013 (n=139,840). The weighted prevalence of familial alcohol supply in each country was estimated. Multilevel binary and ordinal logistic regression analyses were used to examine the country-level effect of familial alcohol supply on early onset of alcohol use (first alcohol before 12), past 30-day alcohol use, lifetime drunkenness and alcohol-related social problems.

Results: There were large variations between LMICs in the prevalence of familial alcohol supply and pattern of adolescent alcohol use. The prevalence of familial supply ranged from 0.1% in Tajikistan to 23.8% in St Lucia. It was estimated that a one percentage change in prevalence of familial alcohol supply was associated with 10%, 12% and 12% change in the odds of lifetime drunkenness (OR = 1.10, 95% CI = [1.04, 1.16]), early onset of alcohol use (OR = 1.12, 95% CI = [1.07, 1.08]) and more frequent drinking in the past month (OR = 1.12, 95% CI = [1.04, 1.20]).

Conclusion: There were large variations in the prevalence of familial alcohol supply and adolescent alcohol use among LMICs. Adolescents in countries with higher prevalence of familial alcohol supply were more likely to start using alcohol at an earlier age, to have used alcohol in the past 30 days and experience intoxication.

Introduction

Alcohol use is one of the major preventable contributors to global burden of disease (Rehm et al., 2010; Rehm et al., 2009; World Health Organization, 2014). It was identified as one of the most prominent risk factors for non-communicable diseases in the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-Communicable Diseases (UN General Assembly, 2012). The 66th World Health Assembly set a target of reducing alcohol-related burden of disease by 10% by 2025 (UN General Assembly, 2012).

Traditionally, consumption in high income countries (HICs) has been higher than in low and middle income countries (LMICs). However, this consumption gap is likely to narrow with the increasing globalization of alcohol production and sophisticated marketing campaigns by the alcohol industry in LMIC (Alcohol and Public Policy Group, 2010). Consumption in many HICs, such as the United States, Canada and Australia, has stabilized or declined while consumption in LMICs such as China and India has been increasing (World Health Organization, 2014).

Our understanding of alcohol use is largely based on research in HICs. This body of research has shown that alcohol use is commonly initiated during adolescence (Johnston, O'Malley, Bachman, & Schulenberg, 2013) and that early onset of alcohol use is strongly associated with future alcohol misuse (Hingson, Heeren, & Winter, 2006), making adolescence an important window for prevention and intervention in HICs.

Many countries have a minimum legal purchasing age (MLPA) for alcohol. Adolescents below the MLPA in these countries are not able to legally purchase alcohol themselves but often obtain alcohol from peers or family members (White & Bariola, 2012). In some HICs, many

parents see alcohol use as a rite of passage in adolescence and use harm minimization as the rationale for supplying their children with alcohol. For example, a study on Australian parents who gave their children alcohol found that many of these parents believed that they could teach their children to drink responsibly and provide a safe place to drink by giving their children alcohol (Allan, Clifford, Ball, Alston, & Meister, 2012). Current evidence suggests otherwise. Studies show that parental supply of alcohol is associated with higher risks of adolescent alcohol use (Mattick et al., 2017), heavy episodic drinking and alcohol-related problems (Kaynak, Winters, Cacciola, Kirby, & Arria, 2014; Mattick et al., 2018). This emerging body of research on familial alcohol supply and adolescent alcohol use is based upon studies done in HICs, and it is unclear if similar results would be found among young people in LMICs. This is an important limitation because adolescent drinking in LMICs is a global public health priority since LMICs comprise 87% of the world's adolescent population (United Nations Population Division, 2015).

Most research on parental and/or familial alcohol supply focuses on the individual level effect of supply. This body of research has primarily examined the effect of the supply of alcohol by parents to their own children on their children's alcohol use and alcohol-related harm. However, parental supply of alcohol may also have an impact on the broader community in addition to the influence each parent may exercise on their own children's alcohol consumption (Chan, Leung, Connor, Hall, & Kelly, 2017). For example, parents who supply alcohol to their children can influence the alcohol-related attitudes and behaviors of other parents (Gilligan, Thompson, Bourke, Kypri, & Stockwell, 2014). When parents see other parents as having favorable attitudes towards supplying alcohol to children, they may relax their own attitudes toward underage drinking and be more likely to supply alcohol to their own children (Gilligan et al., 2014). A high level of parental supply to underage drinkers also heightens the perception that

underage drinking is socially condoned (Gilligan, Kypri, Johnson, Lynagh, & Love, 2012). In addition, supplying alcohol to youngsters, regardless whether it is given by parents to their own children, reduces barriers to alcohol access (Jones, Andrews, & Berry, 2016). Hence, communities with a high level of parental alcohol supply can perpetuate a social environment that encourages more parents to give alcohol to their own children, increasing the contextual risks of adolescent alcohol misuse.

The first aim of this study was to investigate country-level contextual effects of familial alcohol supply on adolescents' alcohol use by examining the effects of the overall prevalence of familial alcohol supply in each country on adolescent alcohol use.

The second aim was to estimate the extent of familial alcohol supply in LMICs. The majority of research on familial alcohol supply and adolescent alcohol use has been done in high income countries and research on the contextual effect of familial alcohol supply is even more limited within these countries. Given that familial alcohol supply is potentially a modifiable risk factor for future alcohol misuse, it is important to understand the prevalence of familial alcohol supply in LMICs, and its impact on adolescent drinking behaviors.

Method

Data source

Data from the Global School-Based Student Health Survey (GSHS) were used for this study. GSHS is a World Health Organization initiative which aims to monitor health behaviors among adolescents in participating countries by means of a self-administered questionnaire with standardized content and procedures. In each country, data were collected through a two-stage sampling process via schools. In stage 1 a school was randomly selected based on probability proportional to their enrolment size, and in stage 2 a classroom was randomly selected. Data collected from 45 LMICs between 2003 and 2013 were used. Participants who were 16 or older were excluded from this study because they were able to legally purchase alcohol in some countries surveyed in the GSHS. The age range of participants in the current study was 11 to 15. Use of the data for the purposes of this research was approved by the Human Research Ethics Committee at the University of Queensland.

Measures

The source of alcohol was derived from the item "During the past 30 days, how did you usually get the alcohol you drank?" Students selected one response from: "I did not drink alcohol during the past 30 days/ I bought it in a store, shop or from a street vendor/ I gave someone else money to buy it for me/ I got it from my friends/ I got it from my family/ I stole it or got it without permission/ I got it some other way". The responses "from my friends" and "from my family" were used to code two variables, namely "Peer alcohol supply Yes/No" and "Familial alcohol supply Yes/No". The prevalence rates of peer and familial alcohol supply in each

country were estimated from these two variables. For each country, individual responses were aggregated to estimate the prevalence of familial and peer alcohol supply.

Lifetime drunkenness was measured using the item “During your life, how many times did you drink so much alcohol that you were really drunk? 0 times/ 1 or 2 times/ 3 to 9 times/ 10 or more times”. Responses were dichotomized into “Ever intoxicated: Yes/No”.

Lifetime social problems due to alcohol was measured using the item “During your life, how many times have you got into trouble with your family or friends, missed school, or got into fights, as a result of drinking alcohol?”. The response scale was the same as the lifetime drunkenness measure and was dichotomized into Yes (>= 1 times)/No (0 times).

Recent drinking was derived from the item “During the past 30 days, on how many days did you have at least one drink containing alcohol?” The responses were 0 days/ 1 or 2 days/ 3 to 5 days/ 6 to 9 days/ 10 to 19 days/ 20 to 29 days/ All 30 days”.

Early alcohol onset was derived from the item “How old were you when you had your first drink of alcohol other than a few sips?” The responses were Never/ 7 years old or younger/ 8 or 9 years old/ 10 or 11 years old/ 12 or 13 years old/ 14 or 15 years old/ 16 or 17 years old/ 18 years old or older. The responses of first drink at 10 or 11 years old or earlier were coded as early alcohol onset. This item was introduced to the survey after 2008 and therefore only countries (22 countries) that collected data in 2009 or after were included in analyses involving this variable.

Gross national income (GNI) per capita and percentage of the population living in urban areas for the year of survey or nearest year were obtained from the World Bank using the *wbopen* STATA module. Data on national policy on minimum legal alcohol purchasing age were

sourced from the World Health Organization's *Global status report on alcohol and health* (World Health Organization, 2014).

Analysis

Descriptive analyses were performed in STATA 13 (StataCorp, 2013). Weighted prevalence estimates and the associated 95% confidence intervals were calculated using the svy command to account for the survey weight and complex survey design. Three multilevel logistic regression models examined the contextual effect of familial alcohol supply (as measured by the prevalence of familial alcohol supply in each country) on lifetime drunkenness, early alcohol onset, and lifetime social problems. Multilevel ordinal logistic regression was used for past 30-day drinking. These regression analyses were conducted in Mplus 7.01 (Muthén & Muthén, 2014). Prevalence of familial and peer supply, GNI and urban-dwelling percentage of the population were specified as country-level (Level 2) variables. Age, gender, familial alcohol supply and peer alcohol supply were specified as individual-level (Level 1) variables. The effects of age, gender, country GNI, percentage of the population living in urban areas and national policy on minimum legal alcohol purchasing age were fully adjusted for in the regression analyses. In the model examining past month drinking, we also included the individual familial and peer alcohol supply as covariates. These two variables (past 30 days) were not included in other models because their time frame does not align with that of the dependent variables (lifetime drunkenness, lifetime social problems and early alcohol onset).

We performed the following series of sensitivity analyses to evaluate the robustness of the results. First, because some the countries have a relatively low school enrolment rate (UNESCO, 2017), we excluded countries with a secondary education net enrolment rate less

than 50% to check if this changed the results. Second, the measure regarding the source of alcohol asked the participants to nominate only one alcohol source where they usually got their alcohol. While this gives an estimate for the percentage of adolescents who mainly sourced their alcohol from their family, it may underestimate the overall prevalence of familial alcohol supply because some participants who nominated peers as their usual alcohol supply may also get alcohol from their families. Therefore, we combined the observed data and simulated data that assumed an average of 30% and 50% of participants who nominated their peers as their usual source also obtained alcohol from their family. We performed the same analyses on the combined data to check if there were any substantial changes in the results.

Results

Table 1 shows the sample characteristics of each country. The total number of participants was 139,840, and the sample sizes ranged from 402 (Nauru) to 16,320 (Malaysia) across countries. The response rate, defined as the total response received as a percentage of surveys distributed, was in general high, ranging from 60% (Senegal) to 98% (China).

Table 2 shows all alcohol related variables across countries. There were wide variations in all aspects of alcohol use. For example, the prevalence of familial alcohol supply ranged from 0.1% in Tajikistan and Myanmar to 23.8% in St. Lucia, while the the prevalence of past month alcohol use ranged from 0.7% in Tajikistan to 53.7% in Colombia. Figure 1 illustrates the bivariate associations between prevalence of familial alcohol supply and prevalence of each of the alcohol related variables.

Table 3 shows the results from the four multilevel logistic regression models. Age and gender were significantly associated with lifetime drunkenness, lifetime social problems, early alcohol onset and past month drinking ($p < .001$). The country level prevalence of familial alcohol supply was significantly associated with lifetime drunkenness, *OR* = 1.10, 95% CI = (1.04, 1.16), early alcohol onset, *OR* = 1.12, 95% CI = (1.07, 1.18), and past month drinking, *OR* = 1.12, 95% CI = (1.04, 1.20). This means that for each percentage increase in familial alcohol supply in the country, the odds of lifetime drunkenness, early alcohol onset, and more frequent past month drinking were increased by 10%, 12% and 12% respectively in the individual, after accounting for the prevalence of peer alcohol supply, demographic factors and other country level characteristics. The prevalence of familial alcohol supply was not associated with lifetime social problems, *OR* = 1.03, 95% CI = (0.95, 1.10).

Importantly, the effect of prevalence of familial supply on frequent drinking was also adjusted for the individual's familial and peer alcohol supply. This result indicates that participants who lived in countries with higher prevalence of familial alcohol supply were more likely to drink more frequently in the past month, regardless of whether they primarily obtained alcohol from their own parents.

All drinking outcomes were associated with the prevalence of peer alcohol supply in a given country: lifetime drunkenness, *OR* = 1.13, 95% CI = (1.08, 1.18), early alcohol onset, *OR* = 1.08, 95% CI = (1.05, 1.12), lifetime social problems, *OR* = 1.12, 95% CI = (1.07, 1.17) and more frequent past month drinking, *OR* = 1.11, 95% CI = (1.06, 1.17).

Results from all three sets of sensitivity analyses were similar to the main analysis (Supplementary Table 1). The same conclusions with regards to familial alcohol supply were reached in the sensitivity analyses, indicating that our original analyses and conclusions were robust.

Discussion

Using national data from 45 LMICs that participated in the GSHS between 2003 and 2013, we found that the country-level rate of familial alcohol supply was strongly associated with individuals' recent alcohol use, number of previous experiences of being drunk and an early onset of alcohol use. These associations persisted after controlling for individuals' familial and peer supply, and several country-level characteristics such as gross national income per capita, minimum legal purchasing age and percentage of the population living in urban areas. Adolescents living in countries with higher levels of familial alcohol supply were at higher risk of initiating alcohol use earlier and experiencing intoxication than those in countries with low rates of familial supply. They were also at higher risk of using alcohol more often in the past 30-day, regardless of whether they obtained alcohol from their families. A one percentage change in the prevalence of familial supply was associated with 10%, 12% and 12% changes in the odds of lifetime drunkenness, starting to drink alcohol before the age of 11 and drinking alcohol in the past month. While the cross-sectional nature of the current study does not allow for a causal interpretation of the relationship, our results are consistent with existing longitudinal research that has shown parental alcohol supply precedes heavy alcohol use and alcohol related harm in late adolescence (Mattick et al., 2018; Mattick et al., 2017).

There are several explanations for the contextual effect of familial alcohol supply on young people's drinking. At the country level, a high prevalence of familial alcohol supply may create an environment that encourages underage drinking and normalizes alcohol supply to adolescents. When many parents supply their children with alcohol, it increases the perception that underage drinking is acceptable and socially endorsed. In HICs, when parents perceive that other parents have favorable attitudes towards providing alcohol to their adolescent children they

are more accepting of adolescent drinking (Gilligan & Kypri, 2012), and more likely to provide their own children with alcohol (Gilligan et al., 2014). Furthermore, parents who supply alcohol to their children may also indirectly increase the availability of alcohol in their children's peer group if their children share alcohol with their peers. This increases the risk of alcohol use in other young people whose parents did not provide them alcohol.

Another explanation is that the association between adolescent drinking and prevalence of parental supply may be a reflection of local drinking culture or alcohol availability. For example, in countries where youth risky drinking is common, or in countries where alcohol is easily accessible to young people, parents may actively provide alcohol to their children under a controlled environment as a harm reduction strategy. However, such strategy has no effect on reducing alcohol risk, and may even increase alcohol use and heavy drinking among young people because it normalizes adolescent drinking (Kaynak et al., 2014; Mattick et al., 2018). Given the cross-sectional nature and limited number of measures of the present study, future research is required to better understand the link between familial alcohol supply and adolescent alcohol use in LMICs.

The non-significant effect of prevalence of familial alcohol supply on life time social problems needs to be interpreted with caution. The lower bound of the 95% confidence interval of the odds ratio of familial alcohol supply prevalence was just below 1 (OR = 0.95). Although we had a very large overall sample size (level 1 unit in the multilevel analysis), the number of countries (level 2 unit) was much smaller (N = 45). Since we examined the country-level effect of familial alcohol supply on adolescents' lifetime social problems, the level of inference was at the level 2 units (i.e. country). The relatively small number of countries may lead to a lack of power to detect an effect. Another possibility is that there is an absence of an effect. The measure

of social problems only assessed short-term problems such as getting into fight and missing school. It is possible that children who obtained alcohol from their parents may consume alcohol under supervision or in a more controlled social environment, and therefore not be at higher risk of experiencing the short-term problems described in the measure.

We also found a large variation in adolescent alcohol use and rate of familial alcohol supply across countries. Adolescent alcohol use and familial alcohol supply are likely to reflect the drinking culture in a country, which is in turn influenced by a broad range of factors that include religion and biological factors, and country-specific characteristics such as national wealth and alcohol control policies. For example, countries with a large proportion of the population that is Muslim, such as Indonesia and Malaysia, have a lower level of adolescent drinking and familial alcohol supply (Michalak & Trocki, 2006). In fact, in this study, Islam was the predominant religion in 4 out of the 5 countries with the lowest rate of past month alcohol use (Tajikistan, 0.7%; Indonesia, 2.5%; Senegal, 2.9% and Morocco, 3.8%). It is also possible that some Asian populations are biologically protected from heavy alcohol use by genes that influence alcohol metabolism. Compared to European and African populations, Asian populations are more likely to carry the alleles ADH1B*2 and ALDH2*2 that are protective of alcoholism and alcohol consumption because they interfere with the metabolism of acetaldehyde, a metabolite of alcohol (Agrawal & Bierut, 2012). After consuming alcohol, individuals with these alleles often experience flushing, nausea, increased heart rate, and headache, making them less likely to drink alcohol and to develop alcoholism (Agrawal & Bierut, 2012).

There are several limitations in this study. First, while large national samples from a wide range of LMICs were included, the exclusive use of student samples might limit the generalizability because of the low rates of secondary school enrolment in some countries, such

as Uganda (16.23%), Senegal (19.47%) and Kenya (36.31%). However, we performed a sensitivity analysis that excluded countries with a secondary education net enrolment rate below 50%. The results were similar to those in the full sample, suggesting that using exclusively student samples is unlikely to have a large impact on our findings on the relationship between familial alcohol supply and adolescent drinking.

Second, while the measure of source of alcohol provided a prevalence estimate for adolescents who usually obtained alcohol from their family in each country, these were likely to be under-estimates of the prevalence of familial supply because adolescents who mainly sourced their alcohol from peers may also obtain alcohol from their families. We conducted two set of sensitivity analyses using observed data combined with simulated data that assumed on average of 30% and 50% of adolescents who nominated peers as their usual source also obtained alcohol from their family. We found that all statistically significant results with respect to familial alcohol supply remained consistently significant (see Supplementary Table 1). Therefore, we are confident that our conclusion was robust.

Third, all data were derived from cross-sectional surveys and so causality cannot be inferred. We interpreted the results as familial alcohol supply having an impact on alcohol use because the reversed direction (i.e. individual's alcohol use impacting on the country-level prevalence) is less likely to account for the association between these two key variables. Furthermore, our results were consistent with a recent longitudinal study from Australia that suggested parental supply of alcohol use increased the risk of adolescent drinking (Mattick et al., 2017). Longitudinal cohort studies with more comprehensive measures in LMICs is required to clarify and provide further evidence for the temporal relationship between familial alcohol supply and adolescent alcohol use.

Lastly, all data were based on self-report. Although adolescent self-reported alcohol data are reasonably reliable and valid in HICs (Lintonen, Ahlström, & Metso, 2004), their reliability and validity in LMICs is unknown.

Conclusion

Among LMIC, there were large variations in the prevalence of familial alcohol supply and adolescent alcohol use. At a country level, the prevalence of familial alcohol supply was significantly associated with individual adolescents' alcohol use. Adolescents living in countries with a higher prevalence of familial alcohol supply started using alcohol at an earlier age and were more likely to have been drunk. They were also more likely to have used alcohol in the past 30 days, regardless of whether family was their usual source of alcohol.

Implication and Contribution

This is one of the first studies on cross-national comparison of familial alcohol supply in LMICs. Given its high prevalence, its clear association with drinking risks and its modifiability, familial supply of alcohol should be an important target for preventive and policy interventions for risky adolescent drinking in LMICs.

Table 1. Sample characteristics in the Global School-Based Student Health Survey across countries.

Country	Survey Year	Sample size	% Female	Mean age	Response rate	MLPA[a]	Secondary Education NER %[b]
Africa							
Benin	2009	1196	36.26	12.22	90%	None	42.03
Botswana	2005	1419	57.72	14.33	95%	18	55.5
Ghana	2007	4511	51.09	13.87	83%	None	49.27
Kenya	2003	3091	53.31	13.92	84%	18	36.31
Mauritius	2011	3142	54.7	13.86	82%	18	83.88
Senegal	2005	2834	45.01	13.68	60%	18	19.47
Uganda	2003	1994	51.95	14.28	69%	18	16.23
United Republic of Tanzania	2006	2072	53.17	12.86	87%	18	-[c]
Zambia	2004	1510	54.63	13.86	70%	18	-[c]
Zimbabwe	2003	3980	59.09	14.2	84%	18	35.04
Morocco	2006	2106	51.7	13.94	84%	-[c]	50.53
Americas							
Belize	2011	1740	53.38	13.36	88%	18	65.41
Bolivia	2012	3003	50.56	13.96	88%	None	73.2
Chile	2004	7667	51.69	13.57	86%	18	91.91
Colombia	2007	8168	55.85	13.66	82%	18	35.78
Costa Rica	2009	2284	52.44	13.93	72%	18	75.86
Dominica	2009	1350	56.79	13.5	84%	16	76.59
Ecuador	2007	5126	51.61	13.07	86%	18	56.07
Grenada	2008	1331	56.66	13.68	78%	16	76.87
Guatemala	2009	4627	54.86	13.94	81%	18	40.91
Honduras	2012	1535	52.82	13.58	79%	18	48.42
Jamaica	2010	1248	51.35	14.15	72%	18	77.72
Peru	2010	2388	51.39	14.13	85%	18	79.75
Saint Lucia	2007	1078	57.91	13.64	82%	16	77.04

Saint Vincent and the Grenadines	2007	1223	53.54	13.55	84%	16	90.4
Suriname	2009	1068	53.11	13.94	89%	18	50.69
Venezuela	2003	4182	55.78	13.2	86%	18	57.65
Asia							
Indonesia	2007	3040	52.77	13.71	93%	21	64.86
Myanmar	2007	2255	51.97	13.85	95%	18	43.48
Thailand	2008	2695	51.02	13.52	93%	20	74.45
Malaysia	2012	16320	49.79	13.99	89%	18	67.67
Philippine	2003	4443	59.01	14.22	85%	18	57.32
Mongolia	2013	3778	52.19	13.62	88%	21	81.88
Tajikistan	2006	7623	50.58	14.16	80%	18	79.18
Cambodia	2013	1832	55.88	14	85%	None	38.19
China	2003	8673	51.59	13.63	98%	None	-[c]
Lebanon	2011	2019	53.64	13.63	87%	-[c]	69.23
Vietnam	2013	1757	53.52	14.46	96%	18	-[c]
Europe							
The former Yugoslav Republic of Macedonia	2007	1575	50.39	13.96	93%	18	82.18
Oceania							
Kiribati	2011	1363	58.17	14.05	85%	21	69.14
Nauru	2011	402	57.63	13.55	73%	-[c]	-[c]
Samoa	2011	2263	59.29	13.91	79%	-[c]	80
Solomon	2011	1014	50.21	13.99	88%	-[c]	30.99
Tonga	2010	1968	55.37	13.96	80%	18	82.94
Vanuatu	2011	947	58.2	13.37	72%	-[c]	50.6

[a] Minimum Legal Purchasing Age. Data sourced from the Global status report on alcohol and health 2014 (World Health Organization, 2014). [b] Secondary Education Net Enrolment Rate. Data sourced from the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2017). [c] Data not available.

Table 2. Prevalence of familial alcohol supply, peer supply, lifetime drunkenness (1+ times drunk), past 30-day drinking, lifetime social problems due to alcohol, and early alcohol onset.

	Familial alcohol supply		Peer alcohol supply		Lifetime drunkenness		Past month alcohol use		Lifetime social problems		Early alcohol onset[a]	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Africa												
Benin	5.4	(3.8,7.7)	5.6	(3.9,8.0)	12.5	(9.3,16.7)	15.9	(12.6,19.8)	9.2	(7.0,12.0)	15.5	(11.3,20.9)
Botswana	3.6	(2.6,5.1)	7.4	(5.8,9.5)	21.0	(19.2,23.0)	20.5	(17.9,23.3)	16.6	(14.9,18.4)		
Ghana	4.9	(4.0,5.9)	5.6	(4.6,6.9)	32.8	(29.6,36.0)	28.1	(24.9,31.5)	34.7	(31.6,37.9)		
Kenya	3.2	(1.8,5.7)	5.4	(4.0,7.3)	21.4	(18.2,25.0)	17.0	(12.7,22.5)	29.9	(26.2,33.8)		
Mauritius	7.2	(5.6,9.2)	6.9	(5.5,8.6)	16.2	(12.7,20.4)	23.6	(19.6,28.2)	6.0	(4.4,8.2)	13.4	(10.7,16.7)
Senegal	0.8	(0.4,1.5)	0.4	(0.2,0.8)	4.5	(3.2,6.3)	2.9	(2.0,4.3)	5.3	(4.0,7.1)		
Uganda	4.1	(2.7,6.0)	3.8	(2.8,5.2)	15.4	(12.7,18.6)	12.9	(10.6,15.7)	20.8	(18.5,23.4)		
United Republic of Tanzania	2.6	(1.9,3.7)	1.0	(0.5,1.9)	4.5	(3.2,6.2)	5.2	(4.0,6.9)	13.8	(12.3,15.5)		
Zambia	6.0	(4.6,7.8)	8.7	(6.3,11.9)	42.8	(37.3,48.5)	43.8	(36.6,51.3)	47.6	(42.7,52.6)		
Zimbabwe	5.0	(4.3,5.9)	4.6	(4.0,5.4)	19.0	(17.1,21.1)	17.3	(15.6,19.0)	18.6	(16.1,21.3)		
Morocco	0.4	(0.1,0.9)	1.4	(0.9,2.1)	3.7	(2.6,5.2)	3.8	(2.7,5.3)	13.1	(10.9,15.6)		
Americas												
Belize	5.0	(4.0,6.2)	12.5	(10.5,14.8)	15.9	(13.5,18.6)	24.9	(22.0,28.0)	9.0	(7.4,10.9)	20.8	(18.5,23.5)
Bolivia	1.2	(0.7,1.9)	5.3	(3.9,7.1)	11.3	(9.3,13.8)	15.3	(12.9,18.1)	9.8	(8.2,11.7)	8.7	(7.4,10.2)
Chile	6.3	(5.2,7.7)	9.1	(7.9,10.4)	22.0	(20.0,24.1)	29.2	(26.5,32.0)	14.0	(12.7,15.5)		
Colombia	9.5	(8.3,11.0)	19.3	(17.2,21.6)	39.7	(36.7,42.8)	53.7	(50.7,56.6)	19.9	(17.5,22.7)		
Costa Rica	5.2	(4.3,6.3)	7.8	(6.5,9.2)	15.7	(13.3,18.4)	23.3	(20.4,26.5)	5.9	(4.6,7.5)	20.2	(17.8,22.8)
Dominica	14.1	(12.2,16.3)	15.8	(13.2,18.8)	30.0	(26.5,33.8)	50.7	(46.5,54.9)	12.0	(9.6,14.8)	52.1	(48.1,56.0)
Ecuador	3.9	(3.2,4.9)	8.5	(7.2,10.0)	23.0	(19.9,26.3)	27.1	(23.7,30.8)	18.7	(15.7,22.2)		
Grenada	12.7	(10.1,15.9)	10.6	(8.8,12.7)	27.1	(24.3,30.1)	43.2	(39.2,47.3)	16.0	(13.4,18.9)		
Guatemala	2.6	(1.9,3.5)	6.0	(4.9,7.1)	10.6	(9.1,12.3)	16.1	(13.6,18.9)	5.3	(4.3,6.6)	12.1	(10.2,14.4)
Honduras	2.7	(1.9,3.7)	6.2	(4.8,8.0)	9.8	(8.0,12.0)	14.8	(12.5,17.4)	5.8	(4.7,7.2)	12.6	(10.8,14.7)
Jamaica	10.6	(8.7,13.0)	13.4	(10.8,6.6)	37.6	(29.8,46.0)	52.8	(47.5,57.9)	21.0	(14.3,29.7)	43.5	(39.2,47.9)
Peru	4.1	(3.2,5.1)	8.7	(7.1,10.6)	13.7	(11.4,16.3)	27.0	(23.3,31.1)	12.1	(10.5,14.0)	13.8	(11.5,16.5)

Saint Lucia	23.8	(21.0,26.8)	11.6	(9.2,14.6)	33.1	(29.4,37.1)	52.6	(48.2,56.9)	13.8	(11.2,16.7)	20.5	(16.6,25.0)
Saint Vincent and the Grenadines	15.5	(13.0,18.4)	14.0	(11.2,17.3)	33.0	(29.2,37.0)	49.9	(44.6,55.3)	16.5	(14.2,19.1)		
Suriname	9.3	(7.7,11.1)	4.1	(2.8,6.0)	14.0	(10.6,18.4)	31.2	(26.9,36.0)	4.7	(3.4,6.3)		
Venezuela	6.5	(5.7,7.5)	13.0	(11.6,14.7)	15.1	(13.7,16.5)	31.5	(28.7,34.5)	9.2	(7.9,10.6)		
Asia												
Indonesia	0.3	(0.1,0.9)	1.1	(0.6,1.8)	2.6	(1.7,3.9)	2.5	(1.8,3.7)	1.9	(1.3,2.8)		
Myanmar	0.1	(0.01,0.5)	0.1	(0.1,0.4)	1.5	(0.9,2.3)	0.9	(0.5,1.6)	4.8	(3.8,6.0)		
Thailand	1.8	(1.2,2.6)	3.7	(3.0,4.7)	18.1	(15.9,20.5)	14.3	(12.2,16.6)	9.3	(7.9,11.0)		
Malaysia	3.1	(2.3,4.0)	1.6	(1.2,1.9)	4.9	(4.1,5.8)	7.6	(6.4,8.9)	2.6	(2.2,3.1)	8.0	(6.8,9.4)
Philippine	2.8	(2.2,3.6)	7.6	(6.2,9.3)	19.3	(16.8,22.1)	18.9	(16.1,22.1)	15.6	(13.9,17.3)		
Mongolia	0.4	(0.2,0.7)	0.8	(0.5,1.2)	6.1	(5.0,7.6)	4.1	(3.3,5.1)	2.0	(1.6,2.5)	8.6	(7.4,10.0)
Tajikistan	0.1	(0.1,0.3)	0.3	(0.1,0.8)	1.5	(1.1,2.0)	0.7	(0.4,1.3)	2.6	(1.9,3.6)		
Cambodia	1.5	(0.8,2.6)	0.9	(0.5,1.6)	4.3	(3.2,5.7)	5.2	(4.2,6.4)	1.3	(0.9,1.9)	4.1	(3.0,5.4)
China	4.4	(3.7,5.2)	1.1	(0.9,1.4)	9.3	(8.3,10.5)	13.6	(12.1,15.2)	4.8	(4.1,5.5)		
Lebanon	15.4	(10.1,22.7)	1.2	(0.7,2.2)	21.1	(15.4,28.3)	28.6	(20.8,37.9)	4.9	(3.6,6.5)	23.7	(17.1,31.7)
Viet Nam	7.1	(5.7,8.8)	1.5	(0.9,2.4)	12.7	(10.5,15.4)	15.6	(13.4,18.1)	4.5	(3.4,5.9)	12.2	(9.8,15.0)
Europe												
The former Yugoslav Republic of Macedonia	4.4	(3.0,6.3)	3.0	(1.9,4.7)	20.8	(16.6,25.9)	34.6	(27.6,42.4)	17.2	(14.4,20.4)		
Oceania												
Kiribati	0.8	(0.4,1.5)	15.1	(11.8,19.1)	21.4	(17.7,25.5)	30.2	(26.0,34.6)	17.0	(14.5,19.9)	10.9	(8.7,13.5)
Nauru	0.6	(0.6,0.6)	9.6	(9.6,9.6)	20.4	(20.4,20.4)	22.0	(22.0,22.0)	17.1	(17.1,17.1)	17.5	(17.5,17.5)
Samoa	6.2	(5.0,7.6)	7.5	(6.0,9.4)	36.6	(31.3,42.1)	35.2	(30.1,40.7)	33.8	(28.3,39.8)	38.8	(33.3,44.5)
Solomon	1.0	(0.6,1.9)	7.8	(5.7,10.7)	16.9	(12.6,22.4)	18.4	(13.8,24.1)	15.0	(10.6,20.9)	12.1	(8.8,16.5)
Tonga	2.0	(1.4,2.7)	7.1	(5.7,8.8)	14.4	(11.9,17.3)	16.3	(13.6,19.4)	12.2	(10.2,14.4)	12.7	(10.4,15.3)
Vanuatu	1.0	(0.5,2.1)	3.3	(1.8,6.1)	5.6	(3.7,8.6)	7.0	(4.5,10.6)	3.0	(1.6,5.5)	6.0	(4.0,8.9)

Prevalence estimates are weighted prevalence. [a] Not measured in surveys conducted before 2009.

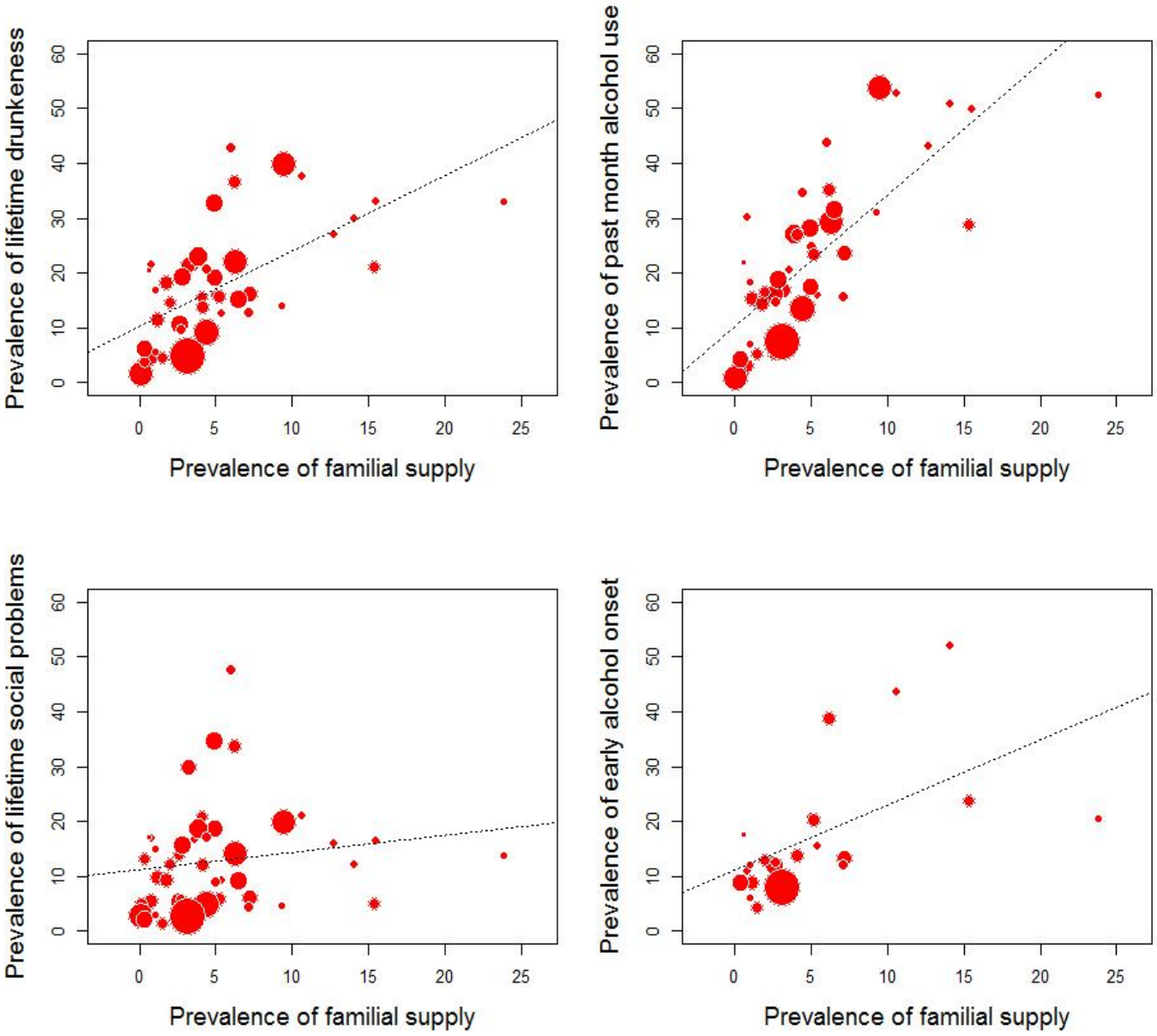
Table 3. Multilevel logistic regression analyses[a] on lifetime drunkenness, social problems due to alcohol, early alcohol onset, and past 30-day drinking.

	Lifetime drunkenness		Lifetime social problems		Early alcohol onset		Past month drinking	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Individual level variables								
Age	1.39***	(1.25,1.55)	1.20**	(1.07,1.34)	0.85***	(0.82,0.89)	1.25***	(1.15,1.36)
Female	0.66***	(0.57,0.76)	0.79***	(0.7,0.88)	0.56***	(0.51,0.62)	0.70***	(0.63,0.79)
Familial alcohol supply[b]	NA		NA		NA		19.41***	(13.38,28.17)
Peer alcohol supply[b]	NA		NA		NA		18.34***	(13.25,25.39)
Country level variables								
Prevalence of familial alcohol supply	**1.10****	**(1.04,1.16)**	**1.03**	**(0.95,1.1)**	**1.12*****	**(1.07,1.18)**	**1.12****	**(1.04,1.20)**
Prevalence of peer alcohol supply	**1.13*****	**(1.08,1.18)**	**1.12*****	**(1.07,1.17)**	**1.08*****	**(1.05,1.12)**	**1.11*****	**(1.06,1.17)**

[a] Variables entered in the multilevel logistic regression models included individual level variables and country level variables, controlling for GNI per capita, percentage of population that is urban-dwelling, and Minimum Legal Purchasing Age; four separate models conducted for each outcome variable. [b] NA: Not applicable Individual level familial and peer alcohol supply were only examined in the frequent drinking model because their time frame (past 30 days) did not align with the time frame of the lifetime drunkenness, lifetime social problems and early alcohol onset.

*** $p < .001$; ** $p < .01$; * $p < .05$.

Figure 1. Bivariate associations between prevalence of familial supply and prevalence of each of the alcohol outcome variables. Size of each bubble represents the sample size of each data point.



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